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LITERATURE REVIEW ON VAN USE IN THE UK

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CONTENTS

Executive summary

Over the last decade the number of vans in the UK has been subject to faster growth rates than cars or heavy goods vehicles, and according to the Driver and Vehicle Licensing Agency (DVLA) vans[1] accounted for 9.5% of the total vehicle population in 2004. Despite their popularity, however, relatively little is known about their patterns of use or safety issues such as accident involvement compared with e.g. the more established body of research for long haul trucks. For these heavy goods vehicles, the available scientific evidence has led to a strict regulation of working and driving time that leaves little flexibility for operators in the very competitive market of goods transport. Similar restrictions are thinkable for the currently far less regulated light goods vehicle market, though this seems likely to depend on the operators'/employers' willingness to commit themselves voluntarily to best practices of managing the occupational road risk of their drivers. Presently, most van drivers (except those who are self-employed) will fall under the Working Time (Amendment) Regulation 2003, which entitles them to limit their working week to 48 hours, but leaves them opportunities to opt out of this limitation. Similarly, driving is limited by the prescription of safeguarding the long-term health for the employee and others rather than through strict prescriptions for managing the driving and working time.

This literature review on van use was produced to inform on current and future trends in the van market as well as van usage patterns, to investigate van involvement in road accident casualties, to highlight the issues associated with occupational road risks and to provide an overview on measures to manage these risks.

Due to the variety of different types of vans and different definitions used, figures on fleet size or accident involvement of vans have to be somewhat imprecise. For the purpose of this report, a van was defined as including (a) a vehicle not exceeding 3.5 tonnes gross vehicle weight in the private and light goods taxation class with a van body type (including car-derived vans) and (b) a vehicle up to 7.5 tonnes gross vehicle weight in the goods taxation class with a van body type. However, different publications often use other definitions. Most frequently, sources focus only on light goods vehicles/light commercial vehicles (as opposed to heavy goods vehicles), that is on part a) of our above definition of vans. This results in a slightly lower number of vans compared to our suggested definition. Where no more specific information was available, the terms 'light commercial vehicle' and 'light goods vehicle' was used synonymously with 'van'.

Following the above definition, there are currently around 3 million vans registered in the UK with an annual volume of new registrations of approximately 320,000 for light commercial vehicles. The majority of vans in the UK are company owned (57.5%) as opposed to private ownership. In 2004 vans accounted for 11 billion tonne kilometres or 7% of all freight activity in Great Britain. Estimates of the number of dedicated van drivers in the UK range between 187,000 and 290,000. Only 11% of these occupational van drivers are reported to be self-employed and the vast majority of professional van drivers work full-time. Women account for only 6% of all professional van drivers. Additional to the group of dedicated van drivers, the number of occasional van drivers is estimated to be around 4 million.

Vans are typically business vehicles, and are only in a minority of cases used for private purposes: 83% of van kilometres per year in privately owned vans are for business related purposes compared with 93% in company-owned vans. Company owned vans are more often used for delivery of goods or equipment and do more travelling between jobs, whereas privately owned vans are most frequently used in the building and maintenance trade and do more travelling between the home of the owner and the workplace. Vans' peak time of use is typically between 8-9 am and 4-5 pm during the week and between 12-1 pm for privately owned vans at the weekend.

The analysis of STATS 19 data from 1999 to 2003 found van accidents rates per billion kilometres to decrease over the last years and vans to be involved in 8% of all road accidents. However, studies also point towards an overrepresentation of vans in fatal road accidents. The casualty rate in vans was

[1] Vehicles up to 7.5 tonnes gross vehicle weight with a van body type

found to be considerably lower (35%) than in other vehicles for accidents with van involvement. Other vehicles most frequently involved in van accidents are cars. One fundamental reason for the lower casualty rate in vans is the mass incompatibility between cars and vans. Vans tend to be heavier than cars, especially when loaded. In a collision a car therefore sees a greater change in velocity than the van. In addition to this, a geometric incompatibility can also exist, which means that in head-on collisions the stiff structures of the front of the van will override the stiff structures in the front of the car. This means, that the front of the car does not absorb energy in the way it was designed and greater intrusion of the passenger compartment can occur. Therefore, the lower casualty rate in vans should not be seen as a safety benefit of these vehicles, but rather as a result of the incompatibility of vans and cars in accidents and a transfer of risk from the van occupant to the occupant of the colliding car.

Of the 51097 STATS 19 accident casualties in van occupants and pedestrians injured by vans that were subjected to analysis, 1.2% were fatal. Two-thirds of the 51097 casualties affected the driver of the van, 17.3% were pedestrians. In 37% of all the cases, wet/damp street surfaces were present at the time of the accident. The analysis pointed towards two distinct patterns for accidents with van involvement: (a) accidents on (high speed) rural carriageways, where the (typically younger) driver loses control over the vehicle, and might leave the carriageway and collide with a stationary object; (b) inner city/village accidents typically associated with lower speeds, frequently at junctions, while the driver is stopping, starting, waiting to go ahead or carrying out a turning or reversing manoeuvre. Accidents took place most frequent between 7am and 5 pm, which reflects the business work patterns.

The cost of work-related road accidents of light goods vehicles to society has been estimated by Health and Safety Economists to be around £689 million per year. For employers the costs of work-related road accidents was estimated to accrue to £4.4 billion annually, manifesting itself in costs due to absence from work, insurance and compensation requirements and loss of productivity. Risk factors that need particular attention when using vans for business purposes were identified as:

- Fatigue
- Time pressure
- Mobile phones
- Use of seat belt
- Load
- Driver experience
- Crash compatibility
- Vehicle maintenance.

The review indicates the following as some of the areas where practice could be improved. Tight time schedules for vans drivers and higher exposure to traffic compared to normal drivers put van drivers at greater risk of becoming a victim of fatigue whilst driving. Attention should be paid to optimise schedules in such a way, that the driver will not be required to speed in order to meet the day's target. As experimental studies clearly demonstrate the deleterious effect of mobile phone use on driving performance and reaction to warnings, policies concerning their use should be implemented by employers/operators. Furthermore, van drivers should be made aware of the changed legislation on seat belt use for van drivers and strongly encouraged to use them. Knowledge on how to secure load, which is central to safe van deliveries, is often not conveyed to van drivers. This has negative implications for safety and training courses should be considered. The van owner should also introduce regular maintenance schemes for vans, as mechanical defects in these vehicles are frequently found and often contribute to accidents. Investigations into crash compatibility of vans and cars by van manufacturers could help to develop vehicles that will better safeguard the health of the drivers of both vehicles involved in an accident. Finally, driving experience has been demonstrated as a factor associated with fewer accidents. This can either mean a change in a business' driver selection policy or the introduction of training measures for the van drivers.

Endeavours have been made by organisations such as the Health and Safety Executive (HSE) or the Royal Society for the Prevention of Accidents (RoSPA) to raise awareness and to develop guidelines for the management of occupational road risk. Their recommendations for employers of drivers are based on existing health and safety legislation, predominantly the Management of Health and Safety at Work Regulations 1999, the Provision of Work Equipment 1998 and the Health and Safety at Work Act 1974. The regulations prescribe the selection and maintenance of work equipment, the provision of training and the regular assessment of risks plus remedial actions for employees and others. With regard to road traffic the basis of successful management of occupational road risk is the thorough risk assessment of the trias of driver, vehicle and journeys.

Future developments in the van market are likely to be fuelled by the significant growth in home shopping and internet connectivity. Home delivery is undertaken for a wide range of products and the vehicle type on the ‘final mile’ from distribution centre or retailer to the customer home depends very much on the type, size and weight of the product involved. Problems and challenges associated with the delivery of goods to customers’ homes are the potential growth of transport cost in relation to volume, the potential increase in delivery trips with associated parking problems and a higher risk for vulnerable road users in residential areas. Newly arising technologies such as alternative fuel technologies and telematics could be employed to reduce noise and emissions associated with van deliveries and could also help to optimise routeing and scheduling.

1 Introduction

Over the last decade the van[2] population in the UK has increased by around a third and van traffic by 40%, compared with increases of around 15% in car traffic and 20% in heavy goods vehicle traffic (DfT, 2005). Whereas information on heavy goods vehicles as well as cars has been accrued and investigated over years, vans in particular have received considerably less attention.

The recent increase in van activity has to be seen within the context of developments in the IT sector and communication technology, especially in the area of freight management and e-commerce: In addition to their classic use as tradesmen’s and construction site vehicles, there has been an increase in the use of vans by courier, express and mail services and in company delivery services. Short delivery times, mail order services and orders placed via the internet or telephone have fuelled this trend.

The rising importance of vans in commercial vehicle operations has also led to questions on safety issues and occupational road risk. Furthermore, commercial van activity has to be reviewed in the context of new EU legislation: whilst drivers and crews of heavy goods vehicles or public services vehicles have to comply with the prescriptions of the Road Transport Directive that came into force on the 4th April 2005, light goods vehicles are exempt from the directive and are instead (considerably less strictly) regulated by the Working Time (Amendment) Regulations 2003.

With their particular size between cars and trucks, vans combine the advantages of both vehicles in terms of speed, comfort on the one side and considerable load capacity and flexibility on the other (Berg et al., 2004). Depending on EU directive 70/156/ECC, which takes into account gross vehicle weight, construction design and purpose, vans are categorised into defined vehicle classes that apply throughout Europe:

- Vans with a gross vehicle weight of up to 3.5 tonnes used for transport of goods are placed in category N1
- Vans with a gross vehicle weight of 3.5-12 tonnes used for transport of goods are categorised as N2.

It is the N1 class that includes the typical van-type vehicle and where the rapid growth in sales has been recorded over the past few years.

In government statistics of vehicle numbers, vans are not listed as a separate category, but are, depending on their registration and weight, contained in the “private and light goods” or in the “goods” category. Given the variety of van-type vehicles, analyses of the fleet size and van accident figures have to be to a certain degree imprecise. Analysing the van involvement in casualty accidents from STATS 19 data for this review, the following vehicles were counted as vans:

- a vehicle not exceeding 3.5 tonnes gross vehicle weight in the private and light goods taxation class with a van body type (including car-derived vans)
- a vehicle up to 7.5 tonnes gross vehicle weight in the goods taxation class with a van body type.

However, different publications on vans often use other definitions. Most frequently, information sources reported results for light goods vehicles or light commercial vehicles only (as opposed to heavy goods vehicles). Where available, results are reported on all van type vehicles, including the 3.5-7.5 tonnes gross vehicle weight segment and the car-derived vans. In the rest of the cases, the term “light goods vehicle” or “light commercial vehicle” is used synonymously with “van”.

This literature review firstly aims to provide basic statistics on van activity in the UK, drawing on available information from the DfT, the DVLA or the Office for National Statistics. This includes the size of the van fleet, geographical differences participation in road traffic, purposes of van use and types of load.

[2] The DfT statistics quoted here refer to vans not exceeding 3.5 tonnes gross vehicle weight in the private and light goods taxation class with van body types.

Results from an analysis of TRL's STATS 19 database are presented to determine the extent and nature of the involvement of vans in accidents with casualties. These findings are amended by other scientific sources to draw a complete picture of the most important risk factors associated with van use. The review then relates these findings to recent developments in the area of occupational road risk and the respective legislation currently in place. Suggestions for codes of good practise developed by the Health and Safety Executive and the Royal Society for Accident Prevention are presented.

Lastly, the review outlines future areas of development in the van sector. This includes an overview of the impact of developments in information technology and e-commerce (potential) on van use and fleet management.

2 Basic information on van activity in the UK

2.1 Current trends in vehicle licensing

Depending on their gross vehicle weight, vans fall into two different vehicle licensing categories:

- Vans up to 3.5 tonnes gross vehicle weight are licensed as "other vehicles" in the "Private and Light Goods" vehicle category. According to the DVLA registrations the number of these vehicles was 2900000 in 2004[3].
- Vans between 3.5 tonnes and 7.5 tonnes gross vehicle weight are counted into the "Goods" vehicle category, which includes vehicles up to 38 tonnes gross vehicle weight. 153000 vehicles of this licensing category qualified as vans with a gross vehicle weight between 3.5 and 7.5 tonnes in 2004.

Of 32,259,000 vehicles registered in the UK in 2004, approximately 3,053,000 qualified as vans, which equals 9.5% of the total vehicle population in the UK.

Table 1 shows the development of the licensing groups over the last nine years. Comparing the number of vehicles licensed in the UK in 1996 with 2004 figures, the greatest increase in the number of licensed vehicles is for the "Other" group (vans) of the "Private and Light Goods" category with an increase of 28%. Cars come second with 22% and "Goods" vehicles third with 5%.

Table 1: Motor vehicle currently licensed: by taxation group: 1996-2004 (DfT, 2004a)

	Thousands			
Year	Private and light goods		Goods	All vehicles
	Cars	Other vehicles (vans)	(includes larger vans between 3.5 and 7.5t gvw)	
1996	21172	2267	413	26302
1997	21681	2317	414	26974
1998	22115	2362	412	27538
1999	22785	2427	415	28368
2000	23196	2469	418	28898
2001	23899	2544	422	29747
2002	24543	2622	425	30557
2003	24985	2730	426	31207
2004	25754	2900	434	32259

[3] The number of actual vans in the "other" category is slightly lower than 2900000, as the category also includes vehicles such as farmer's and showmen's goods vehicles.

For vehicles registered for the first time it is again the van group in the "Private and Light Goods" category that shows the proportionally greatest increases compared to cars and goods vehicles (see Table 2). Whereas the number of cars registered for the first time and vehicles in the "Goods" category show decreases of 2.4% and of 0.8% respectively in 2004 compared to the previous year, the van group in the "Private and Light Goods" category shows an increase of 7.3%.

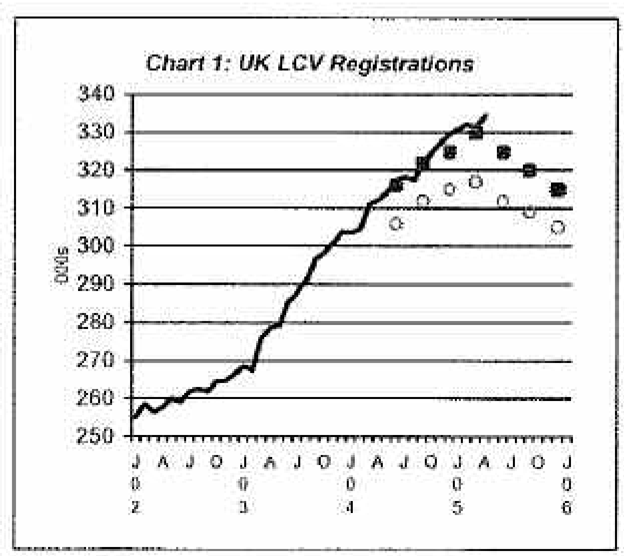
Table 2: Motor vehicle licensed for the first time: by taxation group: 1996-2004 (DfT, 2004a)

	Thousands			
Year	Private and light goods		Goods	All vehicles
	Body type cars	Other vehicles (vans)		
1996	1888.4	205.0	45.5	2410.1
1997	2015.9	228.4	41.8	2597.7
1998	2123.5	244.5	49.1	2740.3
1999	2100.4	241.6	48.3	2765.8
2000	2174.9	254.9	50.4	2870.9
2001	2431.8	277.9	48.6	3137.7
2002	2528.8	286.8	44.9	3229.4
2003	2497.1	323.5	48.4	3231.9
2004	2437.4	347.3	48.0	3185.4

The rapid growth of the van sector is also visible from figures provided by the Society of Motor Manufacturers and Traders (SMMT) for 2005 (Figure 1). The current trend in Light Commercial Vehicle (up to 3.5 tonne gross vehicle weight) registrations is at the upper end of the range of the annual projection for 2004 and 2005 (squares indicate the upper range of projections, circles the lower range). In April 2005 SMMT report a year on year growth of 12.8% in light commercial vehicle registrations with 113008 light commercial vehicles registered since January 05. Current expectations point to an annual volume of 330000-335000 van units to be newly registered, the forecast for 2006 is 315000-320000.

In comparison, growth for heavy commercial vehicles (over 3.5 tonnes gross vehicle weight) is reported to be smaller with 9.2% year on year growth and 18603 new vehicles registered since January 2005. The forecasted number of units in the full year 2005 is 57000.

Figure 1: Light commercial vehicle registrations 2002-2006 (forecast). The circles indicate lower boundaries, the squares upper boundaries of the forecast (SMMT, 2005).



When comparing marques, year on year growth in the van sector is particularly strong for Mitsubishi, Volkswagen and Peugeot as of April 05 although their market shares are smaller than those of Ford and Vauxhall (see Table 3). The ten listed marques took 87.6 percent of 2004's light commercial vehicle registrations.

Table 3: Light Commercial Vehicle registrations for year to April 05, year to April 04 and percentage of year on year changes (SSMT, 2005)

Marque	April 04- April 05	April 03 – April 04	% change (year on year)
Citroen	8334	8525	-2.2%
Ford	29914	30560	-2.1%
Fiat	4152	4009	3.6%
Mercedes	6416	7243	-11.4%
Mitsubishi	5580	4160	34.1%
Nissan	4802	4667	2.9%
Peugeot	6482	5456	18.8%
Renault	7688	6741	14.1%
Vauxhall	19319	16865	14.6%
Volkswagen	7710	6086	26.7%
All other	12611	13774	-8.4%
Total	113008	108086	4.6%

2.2 Vehicle kilometres

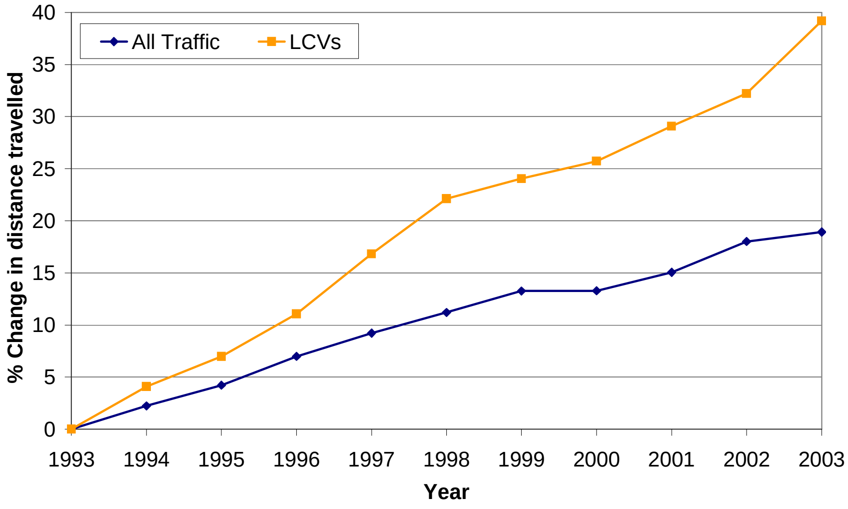
Cars made up for the majority (79.4%) of the 494800 million vehicle kilometres in the UK in 2003 (DfT, 2003c), followed light goods vehicles (LGV) with 11.7%. Heavy Goods Vehicles (HGV) come third with approximately 6% of all vehicle kilometres in 2003 (see Table 4). Whereas the proportions for HGV kilometres of all vehicle kilometres have slightly decreased over the last five years, LGV kilometres have been steadily increasing since 1999. Company owned vans accounted for 7% of all freight activity (or 11 billion tonne kilometres) in 2004 (DfT, 2005).

Table 4: Traffic by vehicle type between 1999 and 2003 (DfT, 2003c)

Traffic by vehicle type				
100 million vehicle kilometres				
Year	Cars and taxis	Light Goods Vehicles (Vans)	Heavy Goods Vehicles	Total
1999	3774	516	281	4710
2000	3768	523	282	4712
2001	3828	536	281	4787
2002	3929	550	283	4910
2003	3930	579	285	4948

This increase of travel is also visible from Figure 2, which shows a comparison of vans with all vehicles with regard to percentage changes of distances travelled between 1993 and 2003. The distance travelled by light commercial vehicles has increased disproportionately in comparison with the increase in all motorised vehicle traffic (Smith and Knight, 2005).

Figure 2: Comparison of the percentages of change in distance travelled between 1993 and 2003 (Smith & Knight, 2005)



2.3 Number of dedicated van drivers

According to the Spring 2004 Labour Force Survey, carried out by National Statistics (ONS, 2004), an estimated 187000 people in the UK would describe themselves as dedicated van drivers as opposed to 314000 truck drivers. 89% of these van drivers work as employees, the remaining 11% report to be self-employed. 81% of employee van drivers work as full time van drivers. For the self-employed dedicated van drivers, all respondents report to work full time. Women account for only 6% of all dedicated van drivers.

Table 5: Van drivers and HGV drivers in employment, by status and sex (National Statistics, 2004)

	All in employment[4][5]		Employees[5]			Self-employed[5]		
	SOC 2000[6]		Fulltime	Part-time	Total	Fulltime	Part-time	Total
Total	Van driver	187,000	134,000	32,000	167,000	17,000	0	19,000
	HGV driver	314,000	282,000	0	288,000	25,000	0	25,000
Male	Van driver	176,000	129,000	27	157,000	16,000	0	17,000
	HGV driver	312,000	280,000	0	286,000	25,000	0	25,000
Female	Van driver	11,000	0	0	10,000	0	0	0
	HGV driver	0	0	0	0	0	0	0

Health and Safety Executive economists (HSE, 1999) reckon that the Labour Force Survey considerably underestimates the number of professional dedicated van drivers. They argue that drivers of vans owned and operated by large manufacturing, wholesale and retail organisations might often be given a different occupational description and they estimate the number of dedicated drivers to be around 10% of the actual number of these vehicles. This would result in 290000 dedicated van drivers

[4] Includes unpaid family workers and persons on government-supported training and employment programmes.
[5] Includes those who did not state whether they worked full or part time.
[6] Standard Occupational Classification

for 2004. The same economists estimated in 2001 that the majority of light goods vehicles is driven by approximately 4 million occasional drivers.

2.4 Differences and similarities in company owned versus privately owned vans

To identify the differences in the use of company owned and privately owned vans, the Department for Transport commissioned two surveys in 2003, one for each ownership type. Vans were considered to be company-owned if the keeper was a Company or Company (Messrs.)[7]. A van was considered to be privately owned if the registered keeper was any other category i.e. Mr, Mrs, Miss, Rev, Dr, or Between keepers. In both surveys, vans were defined as vehicles not exceeding 3.5 tonnes gross vehicle weight in the light goods taxation class with van body types according to DVLA records[8]. This included the following van categories (also see Figure 6):

- **Panel/light:** panel van, light goods van, light van
- **Car-derived:** car derived van
- **Pick-up:** pick-up van
- **Box/Luton/fitted:** box van, Luton van, specially fitted van, insulated van
- **Van/side windows:** van, van with side windows.

Figure 3: Examples of van types.

Panel/light: panel van, light goods van, light van

Car-derived van

Pick-up van

Box/Luton van: box van, Luton van, specially fitted van, insulated van

[7]Company (Messrs.) = Plural of Mr. (Messieurs), used as a title before the name of two or more people.

[8] This specification excludes non-van vehicles such as farmer's vehicles from the light goods vehicle class and at least partially explains the lower overall figures of registered vehicles and annual vehicle kilometres in the van studies compared with the earlier reported licensed vehicle numbers and annual vehicle kilometres (both DfT).

Van with side windows

Figures for 2004 on company-owned vans (DfT, 2005) were published as this report was being written. The new figures are included in separate columns in the tables to indicate developments or changes in the company-owned sector. However, the main focus in the following is on differences and similarities between company-owned versus privately owned vans.

Table 3 provides an overview of the percentage distribution for different van types in the overall UK van fleet for privately owned and company-owned vans based on DVLA figures from 2003 (DfT, 2003a, 2003b). Company-owned vans account for 57.5% of all vans; the remaining 42.5% are in private possession.

Table 3: Absolute numbers and percentages of company owned versus privately owned vans (DfT, 2003a, 2003b, 2005)

	Privately owned vans	Company owned vans (2003)	Company owned vans (2004)
Type of van	N= 988018	N= 1338678	N= 1375493
Panel, Light Goods and Light Van	45.5 %	49.1 %	51.2 %
Car derived	36.4 %	12.7 %	26.3 %
Pick up	10.2 %	28.2 %	7.1 %
Box van, Luton van, Specially fitted van/Insulated van	4.7 %	6.5 %	12.1 %
Van, with side windows	3.2 %	3.5 %	3.4 %
Total	100.0 %	100.0%	100 %

With regard to geographical distribution DVLA data (DfT, 2003a & 2003b) indicates the highest proportions of privately owned vans in the East (11.9% of all privately owned vans), South East (15.5%) and South West (11.2%) of England. The greatest proportions of company-owned vans in 2003 were found in the North West (12.7% of all company owned vans), West Midlands (16.1%) and South East (14.7%). These proportions remain almost unchanged for company-owned vans a year on (in 2004) with North West (13.1%), South East (15.2%) and West Midlands (16.0%) (DfT, 2005).

For privately owned vans, 83% of all vehicle kilometres are business/work related; this is the case for 93% of the company-owned vans in 2003 and for 95.9% for company-owned vans in 2004 (see Table 6). In company-owned vans a considerably higher percentage of vehicle kilometres is used for the collection or delivery of goods or equipment (37.8% (31.6% in 2004) versus 22.9% in private vans, see also Table 6). Travelling between jobs also accounts for a higher percentage in company-owned vans (18.6% (23.6% in 2004) versus 10.2% in privately owned vans).

Table 6: Comparison of vehicle kilometres per year for privately owned vans versus company vans (DfT, 2003a, 2003b, 2005)

Vehicle kilometres per annum by reason for trip		Privately owned vans in 2003	Company owned vans in 2003	Company owned vans in 2004
Business use	Travelling to work from home	23.7%	15.2%	15.8%
	Travelling to home from work	21.4%	16.0%	16.9%
	Collection/delivery of goods/equipment	22.9%	37.8%	31.6%
	Travelling between jobs	10.2%	18.6%	23.6%
	Empty travel	n.a.	3.2%	3.4%
	Other business use	4.7%	5.6%	4.6%
Personal use		17.2%	3.0%	3.1%
Other use		-	3.9%	1.0%
Total		15238 million km	34646[9] million km	33812[10] million km

When comparing business uses for vans (see Table 7), privately owned vans distinctly account for a greater proportion of vehicle kilometre in the construction business (41% versus 29% for company vans in 2003). "Construction" constitutes the largest business category for privately owned vans confirming the picture of the van as a tradesmen's vehicle. Company vans show a more widespread pattern of use in business, with high van usage for manufacturing/ mining/ quarrying (16% in 2003, 15.4% in 2004), construction (29% in 2003, 31.2% in 2004), distribution/ hotels/catering/ repairs (19% in 2003, 21.4% in 2004) and transport/ communication (13% in 2003, 11% in 2003). Vans in general are less frequently used for agriculture, energy/ water supply, health and education.

Table 7: Comparison of estimated annual vehicle kilometres by business for privately versus company owned vans (DfT, 2003a, 2003b, 2005).

Estimated annual vehicle kilometres by type of business van undertakes	Privately owned vans in 2003 N= 15238 million km	Company owned vans in 2003 N=34646 million km	Company owned vans in 2004 N= 33812 million km
Personal use only	13%	-	-
Agriculture, forestry and fishing	5%	3%	2.7%
Energy and water supply	3%	2%	2.3%
Manufacture, mining and quarrying	3%	16%	15.4%
Construction	41%	29%	31.2%
Distribution, hotels, catering and repairs	13%	19%	21.4%
Transport and communication	8%	13%	11.0%
Banking, finance and insurance, business services and leasing	1%	9%	8.1%
Health, social work and other community services	1%	3%	3.4%
Education, public admin & defence, extraterritorial organisations	1%	3%	3.8%
Other services	12%	2%	0.8%
Altogether	100%	100%	100%

With regard to van use and types of goods carried, the "miscellaneous products" category, including goods such as mail/parcels and construction related machinery/equipment shows by far the highest proportions of overall vehicle kilometres for both groups of vans (see Table 8). This product category accounts for 72.8% of all annual vehicle kilometres in company-owned vans in 2003 (71.5% in 2004); however, only for 57% of all annual vehicle kilometres in privately owned vehicles. For 28% of all

[9] Includes unspecified reason for journey
[10] Includes unspecified reason for journey

vehicle kilometres privately owned vans are empty as opposed to 13% in company-owned vans in 2003 (15.7% in company owned vans in 2004) (DfT, 2003a, 2003b, 2005).

Table 8: Vehicle kilometres per annum by type of goods carried for privately owned versus company owned vehicles (DfT, 2003a, 2003b, 2005). Categories printed in bold.

Percentage of vehicle kilometres per annum by type of goods carried	Privately owned vans in 2003	Company owned vans in 2003	Company owned vans in 2004
Total	15238 million km	34646 million km	33812 million km
Food, drink & tobacco	**8%**	**5.7%**	**6.5%**
Live animals	2%	0.2%	0.4%
Other farming	1%	0.4%	0.5%
Other agricultural products	1%	0.5%	0.6%
Beverages	1%	0.7%	0.6%
Other foodstuffs	3%	3.9%	4.4%
Bulk products	**8%**	**4.4%**	**4.0%**
Wood and cork	1%	0.4%	0.3%
Sand, gravel and clay	5%	1.3%	1.5%
Textiles	2%	1.9%	1.1%
Pulp paper	0%	0.7%	1.1%
Coal, coke and other fuel	0%	0.1%	0.2%
Chemicals, petrol & fertiliser	**0.0%**	**1.8%**	**2.2%**
Fertilisers	0%	1.8%	2.2%
Miscellaneous products	**57%**	**72.8%**	**71.5%**
Construction related machinery and equipment	33%	41.9%	46.7%
Agricultural related machinery and equipment	0%	0.5%	0.4%
Other machinery and transport equipment	7%	11.4%	6.5%
Furniture	1%	1.1%	0.6%
Other miscellaneous manufacture	2%	10.0%	10.8%
Paper, mail and parcels	4%	7.3%	5.9%
Other household shopping	1%	0.2%	0.2%
Other miscellaneous articles nes.	9%	0.4%	0.6%
Empty	**27.8%**	**13.4%**	**15.7%**
All commodities	**100%**	**100%**	**100%**

Peak times for van use are very similar for both groups of vans with peak times of use between 8-9 am and 4-5 pm. At these times approximately a quarter of all vans are out on the road (see Table 9). Figures for company-owned vans seem to be slightly higher than for privately owned vans. Differences between company and private ownership are more pronounced for van use on the weekend. Whereas approximately 3% of all company-owned vans are out on the road on weekends during each one-hour interval during the day, this is the case for 10% of the privately used vans. This is in accordance with the differences in work patterns for self-employed versus company employees as well as the higher proportion of personal van use in the privately owned van group. These patterns for company-owned vans stay the same in the survey results from 2004.

Table 9: Peak periods of van activity for weekdays and weekends for privately used vans versus company-owned vans (DfT, 2003a, 2003b, 2005).

Peak periods during the week (Monday to Friday)			
Privately owned vans in 2003		Company owned vans in 2003 and 2004	
8-9 am	25% of all vans are on the road	8-9 am	31% of vans on the road
4-5 pm	24% of all vans on the road	4-5 pm	29% of vans on the road
Between 9am and 4 pm	approx. 16% of all vans on the road each hour	Between 9am and 4 pm	approx. 17% of all vans on the road each hour
Peak periods at the weekend			
12-1 pm	14% of all vans on the road	8-9 am	4% of vans on the road
Between 8am and 5 pm	approx. 10% of all vans on the road each hour	Between 7 am to 6pm	approx. 3% of all vans on the road each hour

A differentiation between privately versus company-owned vans in 2003 in terms of annual vehicle kilometres and van type indicates a higher percentage of annual kilometres for panel vans (46.4%) in the privately owned group as opposed to a higher percentage of "other" vans (41.8%), including light goods, light van, box van, specially fitted van, Luton van, insulated vans, van with side windows and all other vans, in the company owned group (see Table 10).

Table 10: Vehicle kilometre per annum by van type for privately owned versus company-owned vans (DfT 2003a, 2003b, 2005).

Vehicle kilometres per annum and type of van	Privately owned vans in 2003 N= 15238 million km	Company owned vans in 2003 N= 34646 million km	Company owned vans in 2004 N= 33812 million km
Panel Van	46.4%	26.9%	27.1%
Car-derived van	35.5%	26.3%	24.9%
Pick-up	8.5%	5.0%	6.1%
Other van, including:	9.5%		
Light goods	-	15.7%	17.6%
Light van	-	9.3%	8.0%
Box, specially fitted, Luton and insulated van	-	13.0%	12.7%
Van, van with side windows and all other types of vans	-	3.8%	3.6%
All vehicles	100%	100%	100%

With regard to travelling within or between Government Office Regions (GOR), it is the privately owned vans that to a greater proportion travel between different GORs (23% versus 16.2% for company owned vans; see Table 7).

Table 11: Vehicle kilometres per annum by origin and destination Government Office Region for privately owned and company-owned vehicles (DfT, 2003a, 2003b, 2005).

Vehicle kilometres per annum by origin and destination Government Office Region (in %)									
	Privately owned vans in 2003			Company owned vans in 2003			Company owned vans in 2004		
	Same region	Other region	Total	Same region	Other region	Total	Same region	Other region	Total
North East	3.2	0.5	3.7	3.8	0.4	4.2	3.4	0.3	3.8
North West	7.7	1.2	8.9	10.8	1.2	12.1	13.0	1.4	14.4
Yorkshire and the Humber	5.0	2.3	7.3	7.5	1.4	8.9	7.5	1.3	8.8
East Midlands	4.4	1.6	6.0	7.2	2.2	9.3	6.4	1.5	7.9
West Midlands	6.3	1.6	7.9	6.2	1.6	7.8	6.6	1.3	7.9
East	8.8	3.0	11.8	8.3	1.7	10.0	8.8	1.8	10.6
London	4.7	4.4	9.0	5.9	2.1	8.0	5.5	2.3	7.8

Continued	Privately owned vans in 2003			Company owned vans in 2003			Company owned vans in 2004		
	Same region	Other region	Total	Same region	Other region	Total	Same region	Other region	Total
South East	12.5	5.0	17.6	13.2	2.3	15.5	12.0	2.5	14.5
South West	9.9	2.3	12.3	8.4	0.8	9.3	9.6	0.9	10.5
Wales	5.2	1.1	6.3	4.4	0.5	4.8	4.4	0.5	4.9
Scotland	9.0	0.1	9.1	8.2	0.2	8.4	8.7	0.1	8.8
All regions	76.7	23.3	100.0	83.8	16.2	100.0	85.9	14.1	100

Figures on utilisation of vehicle capacity (use of vehicle volume) are only available for company-owned vans (in 2003 and 2004). The most frequent proportion of utilisation is the 0-25% category with 36.3% of all company vans in 2003 and 39.2% for 2004. This finding and the percentage fall for the 76-100% load category from 15.2% in 2003 to 13% in 2004 indicate an increasingly worse utilisation of load capacity in company-owned vans.

Table 12: Utilisation of vehicle capacity of company-owned vans in 2003 and 2004 (DfT, 2003b, 2005)

Total: 34646 million km	not specified	0-25%	26-50%	51-75%	76-100%	Total
Panel van	0.4%	8.6%	7.3%	6.3%	4.1%	26.9%
Light goods	0.6%	5.2%	3.8%	3.5%	2.5%	15.7%
Light van	0.2%	3.6%	2.5%	2.0%	1.0%	9.3%
Box, specially fitted, Luton and insulated van	0.3%	3.1%	2.8%	3.5%	3.2%	13.0%
Car derived van	0.6%	11.7%	5.9%	4.8%	3.3%	26.3%
Pick-up	0.1%	2.7%	1.3%	0.5%	0.5%	5.0%
Van, van with side windows, all other types of van	0.1%	1.3%	1.1%	0.8%	0.5%	3.8%
All vehicles	2.4%	36.3%	24.7%	21.4%	15.2%	100.0%
Total: 33812 million km	not specified	0-25%	26-50%	51-75%	76-100%	Total
Panel van	0.0%	10.4%	7.4%	6.3%	3.0%	27.1%
Light goods	0.3%	7.2%	4.7%	3.2%	2.2%	17.6%
Light van	0.0%	3.4%	2.6%	1.2%	0.8%	8.0%
Box, specially fitted, Luton and insulated van	0.0%	3.3%	3.4%	2.9%	3.0%	12.7%
Car derived van	0.1%	10.3%	7.1%	4.4%	3.0%	24.9%
Pick-up	0.0%	3.3%	1.2%	0.8%	0.9%	6.1%
Van, van with side windows, all other types of van	0.0%	1.3%	1.0%	0.9%	0.4%	3.6%
All vehicles	0.5%	39.2%	27.3%	19.8%	13.2%	100%

2.5 Accident involvement of vans in STATS 19

2.5.1 Overall accident and casualty numbers

The analysis of the STATS 19 database focused on road casualty accidents between 1999 and 2003, in which vans[11] were involved (regardless of their fault in the accident's causation). In general, STATS 19 encompasses all road accidents documented by the police, where a person was injured. STATS 19 currently does not allow a clear differentiation between at-work road accidents and accidents that

[11] For the purpose of the accident analysis we defined vans as light goods vehicles up to 3.5 tonnes and heavy goods vehicles between 3.5 - 7.5 tonnes gross vehicle weight, both with van body types. At the time of the accident, the police only records, if the vehicle belongs to the light or heavy goods vehicle group. The body types of the vehicles involved are later specified by the DVLA, however, for 20% of all recorded vehicles the body type remains unknown. This leads to a slight underestimation of the actual number of vans involved in casualty accidents in our analysis.

happen in the course of non-work related driving. It is merely possible to discriminate company-owned vans from privately owned vans. However, as the DfT surveys on van use quoted earlier showed, the majority of vans (57.5%) are company-owned and of the remaining 42.5% privately owned vans, only 23% of all trips undertaken are for personal use. It can therefore be assumed that van accidents are typically at-work accidents.

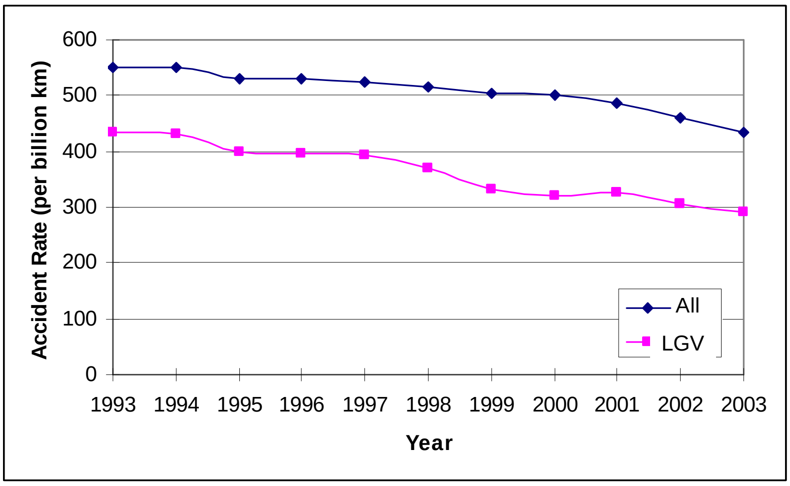
The STATS 19 analysis carried out for this review shows that the proportion of all road casualty accidents with van involvement fluctuates around 8% between 1999 and 2003 (see Table 13). Taking into account the growing number of vans as well as their growing proportion of total vehicle kilometres, the constant figure of 8% is in effect a pronounced decrease of accidents with van involvement.

Table 13: Total number of road accidents, number vehicles involved in all road accidents, number of accidents, in which at least one van was involved and number of all road casualties (DfT, 2004b; STATS 19, 1999-2003).

Year	No of road accidents (all severities)	No of vehicles involved in all road accidents	No of accidents, in which at least one van was involved and % of all road accidents	All road casualties
1999	238923	430492	18669 (7.8%)	320310
2000	235048	429943	18039 (7.7%)	320283
2001	233729	420073	20326 (8.7%)	313309
2002	229014	408325	17355 (7.6%)	302605
2003	214030	392022	16880 (7.9%)	290607

This finding is supported by an analysis of STATS 19 accident rates carried out by Smith & Knight (2005) earlier this year. They showed a 43% reduction in the accident rates per billion km for light goods vehicles between[12] 1993 and 2003 (see Figure 4). Over the same period, the accident rate for all vehicles only decreased by 21%. Therefore, van accident rates decreased more drastically than other vehicles' accident rates.

Figure 4: Trend in accident rates for all injury accidents and those involving light commercial vehicles between 1993 and 2000 (Smith & Knight, 2005).

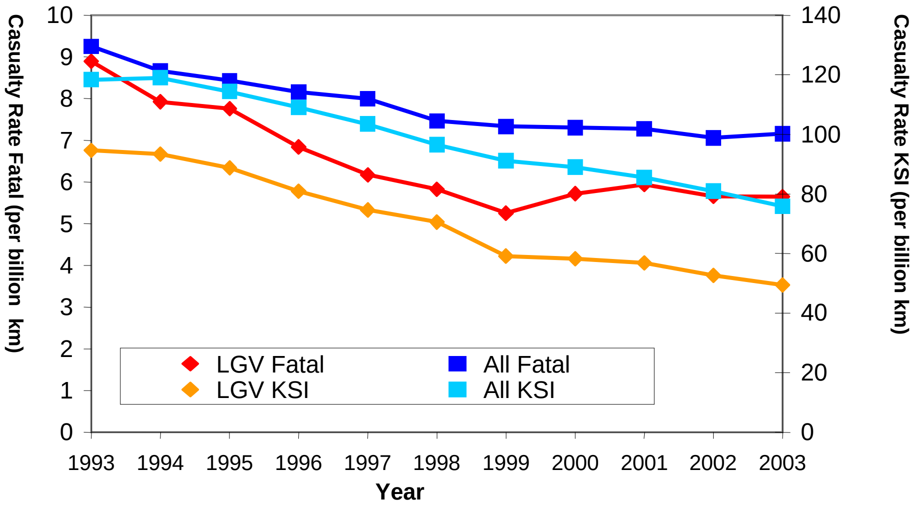


Smith and Knight (2005) carried out further analysis to differentiate trends in casualty rates for fatal or killed/seriously injured (KSI) road users for accidents involving light goods vehicles. Data for all road casualties is included for comparison. Figure 5 indicates that, casualty rates in accidents with light goods vehicles and accidents with all road users decreased in a similar way over a ten year period. However, there is a development against this overall trend in the form of an increase of fatal

[12] With a gross vehicle weight less than 3.5 tonnes

accident rates for light goods vehicles from 1999 onwards. The authors conclude that light goods vehicles are overrepresented in fatal accidents.

Figure 5: Fatal and killed or seriously injured casualty rates for all road users and those injured in accidents with light goods vehicles, 1993-2003 (Smith & Knight, 2005)



Despite an almost equal number of vans and non-vans (which are most frequently cars) in accidents with van involvement, the percentage of casualties in vans is considerably lower (see Table 15). This asymmetry between cars and light goods vehicles becomes even clearer when looking at the breakdown of accident records as provided by the Department for Transport (DfT, 2003c) in Table 14. Whereas 534 of the car occupants are seriously injured and 71 are killed, this is the case for only 219 injured and 4 killed van occupants.

Table 14: Accidents and related casualties in two-vehicle accidents for cars and light goods vehicles (DfT, 2003c)

Vehicle A: Car	Vehicle B: Light goods vehicle	Vehicle A: Light goods vehicle	Vehicle B: Car
Accidents involving	7273	Accidents involving	7273
User casualties	7180	User casualties	3035
of which: killed	71	of which: killed	4
seriously injured	534	seriously injured	219
Pedestrians hit by cars	120	Pedestrians hit by LGVs	66
of which: killed	7	of which: killed	0
seriously injured	21	seriously injured	13

This asymmetry can be attributed to the differences in mass between cars and vans. Differences in stiffness of structures and height between cars and vans also tend to mean that the car's frontal structure does not provide its designed level of protection to the car occupant and (b) that the crash energy tends to be absorbed by crushing of the car rather than the van (see also paragraph 3.2.7. crash compatibility). In effect, crash incompatibility between cars and vans tends to mean that risk is transferred from van occupants to car occupants in frontal collisions between the two types of vehicle.

Of the 146798 casualties in accidents with van involvement from 1999 to 2003, only a third (34.8% or 51097) occurred to the van occupants (or pedestrians hit by the van) themselves, (see Table 15). This rate of casualty involvement for van occupants is fairly stable over the course of five years.

Table 15: Number of road accidents, where at least one van was involved, number of vehicles and number of casualties associated with these accidents (STATS 19, 1999-2003).

	Vehicles involved in van accidents		Casualties associated with van accidents	
	Not vans	Vans and % of all vehicles involved in van accidents	Casualties in other (non-van[13]) vehicles	Casualties in vans[14] and % of all casualties associated with van accidents
year	N	N	N	N
1999	21026	19475 (48.1%)	18991	10544 (35.7%)
2000	20700	18818 (47.6%)	19352	10270 (34.7%
2001	19948	18084 (47.5%)	18903	9693 (33.9%)
2002	23319	21338 (47.8%)	20674	11264 (35.3%)
2003	19362	17634 (47.7%)	17781	9326 (34.4%)
Total	104355	95349 (47.7%)	95701	51097 (34.8%)

2.5.2 Van characteristics and ownership

The following analysis focuses on identifying accident characteristics of the 51097 casualties to van occupants (and pedestrians, if injured by the van) in accidents, in which at least one van was involved (Table 15, right bottom cell). Table 16 gives a break-down of van ownership. Company owned vans make up for 56.3% of all van occupant casualties, compared to 33.4% privately owned vans. These figures are an accurate reflection of the ownership percentages quoted in the DfT van studies.

With regard to van body types, the car derived vans are associated with the highest proportions of occupant/pedestrian casualties (47.4% of all van casualties), followed by panel vans with 42.1%. Again, this is in line with the frequency distribution of van body types in both DfT surveys on van activity (DfT 2003a, 2003b).

The majority (66.5%) of vans in the sample were registered between 1990 and 1999, vehicles with registration date prior to these years make up 11.7%.

Table 16: Ownership, registration year and body types of all casualties to van occupants (and pedestrians injured by vans), all years (STATS 19, 1999-2003)

Variable	Categories	Frequencies	Percentage
Ownership	Company-owned	28765	56.3
	Privately-owned	17068	33.4
	Unknown	5264	10.3
Year of registration	<= 1979	74	0.1
	1980-89	5941	11.6
	1990-99	33987	66.5
	>= 2000	11095	21.7
Body type	Panel van	21494	42.1
	Box van	2291	4.5
	Car derived van	24224	47.4
	Light van	469	0.9
	Van/side windows	264	0.5
	Light goods	55	0.1
	Luton van	592	1.2
	Insulated van	577	1.1
	Glass carrier	7	0.0
	Specially fitted van	47	0.1
	Van	1077	2.1

[13] Including heavy goods vehicles, pedal cycles, motorcycles, cars, passenger carrying vehicles, pedestrians and others

[14] vans occupants and pedestrians outside the van, who were hit by the van

2.5.3 Driver and casualty characteristics

90.8% of all drivers of vans in the sample are male, only 8.1% are female. This finding reflects the reported the gender proportions in the aforementioned Labour Force Survey 2004.

Table 17 shows the age distribution of the van drivers involved in casualty accidents. 26 to 35 year olds account for the greatest percentage with 31.7%. However, the percentage of young drivers of under 25 years is considerable at 18.1%.

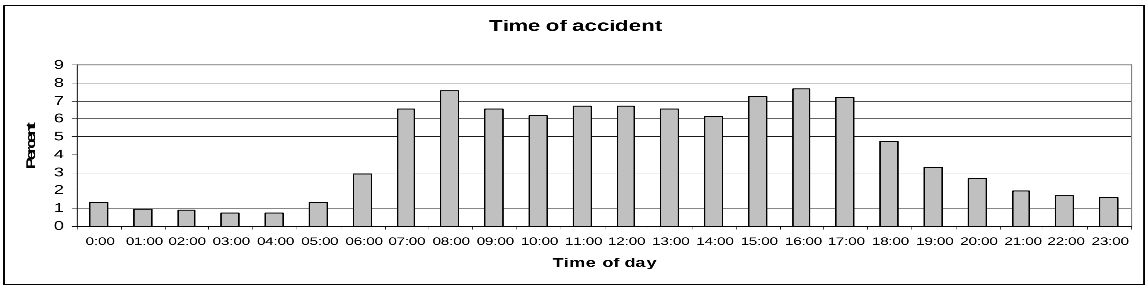
More than half of all accidents with casualties to van occupants (and pedestrians injured by a van) result in one casualty only for all accident parties involved. Accidents with up to three casualties between all parties involved account for 92% of all cases. Accidents with more than 4 casualties account for only 3.6% of all cases. Whereas almost two thirds of the 51097 casualties affect the driver of the van, 17.3% are pedestrian casualties. 1.2% of the sample are fatal, 12.0% are serious.

Table 17: Driver gender, age and casualty types in van occupant casualties (STATS 19, 1999-2003).

Variable	Categories	Frequencies	Percentage
Driver gender	Male	46400	90.8
	Female	4128	8.1
	Not tracked	569	1.1
Driver age	<=25	9257	18.1
	26-35	16181	31.7
	36-45	12298	24.1
	46-55	7489	14.7
	56-65	3675	7.2
	66-75	641	1.3
	>=76	152	0.3
	Missing	1404	2.7
Number of casualties	1	26929	52.7
	2	14475	28.3
	3	5609	11.0
	4	2241	4.4
	>4	1843	3.6
Casualty class	Driver or rider	32134	62.9
	Vehicle or pillion passenger	10144	19.9
	Pedestrian	8819	17.3
Severity of casualty	Fatal	637	1.2
	Serious	6141	12.0
	Slight	44319	86.7

The breakdown of the accidents by time of day shows peak rates for van occupant casualties and pedestrians injured by vans around 8 am and 4 pm (see Figure 6). This is the time of day when most vans are on the road (DfT 2003a, 2003b). Casualty rates remain increased over the over the course of the day and decrease in the interval after 8 pm and before 6 am. The casualty pattern reflects typical business work patterns. In agreement with the time of day distribution of casualties, daylight was recorded to present in around three quarter of all cases.

Figure 6: Time of day for casualties in van occupants and pedestrians injured by vans (STATS 19, 1999-2003).



Whereas most of the casualties in the sample occur on dry roads (59.4%), a third (36.9%) of all cases is associated with wet/damp surfaces. Other surface conditions, such as snow, frost, oil, mud or flood account for the remaining 1.6%. Whereas high winds would arguably play an important role in heavy goods vehicle accidents, they are reported to be present in only 3.4% of all cases.

2.5.4 Road characteristics

Almost half of the van occupant casualties and pedestrian casualties caused by vans occur on Class A roads, followed by roads that are not classified (23.8%). Only 8.3% of all casualties in van occupants or pedestrians hit by vans occur on motorways. With regard to road type, single carriageways with two lanes (one in each direction) are the most typical road type associated with van occupant casualties and pedestrian casualties caused by vans.

Speed limits for 30 mph and slower are present in 49.6% of the cases; for 60 mph and more this is the case in 39.2%.

Although these figures describe the circumstances of van occupant casualties, on their own they tell us little about the relative risk of the different circumstances. The patterns in Table 18 will be largely consistent with exposure patterns.

Table 18: Road class and road types associated with van occupant casualties and pedestrians injured by vans (STATS 19, 1999-2003).

Variable	Categories	Frequencies	Percentage
Road class	Motorway	4249	8.3
	A (M)	221	0.4
	A	24353	47.7
	B	6102	11.9
	C	3995	7.8
	Unclassified	12177	23.8
Road type	Roundabout	2082	4.1
	One way street	1428	2.8
	Dual carriageway - 2 lanes	6224	12.2
	Dual carriageway- 3 or more lanes	4944	9.7
	Single carriageway - single track road	1593	3.1
	Single carriageway- 2 lanes (one in each direction)	32970	64.5
	Single carriageway - 3 lanes (two way capacity)	808	1.6
	Single carriageway- 4 or more lanes (two way capacity)	811	1.6
	Unknown	237	0.5
Speed limit	5 mph	1	0.0
	10 mph	1	0.0
	20 mph	89	0.2
	30 mph	25226	49.4
	40 mph	4372	8.6
	50 mph	1377	2.7
	60 mph	12704	24.9
	70 mph	7327	14.3

2.5.5 Van locations and activities

According to Table 19, 98.4% of the vans were driving on the main road at the time of the accident. Of the remaining 1.6%, 0.6% were accounted for by the van being on the pavement. Junctions play an important role in van casualties with 50.5% of all cases related to a junction in some way. T-junctions or staggered junctions are most frequently associated with casualties in van occupants and pedestrians injured by vans (26.4%).

Going ahead is most frequent vehicle manoeuvre with 63.9%, followed by starting/stopping/waiting to go ahead with 14.3%.

Table 19: Van location at the time of the accident, junction location of the van at first impact and driving manoeuvres carried out at the time of the accident resulting in van occupant and pedestrian casualties (STATS 19. 1999-2003).

Variable	Categories	Frequencies	Percentage
Vehicle location at time of accident - road	Leaving the main road	1998	3.9
	Entering the main road	2666	5.2
	On the main road	43075	84.3
	On the minor road	3319	6.5
	Missing	39	0.1
Junction location of vehicle at first impact	Not at junction (or within 20 metres)	24844	48.6
	Vehicle approaching junction or parked at junction approach	9750	19.1
	Vehicle in middle of junction	12669	24.8
	Vehicle cleared junction or parked at junction exit	3369	6.6
	Did not impact	428	0.8
	Missing	37	0.1
Junction detail	Not at or within 20 metres of junction	24803	48.5
	Roundabout	2655	5.2
	Mini roundabout	294	0.6
	T or staggered junction	13508	26.4
	Slip road	1080	2.1
	Crossroads	4752	9.3
	Multiple junction	614	1.2
	Using private drive or entrance	2200	4.3
	Other junction	1179	2.3
	Missing	12	0.0
Manoeuvres	reversing/parking/u-turn	2704	5.3
	stopping/starting/waiting to go ahead	7284	14.3
	turning left/waiting to turn	1360	2.7
	turning right/waiting to turn	4397	8.6
	changing lane to left/to right	701	1.4
	overtaking moving/stationary vehicle	1953	3.8
	going ahead, going ahead left/right hand bend	32662	63.9
	Missing	37	0.1

2.5.6 Accident consequences and van damage for van occupant casualties and pedestrians hit by vans

With regard to consequence of the accident, vans in three quarter of all the casualties in van occupants documented in STATS19 don’t leave the carriageway (see Table 20). Of those 10920 which do, 75.3% hit an object off the carriageway, most frequently permanent stationary objects (25.7%), trees (10.5%) or crash barriers (15.5%). In 66.3% of all cases where the van left the carriageway, the speed limit is 60 or 70 mph.

In 93.7% of the casualties analysed the van does not hit an object in the carriageway. Of the remaining 6.3%, 2.5% are accounted for by the van hitting the kerb, 1.8% by hitting an unlit parked vehicle (percentages not shown in table).

The first point of impact is in half of the cases the front of the van. The 21.7% in the "back" category point towards a high proportion of rear-end collisions, which is further supported by the earlier quoted 14.3% of casualties occurring whilst starting/stopping/waiting to go ahead. STATS 19 data also register 1356 cases of van casualties while carrying out reversing manoeuvres.

Skidding and overturning is likely to be related to high speed accidents and accounts for 24.6% of all casualties in van occupants and pedestrians injured by vans.

Table 20: First point of impact, damage extent, skidding/overturning for van occupant casualties (STATS 19, 1999-2003)

Variable	Categories	Frequencies	Percentage
Vehicle leaving carriageway	Did not leave carriageway	40150	78.6
	Left carriageway nearside	5703	11.2
	Left carriageway nearside and rebounded	856	1.7
	Left carriageway straight ahead at junction	236	0.5
	Left carriageway offside onto central reservation	546	1.1
	Left carriageway offside onto central reservation and rebounded	452	0.9
	Left carriageway offside and crossed central reservation	105	0.2
	Left carriageway offside	2640	5.2
	Left carriageway offside and rebounded	382	0.7
	Missing	27	0.1
First point of impact	Did not impact	953	1.9
	Front	26841	52.5
	Back	11113	21.7
	Offside	6047	11.8
	Nearside	5503	10.8
	Missing	640	1.3
Damage extent	No part damaged	7475	14.6
	Damage to one side	3333	6.5
	Damage to two sides	23609	46.2
	Damages to three sides	12772	25.0
	Damage to all four sides	3901	7.6
	Missing	7	0.0
Skidding and overturning	No skidding, jack-knifing or overturning	38427	75.2
	Skidded	8621	16.9
	Skidded and overturned	2233	4.4
	Jack-knifed[15]	36	0.1
	Jack-knifed and overturned[16]	32	0.1
	Overturned	1672	3.3
	Missing	76	0.1

2.5.7 Pedestrian causalities

As earlier reported 17.3% of all the 51097 casualties to van occupants or pedestrians injured by vans, were pedestrian casualties. Physical pedestrian crossing facilities, however, are only present in 11.9% of all cases. The majority (65.4 %) of pedestrian accidents happen, when the pedestrian is either crossing a carriage way or being (in the middle of) the road in absence of a pedestrian crossing facility. 11.4% of all cases are accounted for by pedestrians being injured whilst being on footways or

[15]/[14] If the van was pulling a trailer.

verges. In terms of pedestrian activity, accidents during crossing are far more frequent than those with pedestrians being stationary in the road or those, where they walk parallel to the road.

Table 21: Pedestrian facilities, location and movement (STATS 19, 1999-2003).

Variable	Category	Frequency	Percentage
Pedestrians crossing-physical facilities	No physical crossing facility within 50m	45031	88.1
	Zebra crossing	968	1.9
	Pelican, puffin, toucan or similar non-junction crossing	1949	3.8
	Pedestrian phase at traffic signal junction	2216	4.3
	Central refuge- no other controls	734	1.4
	Footbridge or subway	165	0.3
	Missing	34	0.1
Pedestrian location	Not a pedestrian	42282	82.7
	In carriageway, crossing on pedestrian crossing facility	766	1.5
	In carriageway, crossing within zig-zag lines at crossing approach	32	0.1
	In carriageway, crossing within zig-zag lines at crossing exit	31	0.1
	In carriageway, crossing elsewhere within 50 metres of pedestrian crossing.	740	1.4
	In carriageway, crossing elsewhere	4355	8.5
	On footway or verge	1007	2.0
	On refuge, central island or central reservation	40	0.1
	In centre of carriageway, not on refuge, central island or central reservation	307	0.6
	In carriageway, not crossing	1100	2.2
	Unknown or other	430	0.8
	Missing	7	0.0

2.5.8 Summary and findings from other van accident analyses

As a proportion of all road casualty accidents, the incidence of casualty accidents in which vans are involved, is (at 8%) comparatively low, and has -considering the fast growing number of vans- effectively reduced over the last five years.

However, evidence from a German analysis of police-recoded injury accidents indicated that van drivers were more frequently to blame for the accident than drivers of other vehicles: 64% of van drivers involved in injury accidents were found to be solely responsible for them, compared to 54% of car drivers and 59% of heavy goods vehicle drivers (Schepers & Schmid, 2004). Greater blameworthiness of van drivers compared to bus drivers, truck drivers and motor cyclists are also reported in a German study by Berg et al. (2004), who point out that all the groups with lower blameworthiness rates require a distinct driving licence class and thus have the advantage of additional training. A UK van accident analysis (Smith & Knight, 2005) reports that vans are over-represented in fatal accidents and that in 44% of fatal accidents where light commercial vehicles were involved, the driver of the light commercial vehicle was considered to have contributed to the accident. The authors identified lack of attention as the most frequent cause of accident (24% of all LCV drivers involved in fatal accidents), followed by driving at a speed unsuitable for the conditions. In 5% of the fatal accidents with van involvement the van driver suffered from fatigue and a further 5% made errors of judgement). These findings might be an expression of handling deficits in van drivers, safety negative attitudes or could be a reflection of work conditions and schedule pressures on vans drivers. In any case they do underline the need for action to make the growing sector of van transport safer.

The STATS 19 data indicate that even though van casualty accidents involve roughly the same number of other vehicles as they do vans, the van occupants are considerably less likely to be injured than the occupants of the other vehicle, which might be explained by advantages of the van in a collision with a car in terms of mass, stiffness and geometry. There is evidence to indicate that this 'crash incompatibility' between vans and cars shifts injury risk from van occupants to car occupants similar to truck-car collision. Wet or damp road surfaces are involved in more than a third of all cases and thus constitute an issue that should be picked up in driver training. In the majority of cases the van driver was going ahead and the accident resulted in damage to the front of the car.

The analysis of STAS 19 data points towards two major van accident groups that involve van occupant casualties:

- Speed-related accidents on (rural) roads with speed limits of 60 or 70 miles per hour where the driver loses control over the van and as a result leaves the carriageway and hits an object off the carriageway. These accidents are also associated with higher percentages of fatalities and severe casualties. Drivers, who leave the carriageway, are furthermore significantly younger than those who don’t (on average 2 years).
- Inner city/village accidents with speed limits of 40mph and below, typically associated junctions or while the driver is stopping or starting or carrying out a turning or reversing manoeuvre.

Schepers &Schmid (1994) in their German accident analysis find comparable circumstances with a majority of van accidents occurring in built-up areas, followed by accidents on rural carriageways and a relatively small proportion of van casualties on the motorway. The authors report van casualty accidents in comparison with car casualty accidents to more often involve other vehicles, thus the proportion of accidents without interference of another vehicle is higher in cars. Furthermore, the German study finds accident-involved van drivers in the 2.8-3.5 tonnes van segment to be significantly younger (two years on average) than truck or car drivers.

3 Work related road risk in commercial vehicle use

3.1 Cost and accident severity

Road vehicles are a critical success factor for modern businesses in enabling them to carry goods and services to customers. However their use carries with it a significant risk of accidents affecting employees as well as other road users. According to the Health and Safety Executive, between 25% and 33% of all serious or fatal road incidents involve someone who was ‘at work’ at the time of the accident (HSE, 1999). National Statistics data suggests that 23% of all traffic fatalities involve one or more ‘at-work’ commercial vehicle(s), including buses, coaches, taxis or goods vehicles (Work-Related Road Safety Task Group, 2001). TRL research in the late 1980s and early 1990s, summarised by Downs et al (1999), found that even after adjusting for differences in annual mileage and in drivers' age and sex, people who drove a company-owned car regularly for work had an estimated 40 to 50% more accidents than private motorists. In other words, if a group of company drivers is matched with a group of private motorists in terms of age, sex and annual mileage, the company drivers would have one and a half times as many accidents as the private drivers. The finding strongly suggests that there is something about the drivers themselves, the way that they drive, or the types of journeys they do, that increases their accident risk.

That research studied all accidents that drivers reported in specially designed questionnaire surveys. Most of these were damage-only accidents rather than personal injury accidents - so there still remained the question of whether the findings would apply to injury accidents as well. Sometimes it has been suggested that they would not; that the excess risk for company car drivers will apply mainly to damage accidents resulting from the company driver's lack of financial incentive to care about minor bumps and scrapes (the "not my car" explanation). But the opposite might be true: if company drivers tend to have higher speed collisions because they drive faster or because they are more likely to fall asleep at the wheel, they would tend to have higher severity collisions than private drivers.

More recent research by TRL (Broughton et al., 2003) surveyed a representative sample of all drivers, and a sample of drivers who had recently been involved in an injury-accident reported to the police. The idea was to find out whether company drivers were over-represented in the injury accident sample. The results indicated that drivers who do over 80% of their mileage for work have about 53% more injury accidents than private drivers of the same age and sex who do the same overall mileage, and the same proportion of their mileage on motorways.

Costs to society arising from accidents involving ‘at-work’ vehicles were estimated with a total of £4.4 billion per year in 1999 by Health and Safety Executive economists, 689 million of which are associated with light goods vehicles (see Table 22). For employers, the costs resulting from absence from work due to injury, from employees that are killed or forced to quit their job due to injury, from insurance and compensation requirements and from loss of productivity were estimated to accrue to £2.7 billion per year.

Table 22: Total costs (in million £) to society of road accidents involving ‘at work’ vehicles (HSE, 1999).

Vehicle type	Fatal accidents	Serious accidents	Slight accidents	Damage only accidents	Total
Cars	291	388	245	388	1313
Heavy Goods Vehicles	481	240	129	204	1054
Light Goods Vehicles	170	214	118	187	689
Bus/coaches	112	402	110	175	799
Others	125	188	89	141	541
Total	1179	1432	691	1095	4396

The risks and costs associated with at-work road traffic have instigated research endeavours to clarify causation and responsibilities in accidents over the last ten years. The identification of key factors involved in work-related road accidents is a prerequisite for the development and implementation of adequate measures and policies to reduce accident rates and provide safer work environments for employees who have to drive in the course of their work.

3.2 Risk factors in commercial vehicle driving

In the following a brief overview will be provided on research findings regarding the most prominent factors associated with commercial vehicle use and occupational road risk. Even though these risk factors might not have been identified in association with van activity specifically, they will, for the reason of similarity of tasks and usage, most probably have an impact on occupational van drivers, too, and should be taken into consideration when identifying measure to improve van drivers’ safety.

3.2.1 Fatigue

Brown (1994) has defined fatigue as a “subjectively experienced inability or disinclination to continue performing the task in hand”. Fatigue is known to increase reaction time, to reduce vigilance, alertness, concentration and the speed of information processing (Akerstedt, 2000). Furthermore, fatigue can affect the quality of decision making. As driving can be interpreted as a predominantly self-paced task that requires sustained vigilance to avoid accidents, fatigue has a detrimental affect on the ability to drive. Factors that have been identified to influence the level of fatigue are:

- Circadian rhythm
- Time-on-task

- Sleep deprivation
- Medication/alcohol/stress/illness/sleep disorders

Driver fatigue is often cited as a cause of road accidents. As fatigue is not normally referred to on road accidents forms, studies that draw on officially reported accident data estimate the involvement of fatigue in accidents ranging from 0.5 to 3.7%. (Maycock, 1995). Maycock (1995) who carried out a study that based its estimation of the extent of fatigue on in-depth investigation of accident characteristics estimates that sleep may be a factor in 7.3% of all road accidents.

Horne & Reyner (1995) investigates sleep-related vehicle accidents (SRVA) using police records and other data. Their criteria for SRVA were:

a) the driver had typically run off the road and/or had collided with another vehicle or object

b) the absence of skid marks or other signs of hard breaking prior to the accident

c) establishing that for several seconds (about 7s) immediately prior to the accident the driver could have seen clearly the point of run-off or the object hit (implying prolonged inattention rather than momentary distraction)

d) other causes had been eliminated, such as mechanical defects in the vehicle, bad weather, poor road conditions, speeding, driving too close, excess alcohol consumption or medical disorder in the driver, suicide attempt by the driver.

e) witnesses would have reported lane-drifting prior to the accident

f) the driver would seldom had acknowledged to have fallen asleep or to have been sleepy beforehand.

Using these criteria the authors estimated that for urban roads, sleep-related vehicle accidents comprised 15-20% of accidents to which the police were called. For motorway Horne and Reyner (1995) identified 20% of accidents as being sleep-related.

Folkard (1997) reports two very distinct peak times for sleep-related vehicle accidents when traffic density is controlled for: one in the early hours of the morning at around three o’clock and the other as a quasi post-lunch dip around three o’clock in the afternoon. He finds this time-of-day effect to be very similar to that found in industrial performance measures and assumes both to be caused by the individual’s underlying circadian rhythm. Reviewing accident data of bus, lorry and British Rail drivers, Folkard (1997) finds that working time is associated with an exponential increase in risk over time-on-task, with a transient 2-4 hour peak in risk and a sharp increase after 12 hours of work. Reyner & Horne (2000) report an increased vulnerability to sleepiness for night-workers, when driving home after the shift in the early morning.

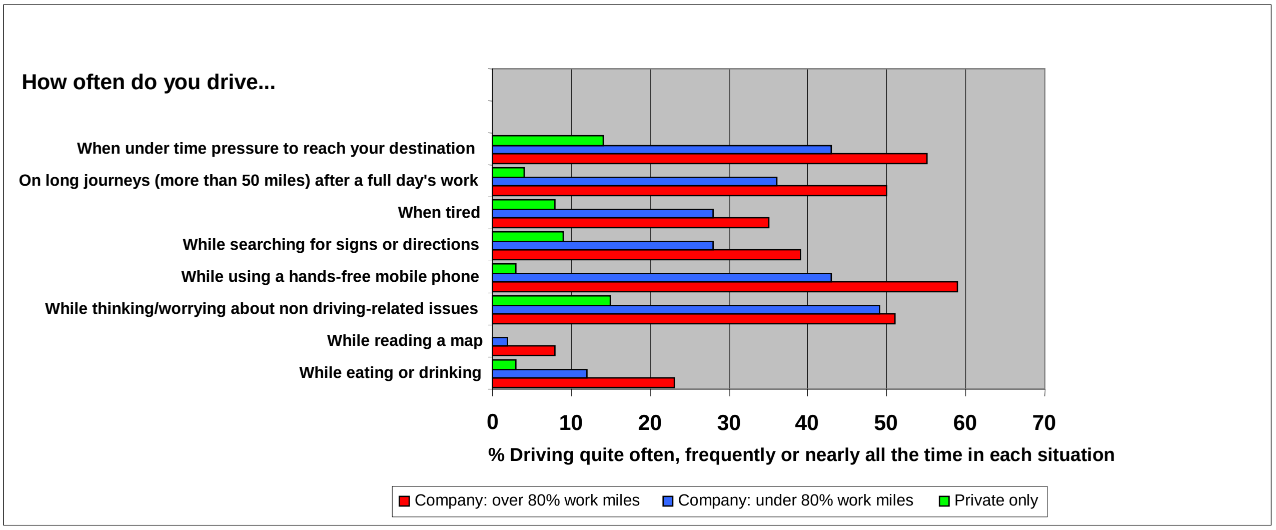
Within commercial road transport, especially for long haul truck driving, driver fatigue is a well known problem that has been subject to extensive research, particularly in Australia and the United States. According to Brown (1997) fatigue is a persistent occupational hazard for professional drivers, who have schedules to maintain and who may be working shifts. This commercial pressure can induce them to reach their scheduled destination regardless of any symptoms of fatigue they might experience. The European Transport Safety Council (1991) estimates that driver fatigue is a significant factor in approximately 20% of commercial road transport crashes.

An American study (Blower et al., 1998) found that about 20% of all fatal crashes and fatalities and 10% of all injuries involving a long-haul truck occurred between midnight and 6 am, the peak period for driver fatigue. Maycock (1995) found UK company car drivers to have an increased probability of falling asleep, due to them driving more often on long journeys along monotonous roads, having tight schedules and driving after a full days work. In accordance with Folkard’s (1997) study, Maycock found two sleep related accident peaks, one in the early hours of the morning, between 2 and 6 am and one in the mid afternoon, between 3 and 4 pm.

With regard to regulations that prescribe “adequate rest” for professional drivers, Horne & Reyner (2001) note that rest can be of little benefit if it contains inadequate sleep. According to the authors, non-sleeping rest is not substitute for sleep, and driving schedules should be planned so as to minimise exposure to prolonged driving under monotonous conditions during the more vulnerable times of the day and night. The authors find common countermeasures against fatigue such as cold air (opening the window), turning up the radio (Reyner & Horne, 1998) or physical exercise (Horne & Foster, 1995) ineffective or only partially effective for a short period of time (15 minutes). Instead they recommend the consumption of caffeine (effective doses 150-200mg), followed by a short nap (15 minutes) (Horne & Reyner, 1997).

Broughton et al. (2003) asked their samples of drivers how often they drove in various situations associated with time pressure, distraction and fatigue. Their responses are summarised in Figure 7, which shows the percentage of drivers who reported driving at least "quite often" in each situation. There were very large differences between private and company drivers. Driving more than 50 miles after a full day's work is one of the predictors of falling asleep at the wheel, which accounts for a substantial proportion of serious accidents. Of drivers who did over 80% of their mileage for work, 50% reported driving at least "quite often" in this situation. The corresponding figure for private-only drivers was 5%. Other findings illustrated in Figure 7 are mentioned in the following sections.

Figure 7: Distraction, fatigue and time-pressure (Broughton et al., 2003)



3.2.2 Time pressure

To minimise costs in a highly competitive market, transport and delivery of goods are operated with narrow time windows and have a great need for flexibility with regard to working hours on the part of the commercial vehicle driver. The pressures on drivers come from freight forwarders, cargo owners, and the large numbers of operators for loads. Self-imposed schedules, which may encourage excess speed, are often the outcome of the pressures on truck drivers, especially owner drivers.

The influence of earning opportunities and wage levels on the on-road performance of truck drivers (measured by average speed) has been investigated in a study by Gotlob & Hensher (1996) through analysis of in-depth interviews with 800 long distance truck drivers in Australia. Using structural equation modelling they found that self-imposed schedules led to speeding and speeding fines. A negative effect of fines on speeding documented the effectiveness of the enforcement of traffic laws. Older drivers were less inclined to have self-imposed schedules or to receive speeding fines, which the authors assumed to be a consequence of a more established position in the market and a greater certainty of jobs. Carrying perishable goods encouraged the self-imposition of schedules, higher speeds and speeding fines. Small company employee drivers were found to have the worst industry practises in respect of speeding and incidence of fines.

Broughton et al (2003) found that 55% of their high company mileage group reported driving at least "quite often" under time pressure. The figure for private drivers was 14% (see Figure 7).

3.2.3 Mobile phone use

Using a mobile phone while driving is a risk factor, which has been shown to increase the risk of collision by four to nine times (Redelmeier & Tibshirani, 1997). The typical consequences of mobile phone use during driving are poorer lane keeping, more variable speed and a slower reaction time to hazards (Brookhuis et al. 1991). Burns et al (2002) conducted a study in the TRL driving simulator, aimed at quantifying the impairment from hands-free and hand-held mobile phones in relation to the decline in performance caused by alcohol at the UK legal BAC limit of 80mg/100ml. They found that some aspects of driving performance were impaired more by using a phone than by having blood alcohol at the legal limit, and that hands-free, as well as hand-held, phones had important effects on performance. For example, drivers had significantly poorer speed control when using hand-held phones than in all other conditions. Reaction times were significantly longer for drivers using phones (hand-held or hands-free) in comparison to when they had alcohol. Also the drivers missed more warnings when using a phone. Drivers demonstrated a tendency to slow down when talking on hand-held or hands-free phones, even when instructed to maintain a set speed. Alcohol had the opposite effects. Subjective mental effort ratings of the participants indicated that they found it most difficult to drive using a hand-held phone.
59% of Broughton et al. (2003)'s high company mileage sample reported using a hands-free phone at least "quite often" while driving. For private drivers the figure was 3 per cent. The distracting influence of hands-free phone conversations is now well established by research at TRL and elsewhere.

3.2.4 Seat belt use

The wearing of front seat restraints has been compulsory since January 1983. However, as vans are frequently used for local deliveries several EU Member States introduced exemptions for the seat belt use requirements on convenience grounds. However, recent changes to EU Directives have imposed belt use requirements for van drivers and passengers as of March 2005 (RoSPA, 2005). The seat belt exemption for delivery drivers now only applies when travelling 50m or less between deliveries or collections.

Seat belt usage rates amongst the drivers and front passengers of vans are considerably lower than for car drivers, which typically fluctuate around 90%. In April 2002, 64% of van drivers and only 51% of van front-seat passengers wore restraints (PACTS, 2003). As the levels of protection offered by vans are generally focused on restrained occupants, van occupants not wearing their seat belts will not be receiving optimised safety.

Berg et al. (2004) in Germany found van drivers involved in casualty accidents only to have worn a seat belt in 50% of the cases. Compared to those drivers who wore a seat belt at the time of the accident, unrestrained drivers were more frequently seriously injured or killed. Fay et al. (2002) in the UK find that only 47% of light commercial vehicle drivers involved in accidents have actually worn a seatbelt at the time of the accident. A further 9% claimed to have worn a seat belt at the time of the accident, although no confirmatory physical evidence was identified. For passengers in light commercial vehicles that were involved in accidents the rate for seatbelt wearing was even lower (11% for front passengers, 18% for other passengers).

Of the 87 light commercial vehicle fatalities that Smith and Knight (2005) investigated in the UK, 78% were driving the vehicle at the time of the accident. The use of the seatbelt was known for 84% of the drivers. Where seatbelt use was known, 63% were not using the seatbelt provided. Therefore approximately only 50% were wearing seatbelts.

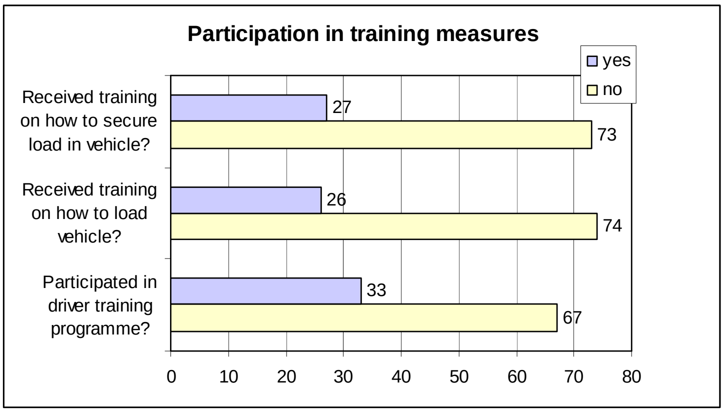
3.2.5 Load

It is often difficult to establish from accident records if and to what extent an unsecured load or overload was the cause or contributing factor of an accident. However, if the load has not been properly secured, if the load is too heavy or the dividing walls or lashing points have been inadequately fitted, vehicle dynamics are negatively affected, and in the case of an accident the risk for the van occupants to be injured is much higher. In an analysis of 608 casualty accidents with van involvement in Germany, 20% of all vans involved in accidents on motorways were found to be fully loaded or overloaded (Gwehenberger, 2004). The author points out that in combination with insufficient tyre pressure or excessive wheel load as a result of incorrect loading, there is an increased risk of a sudden blow-out.

In their STATS 19 analysis of light commercial vehicle accidents Smith and Knight (2005) found 18 cases where the load of the van had moved after impact. In ten of these cases the load was shed, and in the remaining 8 cases the load had shifted. In two of the cases where the load had shifted, this caused injury to the driver by trapping him between the seat and the steering wheel. In accidents where the load was shed, there was one case of injury to the driver.

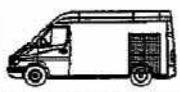
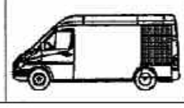
Berg et al. (2004) report findings of a German survey with 52 drivers of delivery vehicles. In the survey, drivers were asked if they had participated in a driver training programme, if they had received training on how to properly load a vehicle and how to properly secure load in a delivery vehicle. According to the findings, the reality with regard to specific training for the operation of delivery vehicles is that in the majority of cases driver hasn't received any training (see Figure 8).

Figure 8: Participation in training measures for van drivers in Germany (Berg et al. 2004).



Load has to be also considered with regard to its effect on vehicle handling characteristics. This has been investigated by the German DEKRA in a lane changing test based on the German Association of Engineers standard. The test vehicle was a Mercedes Sprinter van with a long wheel base. The maximum speed at which the empty van was able to drive through the lane-changing channel without touching the marker cones was 60km/h. The maximum speed for the fully laden vehicle varied between 49 and 56 km/h depending on the distribution of the load (see Figure 9). Berg et al. (2003) conclude that knowledge on the change in driving dynamics depending on amount and distribution of load should be conveyed in driver training programmes.

Figure 9: Comparison of maximum speeds in the Association of Engineers lane-changing test depending on the distribution of load (Berg et al., 2004)

Version of loading	Maximum speed	Version of loading	Maximum speed
	60 km/h		56 km/h
	54 km/h		53 km/h
	51 km/h		49 km/h

3.2.6 Driver experience

The higher accident involvement of novice drivers (who are usually also young, as age is confounded with experience) is a well established fact and has frequently been associated with inadequately developed vehicle handling skills (Fastenmeier, 1995), safety negative attitudes (Näätänen & Summala, 1976) and insufficient hazard perception (Harrison, 2002).

Maycock (2002) provided a review of the international evidence dealing with the relative effect of age and experience on accident liability, including the results from earlier British studies (e.g. Maycock, Lockwood and Lester, 1991 and Forsyth, Maycock and Sexton, 1995) which used statistical modelling to estimate the separate effects of these two variables. These studies showed very strong effects of increasing experience in the first three years of driving, and somewhat less strong effects of age. Interventions that increase the amount of experience gained by learner drivers before they drive unsupervised have been found very effective in reducing accidents (Gregersen & Bjurulf,, 1996).

For a sample of 1000 heavy goods vehicle drivers, Maycock (1995) demonstrated that the average number of accidents per three years fell from 0.44 for the 17-29 age group to less than one third of that figure for the over 55 year olds. When controlling for other factors such as annual mileage, drivers aged 19 displayed an accident frequency, which was over 5 times that of a driver of 41 years (sample average). For 65 year old drivers the effect was reversed: they had an accident frequency that was 40% less than that of a 41 year old driver. 83.6% of all 252 accidents reported by the sample over a 3 year period did not involve injury. No statistically significant relationship was found between accident involvement frequencies (per 3 year period) and annual mileage or percentage of driving time spent on motorways.

With regard to accident involvement of van drivers, Schepers & Schmid (2004) found drivers of accident-involved vans in Germany with a gross vehicle weight of 2.8-3.5 tonnes to be on average 2 years younger than drivers of cars or vans with a gross vehicle weight of between 2-2.8 tonnes. Compared to accident-involved lorry drivers these drivers were on average 2.5 years younger. The absence of special licence requirements for vans up to 3.5 tonnes gross vehicle weight allows especially young people to earn money as occasional van drivers, and as reported earlier, the group of occasional van drivers is by far greater than the group of dedicated van drivers. Additional qualifications for driving transport vehicles are not prescribed for N1 vehicles and only very few van drivers attend safer driving courses (Berg et al., 2004).

Defensive driving and increased driving competence through training might prevent or mitigate work-related road accidents. However, in the work context consideration has also be given to factors that might impair the worker’s ability to drive defensively such as time pressure, stress, use of mobile phones or fatigue. Broughton et al (2003) argued that failure to address such issues may undermine companies' attempts to improve safety by means of training and other driver-centred interventions. Baughan (2005) placed this in the context of recent theoretical developments that emphasise the importance of journey-related goals and circumstances as influences on driver behaviour and safety. He pointed out that companies to a large extent are in control of such goals for their drivers, and need to take action to make them more compatible with safety.

3.2.7 Crash compatibility

According to Thomson & Edwards (2005) compatibility can be broken down into three subtopics:

Frontal force levels: Frontal force levels are closely related to vehicle mass. Small vehicles undergo greater deceleration due to momentum conservation. In compatible collisions small vehicles absorb their share of the impact energy. However, in collisions with larger vehicles, cars absorb more than their share of the impact energy as they are unable to deform the heavier vehicle at the higher force required. As a result, the larger vehicle absorbs less than its share of the impact energy. Matched frontal force levels, e.g. in collision of vans with the same weight (and with good interaction), would mean that both vehicles in an impact absorb a 50% share of the kinetic energy. The risk of injury for both occupants would be balanced. In car-to-van collisions the car driver is, due to the smaller mass of his vehicle, at disadvantage and thus at higher risk. Given the operational requirements of commercial vehicles such as vans or trucks and environmental considerations for cars, action towards remedying the disadvantage of car drivers is limited. Possible improvements would include measures such as longer vehicle fronts and thus lower force levels or inclusion of energy absorbing structures in vans.

Structural interaction/geometry: Structural interaction is a measurement of how well vehicles interact in frontal impacts. If the structural interaction is poor, the energy absorbing front structures of the vehicle may not function as designed thus leading to a risk of compartment intrusion at lower than designed impact severities. An example for poor structural interaction are car-to-HGV collisions. Here, the truck chassis may be 800mm above the ground with little stiff structure beneath it, whereas the energy absorbing part of a car front may be 300-400mm above the ground. When the two vehicles collide, the structure of the car passes under the truck without much energy absorption or deceleration. The chassis of the truck then collides with the A-pillars of the car at a still high relative speed, and catastrophic deformation of the passenger compartment of the car occurs. Ideally, the stiff energy absorbing parts of each vehicle should be in the same position such that they interact properly with each other.

Compartment strength/stiffness: Compartment strength is closely related to frontal force levels but is nevertheless distinguished since it is an important issue for self-protection. In cases where the vehicle is exposed to higher impact severity than it is designed for or where the frontal structures of the vehicle have not absorbed the amount of energy as designed, the compartment strength needs to be sufficiently high to resist a compartment collapse. For example, in a collision, where the structures of both vehicles are interacting properly, but where the structure of one vehicle is less stiff than the other, the vehicle with the lower stiffness has to absorb more crash energy and as a result has a greater risk of passenger compartment intrusion.

Whereas car-to-truck compatibility has been subject to extensive investigation (Thomson & Edwards, 2005; Knight, Couper & Smith, 2000; Knight, 2000), there is only a limited number of findings with regards to car-to-van compatibility.

Fay et al. (2002) analysed 36347 records of collisions between cars and light goods vehicles (LGV) in Britain between 1994-1998. In around half of the cases (18,573) the car driver was slightly injured and the light commercial vehicle driver was uninjured according to police records. To quantify the compatibility of light commercial vehicles in collisions with passenger cars, the authors used the aggressivity index B, developed at TRL by Broughton (1994), which ranges from 0 (low aggressivity) and 1 (high aggressivity). The index B is derived from a two-by-two cross tabulation, as a ratio of occupants injured in the car to the total number of people injured in the car and/or the van:

$$B= (a+b)/(a+b+c)$$

	Subject vehicle (light commercial vehicle)	
Other vehicle	Injured	Not injured
Injured	a	b
Not injured	c	d

The index was calculated for three groups of drivers with the following results:

a) Killed: $B_{LGV}= 0.87$ $B_{car}= 0.15$

b) Killed or seriously injured $B_{LGV}= 0.8$ $B_{car}= 0.32$

c) All injury levels: $B_{LGV}= 0.8$ $B_{car}= 0.35$

As can be seen from the indices for car-to-LGV crashes, it is the drivers of cars who are at greatest risk of injury at every level of severity. The authors attribute this advantage of vans in car-to-LGV accidents to size and mass as well as to reasons connected with their construction and intended use, namely having stiff structures at greater height than passenger cars. As described above, the misalignment of stiff structures results in the van over-riding the car and intrusion of the car compartment. Although this tends to reduce the van occupants' risk of injury, increases the risk to the car occupant. According to the authors, the geometrical incompatibility between vans and cars is a dominant feature in many car/LGV accidents and they suggest exploring ways of improving and encouraging crash compatibility in impacts between light goods vehicles and cars.

3.2.8 Self-protection

The need for increased regulatory crash testing of light commercial vehicles is currently being debated (EEVC, 2000). At present vehicle crash safety is regulated by two EU directives, a) the frontal impact Directive (96/79/EC) and b) the side impact Directive (96/27/EC). Vans (N1 vehicles) are not included in the scope of the frontal impact Directive and only vans with the R point[17] lower than 700 mm are included in the scope of the side impact Directive. This means that the self-protection safety levels of vans are generally lower those of cars (M1 vehicles). Furthermore, there are no objective van safety ratings for consumers as there are for cars through the EuroNCAP (European New Car Assessment Programme).

On the basis of accident analyses the European Enhanced Vehicle Safety Committee (EEVC) have argued that N1 vehicles are involved in similar accidents to M1 vehicles (cars), but show (partly as a result of their greater weight) higher aggressivity levels (Fay et al. 2002). The EEVC have recommended that vans less than 2.5 tonnes gross vehicle weight should be included within the scope of the frontal impact directive, whereas vehicles above 2.5 tonnes should remain exempt until there is a better understanding of the influence of improved self-protection levels in vans could have on the compatibility of these vehicles.

Fay et al. (2002) point out that the inclusion of N1 vehicles in the frontal impact Directive might have an overall negative effect on road safety. They argue that the introduction of regulatory crash tests for N1 vehicles and the resulting better crashworthiness could increase the level of incompatibility between cars and vans. They argue that crash test for vans to promote better self-protection is likely to result in the introduction of stiff longitudinal members and thus stiff and reinforced front end structures to absorb crash energy. However, if these structures would not interact with the equivalent member in cars, this could further increase the injury risk of car occupants. Given that collisions of vans with cars are more frequent than collisions with rigid objects or other vans, the overall effect on road safety would be negative. Therefore conditions have to be chosen for crash tests that are aimed at increasing self-protection and encouraging compatibility without resulting in increased local stiffness.

3.2.9 Vehicle maintenance

According to the Royal Society for the Prevention of Accidents, mechanical faults are estimated to be a factor in 5.5% of all vehicle accidents. The Vehicle Inspectorate issued 3700 (32%) of 11700 inspected light goods vehicles with prohibition notices due to mechanical defects. The proportion of heavy goods vehicles inspected issued with prohibitions was lower at 21%.

Smith & Knight (2005) found in their analysis of STATS 19 van accident data that in 22% of all defective vans involved in accidents, these defects had contributed to the accident. Most frequent were contributory tyre defects, which were due to a lack of maintenance. Other defects included structural defects, faulty maintenance and brake defects. The data showed that defects were not so much associated with vehicle age, but rather with negligence of maintenance.

[17] The R point height is approximately at the centre of the driver’s pelvis.

3.2.10 Summary

Considering the evidence on fatigue and driving, time pressure, mobile phone use, use of seat belts, vehicle load, crash compatibility, self-protection, vehicle maintenance and driver experience clear priorities for action are indicated. Companies who rely on van drivers should identify problem areas and introduce the appropriate changes to create safe work environments for their employees. Sending drivers to training courses for example will not reduce accident numbers, if time constraints will force the driver to ignore what he has learned. Reducing occupational road risk also means to encourage a strong safety culture within the company that will inform drivers of risks and discourage the display of unsafe practices.

3.3 Legislation regarding working and driving time

3.3.1 The Working Time (Amendment) Regulation 2003

Following EU legislation, the UK implemented the "Working Time Regulations 1998" (Office of Public Sector Information, 1998). However, this regulation temporarily excluded employees in the transport sector, as it was felt that specific and more flexible guidelines were needed for this employment sector. Discussion between industry representatives didn't reach unanimity on the subject of the implementation of working time in the road transport sector on EU level. As a result of this continuing disagreement the European Commission (a) introduced the Working Time Directive for vehicles subject to 820/85/EEC to regulate working time of commercial drivers of heavy goods and public service vehicles (see next paragraph) and (b) amended the original directive (Horizontal Amending Directive, HAD) which brought the excluded sectors within scope of the original working time directive and resulted in the implementation in UK legislation as the Working Time (Amendment) Regulation 2003 (Office of Public Sector Information, 2003). In the amended version this regulation covers all mobile workers, who don't fall under the new Road Transport (Working Time) Regulations, as well as occasional drivers. Self-employed drivers, however, are exempt from the regulation. Specifically, the amendments entitle mobile[18] workers[19] to:

- the 48 hours average working week (averaged over a 17, or if agreed, over an up to 53 weeks reference period). However, the employee has the possibility to opt-out of this limit for a specified period or indefinitely
- 4 weeks paid annual leave
- health checks for night workers
- adequate rest[20]

The majority of vans drivers (employee drivers of vehicles under 3.5 tonnes gross vehicle weight and occasional[21] drivers) fall under the remit of this direction. Compared to the requirements of the Road Transport Regulations, it is considerably more flexible, e.g. enabling the driver to work more than the prescribed 48 hours per week or to drive without fixed rules for breaks. Self-employed drivers are not

[18] A 'mobile worker' is any worker forming part of the travelling staff (typically drivers and crew, but also trainees and apprentices), who is in the service of an undertaking which operates road transport services for passengers or the movement of goods. Mobile workers include drivers who work for hire and reward companies or companies with own account operations.

[19] A 'worker' is anyone who provides work or services under a contract, expressed or implied.

[20] Adequate rest means that a worker has regular rest periods, the duration of which are expressed in units of time and which are sufficiently long and continuous to ensure that, as a result of fatigue or other irregular working patterns, he does not cause injury to himself, fellow workers or to others and that he does not damage his health, either in the short term or in the longer term.

[21] An occasional driver is someone who drives under the EU drivers' hours rules, for 11 days or less within a reference period of up to 26 weeks, or 16 or less days within a reference period exceeding 26 weeks.

covered by the regulation, which means that they are not obliged to conform with the prescriptions regarding working time.

3.3.2 Road Transport (Working Time) Regulations

The Road Transport Directive came into force on 4 April 2005. It affects drivers and other mobile workers who are travelling in vehicles subject to the Community Drivers' Hours regulation (3820/85/EEC). Generally, this includes driver, vehicle crew and travelling staff of goods vehicles where the maximum permissible weight exceeds 3.5 tonnes or passenger vehicles suitable for carrying more than 9 people, including the driver (DfT 2005). Self-employed drivers (as defined under these regulations[22]), however, are not covered by the regulation until March 2009. Drivers, who do not satisfy the criteria for being self-employed under these new regulations, will (along with employees) be subject to them from 4 April 2005.

The new regulations prescribe that:

- the weekly working time is limited to an average 48 hours (usually calculated over a 17 weeks reference period). There is no opt-out from these weekly limits for mobile workers. However, with a workforce agreement at company level the reference period for calculation can be extended to 6 months)
- up to 60 hours work can be performed in a single week, as long as the average 48 hour limit is maintained.
- night workers are restricted to 10 hours working time in any 24 hour period (this can be exceeded if a workforce agreement is in place; however rest requirements under the EU drivers' hours rules must still be obeyed). The definition of 'night time' is a period between 0-4 am for mobile workers of goods vehicles, and 1-5 am for mobile workers of passenger vehicles.
- additional break requirements will apply (when doing other work instead of driving, or other work in addition to driving).

The new regulations define 'Working time' as the time from the beginning of work, during which the mobile worker is at the workstation (typically the driver's cab) at the disposal of the employer and exercising his functions or activities. Working time therefore encompasses:

(a) the time devoted to all road transport activities, including:

- driving
- loading/unloading
- training that is part of normal work and is part of the commercial operation
- assisting passengers boarding/disembarking from vehicle
- cleaning, maintenance of vehicle
- work intended to ensure safety of vehicle and its cargo and passengers (e.g. monitoring, loading and unloading/including daily defect check and report)

[22] Self-employed driver means anyone whose main occupation is to transport passengers or goods by road for hire or reward within the meaning of Community legislation under cover of a Community licence or any other professional authorisation to carry such transport, who is entitled to work for himself and who is not tied to an employer by an employment contract or by any other type of working hierarchical relationship, who is free to organise the relevant work activities, whose income depends directly on the profits made and who has the freedom, individually or through a cooperation between self-employed drivers, to have commercial relations with several customers. Self-employed drivers (as defined under these new regulations) must have an operator's licence.

- administrative formalities or work linked to legal or regulatory obligations directly linked to the specific transport operations under way

(b) time devoted to other activities, including:

- time during which the mobile worker cannot freely dispose of his/her time and is required to be at the workstation ready to take up normal work, with certain tasks associated with being on duty (e.g. working in the warehouse, or in an office doing other activities for the employer)
- waiting periods where the foreseeable duration is not known in advance, by the mobile worker, either before departure or just before the start of the period in question.

Employers have to monitor working time and must do what they can to ensure the limits are not breached. This includes:

- to inform mobile workers of the requirement under the new regulations and of details of any collective or workforce agreements
- inform employees that they must provide (in writing) an account of the time worked for another employer
- keep working time records for 2 years after the period covered
- provide (on request), a record of the working time performed by the mobile worker
- be able to show that they are complying with the regulations

If there is no employer, the agency, employment business or even the worker concerned must monitor their working time. The new regulations are enforced by the Vehicle Operator Services Agency (VOSA). Only a minority of van drivers (drivers of vans between 3.5 and 7.5 tonnes gross vehicle weight) are affected by this regulation.

3.4 Legislation on occupational road risk

3.4.1 Health and safety law and on the road work activities

According to the HSE, employers can already be prosecuted for

- setting schedules so tight that the drivers would be breaking speed limits if they tried to meet them
- allowing a driver to drive without a relevant licence or a vehicle to be driven in a dangerous condition
- failing to have suitable recording equipment installed in vehicles where appropriate
- failing to inspect goods vehicles
- not ensuring their company vehicles are properly taxed and insured.

As Womble (2000) points out, health and safety legislation is already in place, which, if properly enforced, could be used to control occupational road risk (ORR) for all at-work road traffic effectively. This is a position also maintained by the HSE. However, the protection of workers and members of the public from traffic risks to date has been mostly a matter for road traffic law, normally enforced by the police and the courts (Road Safety Task Group, 2001). It has been Government policy for many years not to seek to apply Health and Safety legislation where there is more specific and detailed law (in this case the Road Traffic Acts and related regulations administered by enforcing agencies) that adequately protects public and worker safety. Health and safety enforcing authorities did not investigate at-work road traffic incidents (except where work vehicles or workers are engaged in specific work activities). This situation has led to the available legislation often not being properly enforced. In the following, an overview on those statutory requirements already in place will be provided. None of the regulations cited does explicitly exclude road traffic.

3.4.2 The Health and Safety at Work Act 1974

The act covers employers, employees and the self-employed and is aimed at people and their activities rather than places or premises. Its scope is limited by what is 'reasonably practicable'. In summary the act prescribes:

- a requirement for safe plants and their maintenance
- the requirement for employers to provide information, instruction, training and supervision as is necessary to safeguard workers
- the requirement for employers to conduct their undertaking in such a way (subject to reasonable practicality), that the health and safety of persons not in employment (in ORR this would mean other road users) are not exposed to risks.

3.4.3 Management of Health and Safety at Work Regulations 1999

The regulation requires every employer to make a suitable and sufficient assessment of (a) the risks to the health and safety of their employees, while they are at work and (b) the risks to persons not in his employment. Furthermore the employer should provide his employees with comprehensible and relevant information on (a) the risks to their health and safety and (b) preventive and protective measures.

3.4.4 Provision of work equipment 1998 (PUWER)

PUWER applies to any equipment provided for use at work. Private vehicles are excluded from the definition of work equipment; however, motor vehicles not privately owned fall within the scope of the regulations. The regulation requires employers to ensure that the work equipment they select is suitable for the purpose intended and complies with ergonomic guidelines. They have to ensure that work equipment is maintained in an efficient state, in efficient working order and good repair. Work equipment exposed to conditions causing deterioration, which is liable to result in dangerous situations has to be inspected at suitable intervals. Checklists drawn up to reflect the differing inspection criteria should be available to both drivers and workshop staff, so that slowly developing faults are less likely to be overlooked. Employees sent out onto the roads need to be given instructions that will get them to their destination safely and with a minimum of delay. Furthermore, written instructions to deal with foreseeable abnormal situations and the action to be taken have to be provided (e.g. to advise drivers what to do in the event of an accident, especially when dangerous goods are in transit). Employers are required to ensure that persons who use work equipment have received adequate training, including training in the methods which may be adopted when using the work equipment.

3.5 Management of occupational road risk

At-work road risk has recently received considerable attention by organisations such as the Royal Association of Accident Prevention (RoSPA) or the Health and Safety Executive (HSE), who maintain that, like any other health and safety at work problem, at-work road risk needs to be targeted by employers. Specifically, this means for the employers to do all that is 'reasonably practicable' to protect staff, who use the road as part of their job.

An independent Work-Related Road Safety Task Group[23] was appointed in May 2000 jointly by the Government and the Health and Safety Commission to identify measures aimed at reducing at-work road traffic incidents. In summary they recommended that

- employers should ensure that systems were in place to manage at-work risk
- the actions they took were in proportion to that risk
- the actions covered not only regular drivers but also occasional drivers and those employed to work on or by roads
- the existing health and safety framework was applied more overtly to all work activity on the road.

Specifically, the task group gave the following recommendations:

"*The first step for employers is to assess the risks to their employees from the activities carried out at work, by identifying hazards and who might be harmed, and then evaluating the risks and assessing whether existing precautions are adequate. Where more needs to be done, employers and the self-employed need to apply the following principles of prevention:*"

- if possible, avoid the risk altogether, e.g. consider alternatives to the journey or type of travel
- tackle risks at source, e.g. by giving thought to work schedules to restrict long hours, choose vehicles carefully and maintain them conscientiously, specify safe routes for journeys etc.
- select drivers who are entitled to drive, ensure they are competent to drive, e.g. by driver assessment and provide them with necessary information, training and instruction to enable them to drive safely; introduce continuing licensing inspections
- involve employees in putting controls in place
- clarify roles and responsibilities of the management chain from directors to individual employee; set standards of what behaviour is expected
- put in place measures to review experience and take further action where necessary; this creates a loop of continuous improvement and establishes the health and safety culture in the company
- ensure that the systems apply equally to those who drive for work only occasionally
- provide advisory limits e.g. on drivers' hours.

The task group considered different ways of encouraging employers to pay more attention to the management of occupational road risk. It was felt that and Approved Code of Practice (ACoP) was a too heavy-handed approach and that the HSE should publish guidance for employers instead, the impact of which could be assessed before considering further steps.

The guidance, published in September 2003 and available on the DfT website, advises employers on their obligations under the Health and Safety at Work Act 1974 and the Management of Health and Safety at Work Regulations 1999 and instructs them to consider whether their health and safety systems adequately cover work-related road safety, including policy, responsibility, organisation/structure, systems, monitoring. It provides a step by step guidance on how to conduct a risk assessment and furthermore a checklist (see appendix for full version) to evaluate whether the employer manages work-related road safety effectively, including the following areas of consideration:

- the driver: competency, training, fitness and health
- the vehicle: suitability, condition, safety equipment, safety critical information, ergonomic considerations

[23] The task group was made up of law enforcement agencies, road safety experts, employers (large and small), work representatives, transport group, the insurance industry and policy makers.

- the journey: routes, scheduling, time, distance, weather conditions.

Furthermore information has been published by RoSPA, providing guidance on journey planning, and management of occupational road risk. The RoSPA guide on managing occupational road risk also provides and Initial Status Review Questionnaire (see appendix for full version) that allows an organisation to determine the current status of occupational road risk management and to identify areas for further action.

4 Development in IT and the van market

4.1 Internet shopping, home delivery and the use of vans

4.1.1 Growth in Home Delivery and Internet shopping

One of the reasons for the increasing numbers of vans on UK roads in recent years is a significant growth in home shopping as the majority of home-shopping goods are delivered by vans. A key driver in the home shopping industry is e-shopping via the Internet. Internet shoppers in the UK bought £4.9 billion worth of goods in 2000 and this number is expected to reach £11 billion in 2005 (Van User, 2005). In 2005 the total trading volume on the Internet auction platform eBay is expected to reach £4 billion in the UK[24].

This development is driven by a rapid growth in internet connectivity. According to Ofcom there were over 6 million broadband homes in the UK by the end of 2004. This is over 90% more than at the end of 2003. By May 2005 the 7.5 million mark had been reached. This means that there are now more broadband than dial-up internet subscribers.[25] The market potential for online shopping is increasing rapidly. This is reflected in the number of customers. In 2003 more than 50 percent of the UK adult population (26.1 million people) bought goods that were delivered to their home. On average each one of these customers spent 25.7 percent of their annual retail budget on home delivery goods (Advantage, 2004).

Tesco.com, the UK's largest internet grocery home shopping company generated total sales of £719 million[26] in 2004. Their service currently covers 98% of the UK. Goods are delivered with a 950[27] vehicle van fleet to 150.000 customers a day.

Traditional distance shopping businesses, e.g. companies that traditionally sell a range of goods to customers by issuing catalogues and then taking orders by post or telephone are expanding these market channels rapidly, too. Total home deliveries in the UK accounted for £28.3 billion in 2001, had grown to £34.7 billion by 2003 and are expected to reach £42 billion in 2006 (Van User, 2005). In 2003 home delivery represented 13.9% of the overall retail expenditure in the UK.

The vast majority of home delivery goods reach the customer's home in a delivery van of under 3.5 tonnes gross vehicle weight. In the last ten years van activity in the UK has grown disproportionately. The van population has increased by approximately a third (DfT, 2005) and light goods vehicles traffic by 40% reaching 54000 million vehicle kilometres in 2003. Although this development is due to a variety of reasons, growth in home shopping and in particular the growth in Internet shopping are an important factor in the increase of the UK van fleet.

[24] Source: BBC Radio 4
[25] Source: Ofcom; http://www.ofcom.org.uk/
[26] Source: Tesco
[27] Source: SMMT CV News Brief 09.12.2003

4.1.2 Home delivery

Home delivery is being undertaken for a very wide range of products. The logistics operation, and the vehicle type in particular, on the "final mile" from distribution centre or retailer to the customer home depends very much on type, size and weight of the product involved.

There are two main categories of home shopping goods:

- Items which are small enough to travel by post or through the network of some other courier/parcel service, e.g. books, clothing and CDs. Many of these items are delivered in vans with a gross vehicle weight of less than 3.5 tonnes.
- Items which require a customised logistics operation which can be run either by the retailer themselves or a third party logistics provider, e.g. groceries, furniture or electrical items. Often these operations require specialist vehicles such as refrigerated vans for grocery or larger, removal-type vehicles for furniture. Furthermore these operations frequently require a second man on the vehicle.

Although home delivery operations vary to a high degree, home delivery can be defined as

"All goods delivered to customer's homes (or another location of the customer's choice) rather than customers having to collect the goods in person from a shop and transport them home themselves."

Therefore, in a home delivery operation, the physical distribution of the goods from the point of purchase to the customer is organised and carried out by either specialist logistics providers or by the retail store itself (Brown, Allen, Anderson & Jackson, 2001). The term home delivery is usually used to describe B2C (Business to consumer) rather than B2B (Business to business) deliveries.

There are a number of different reasons why home delivery services are provided and some of these are described below (Brown et al. 2001):

1. A physical shop can provide its customers with an additional or added value service. This may be driven by a customer's reluctance or inability to take the goods with them at the point of purchase.
2. The size and/or weight of the products make it impossible for customers to transport the goods themselves.
3. The goods retailer has limited floor space or does not operate physical shops and therefore the customer is unable to collect the goods. Instead they have to be delivered to the consumer.

An example applicable to all of the three scenarios above could be white or electrical goods. Their size and/or complexity of installation may stimulate different delivery systems and services. Additionally the goods may not be held in stock and need to be ordered. Home delivery therefore replaces the need for the customer to make a return visit to the shop and, more importantly, to secure the sale. Alternatively, the customer may place an order with the shop remotely and avoids visiting the store to collect the goods.

It is the nature of direct sales and one of the key advantages to avoid rental of high value property, especially in town centres, and operation of associated distribution networks which are required to supply the retail outlets. These networks however, need to be replaced by a distribution structure that allows for deliveries to a much higher number of addresses - the customers' homes. This is where vans due to their smaller sizes and flexibility play an important role.

4.1.3 Problems/Challenges

In recent years home- and e-shopping have grown rapidly and home delivery consumers are becoming more and more demanding, expecting order accuracy, convenience and speed. Some ordered items can be put to use within less than 24 hours and some retailers offer exactly specified one-hour delivery slots. The home delivery industry has to meet these demands in order to compete with traditional sales channels but at the same time operate in cost-effective ways.

Apart from the issues emerging through increased customer expectations there are challenges which are associated with home delivery concepts including the need to undertake numerous deliveries directly to private customers' homes. While, currently, there do not seem to be any limits to the growth of the sector the major challenges associated with the "final mile" and the associated distribution infrastructure, including environmental and social concerns, are becoming increasingly apparent:

- The "atomising" of deliveries and the resulting dispatch of small deliveries to a very high number of delivery addresses creates the potential for significant increases in transport cost in relation to volume.
- The efficiency of the system becomes even worse if a customer is not present at home at the arranged delivery time or wants to return the goods for whatever reason. Return rates in e-commerce are well above 30% and while this has been identified as a major problem for quite some time, retailers have only recently begun to streamline their reverse supply chains. Until not too long ago they concentrated almost exclusively on the outbound operation.

With growing home delivery volumes both factors the atomisation of deliveries and high return rates contribute directly to an increase in van trips and therefore to increases in congestion and emissions.

Increasing pressure is put on the reverse leg of home delivery supply chain through new legislation on packaging and recycling such as the European Directive on Waste Electrical and Electronic Equipment which sets recycling targets of 68% for electronic goods. Home delivery companies will have to carefully design their reverse logistics processes in order to maximise transport efficiency and maintain customer service levels.

At a social, environmental and traffic level risk is potentially increased through urban freight trips as delivery vans target suburbs where vulnerable pedestrians such as the elderly and children are not accustomed to such traffic, and extra risk may apply if deliveries are made at early evening to "catch" households at home (Smith, Ferreira & Marquez, 2001). This is especially the case for deliveries in residential areas where their impacts tend to be high. Other concerns about growth in home deliveries are:

- Potential growth in the use of home delivery services could lead to significant delivery vehicle trip generation.
- There is currently a lack of evidence about whether the overall impact of replacing customers' shopping trips with home delivery operations are positive or negative.
- Parking is already a major problem when performing home deliveries. It is likely that this problem will worsen (Brown et al., 2001).

It is likely that the UK government will introduce more policy measures to mitigate the impact of urban distribution on local communities. These measures include road pricing, vehicle access restrictions (potentially emissions and/or noise based), parking and loading restrictions and the introduction of more pedestrianised zones.

All stakeholders in home delivery will have to work together in order to improve efficiency and make vehicles operations more environmentally sustainable. The Mayor of London's Transport Strategy recommends the following measures:

- Consolidation of loads and numbers of deliveries - deliveries to intermediate points between supplier and recipient, such as staging depots for bulk deliveries on the outskirts of town centres or for retail deliveries to consumers at corner shops or office complexes;
- Changes to delivery hours – currently in some areas local authority curfews keep commercial vehicles from entering town centres, in other locations business and freight operators are not willing to further extend hours of operation;
- Use of vehicles better suited to operation in dense urban environments, firstly in terms of smaller, less polluting vehicles and secondly in terms of alternative technologies such as

electric or fuel cell vehicles and also cycling and walking for courier work and even some servicing.

Van manufacturers can play an important role by providing the vehicle technology that allows for more sustainable urban distribution.

4.1.4 Technology

Technology plays a vital part in helping home delivery companies and their logistics providers to improve operational and cost efficiency. In a home delivery logistics operation technology can be applied in many ways, through vehicles, information and communication technologies combined with innovative ways of reducing vehicle trips such as “last mile” solutions.

Vehicle technology is very much operation dependent. The vast majority of courier and parcel deliveries are undertaken in vans with a gross vehicle weight of under 3.5 tons. Vehicles in customised deliveries, i.e. items which are not delivered through the network of a courier or parcel company, come in many shapes and sizes. Furniture deliveries for instance normally require larger vehicles whereas vans used to deliver grocery are the most customised of all home delivery vehicles currently in use. To comply with food safety legislation loading space is usually divided into three compartments - ambient, chilled and frozen, chilled normally being the largest. In general most delivery companies think that a 3.5 tonnes van is the largest vehicle, especially in congested urban areas, that will be acceptable to residents when undertaking its deliveries.

In terms of engine technology in home delivery the same rules apply as in the rest of the logistics industry. Whole life and operational cost of vehicles is paramount for a company’s success. It is therefore crucial to operate the right vehicles for the operation. Delivery companies such as UPS in the USA have been using alternative fuel technology in vans for quite some time. This includes compressed natural gas (CNG), liquefied natural gas (LNG) and propane. Recently a lot of research is being done on fuel cells. Fuel cell powered vehicles require pure hydrogen and oxygen to run and the only emissions are water vapour. These vehicles can therefore be classified as zero emissions vehicles. Noise emissions are also significantly reduced. This makes fuel cell powered vehicles ideal for urban environments. A DTI-commissioned study (Selwood & Seymour, 2001) that examined the applicability of fuel cell technology in a range of van operations found that urban delivery is the type of operation that would most benefit from fuel cell technology. Home delivery vehicles usually return to base which is ideal for overnight refuelling which is often required due to relatively low availability of hydrogen at service stations. An analysis in the same study shows that reduced running cost can offset the higher capital cost of fuel powered vans.

Currently fuel cell powered vehicles are being tested in public transport, Transport for London took delivery of the UK's first hydrogen fuel cell buses last year and currently the vehicles are on trial on a number of routes. However, in the urban delivery industry the zero emissions technology in being piloted as well. Hermes courier service in Germany who operate a fleet of 3000 vans use fuel cell powered Daimler Chrysler Sprinter vehicles since 2001 in their daily operations. More recently, UPS began trialling a DaimlerChrysler Sprinter fuel cell vehicle in Stuttgart, Germany, where it will cover around 45 miles (72km) per day making deliveries from a central UPS depot[28].

Fuel cell technology is also high up the agenda at the European Union. The European Commission wants 20 per cent of vehicles on alternative fuels by 2020.[29] A European fuel cells technology partnership including all major EU stakeholders was established and Japan and the EU plan to work together in setting joint standards for next-generation auto technologies, including fuel cells and intelligent transport systems.[30]

[28] Source: Fuel Cell today
[29] Source: CV News Brief 13.09.2003
[30] Source: CV News Brief 20.05.2003

There are also clear signs that the use of technologies such as Telematics and RFID (radio frequency identification) create significant opportunities to optimise fleet utilisation in light commercial/light goods vehicles.

Within the express parcels sector technological applications supporting light commercial/light goods vehicles have had widespread ubiquity for a number of years primarily to increase transparency of the supply chains they are supporting. However it is also becoming more apparent where the technology can be used to optimise routeing and scheduling. Primarily because of their global expertise where the integrators and express operators lead, other companies often follow. It can therefore be anticipated that smaller companies will begin to make greater use of Telematics and similar technologies to optimise their own light commercial/light goods vehicle operations. They will be seeking the benefits that Telematics solutions can potentially deliver, including utilisation of information, communication and positioning technology to create a range of applications such as:

- **Vehicle routeing** – the most time or cost efficient routes between base and delivery addresses are calculated and communicated to drivers through in-cab displays.
- **Vehicle tracking** – Office staff always know where to find their vehicles through satellite tracking technology
- **Item tracking** – Goods are tracked throughout the supply chain – from the retailer's warehouse to the customer's home – by scanning the barcodes on items at each event such as loading or unloading.
- **Hazard warnings** – Routeing systems in combination with GPS (global positioning) technology can warn drivers when they approach accident black spots or other dangerous locations such as low bridges
- **Congestion avoidance** – The same technology as above, through integration of real-time traffic data, technology allows to avoid congested areas and increase journey times
- **Toll management** – Routeing systems can help reduce the need to enter road pricing areas such as the London Congestion Charge and find alternative routes if they are cost-efficient.
- **Communication** – Communication between vehicles and base with text messaging systems is another key functionality of Telematics systems and in many operations has proven to significantly reduce communication cost in comparison to mobile phone use.
- **Order system integration** – Most of the Telematics functionalities described above can be integrated with the home delivery company's ERP (Enterprise Resource Planning) and order systems which allows for automated calculation of delivery routes and streamlined processes.

Greater commitment by infrastructure providers such as the HA (Highways Agency) to delivering coherent information to providers of the above mentioned application is likely to accelerate technological development.

Another different technological approach to making home delivery more efficient aims at reducing the number of deliveries rather than at making a fixed number of deliveries more efficient through modern vehicle and Telematics technology. In recent years the concepts of collection and delivery points and unattended delivery systems have emerged in the home delivery environment:

- **Collection and delivery points (CDP):** These include initiatives designed to overcome the problem of home deliveries that fail when customers are not at home. There are currently a number of solutions competing in the marketplace, with varying degrees of technical and logistical sophistication. Collection and delivery points allow customers to choose more convenient delivery locations for their goods. These may include place of work, a local shop or a Post Office. This service is typically organised and co-ordinated by a collection and delivery point company. Collection and delivery points have advantages for retailers/logistics providers and customers at the same time:

  - **Retailers/logistics providers:** CDPs allow for consolidation of goods by delivering to one CDP rather than to a number of customer addresses. At the same time returns are reduced because deliveries to CDPs do not depend on a customer being at home. More sophisticated solutions also facilitate efficient returns management in the case of damaged or otherwise unsatisfactory goods.
  - **Customers:** Customers can get goods delivered to a CDP instead of their home which allows them to pick them up at their convenience and combine the trip to the CDP with another journey, e.g. the way home from work.
- **Unattended delivery systems:** These systems offer reception boxes used at the customers' home, to allow successful delivery to be made at any time regardless of whether or not the customer is at home.

These solutions only address the problem of customers not being at home at the time of delivery and therefore reduce the return rates. They do not enable retailers and logistics providers to consolidate as goods still have to be delivered to each delivery address.

4.1.5 People's perceptions of vans and home delivery

"Ever since the term "White Van Man" was coined in 1997, by Sarah Kennedy on Radio 2, van drivers have taken on the mantle of what sociologists refer to as 'folk devils'. Overtaking even the football hooligan in the league table of social undesirability, WVM is now most often viewed as a mobile thug - a dangerous threat to the decent, right-thinking, motoring majority (SIRC, undated).

The previous paragraph was taken from the introduction to a study undertaken by the Social Issues Research Centre and describes the image of van drivers in the public as it is displayed in the media. However, the same study comes to the conclusion that although the stereotypical white van man does exist, he constitutes only a tiny fraction of the highly varied population of van drivers.

The RAC Report on Motoring 2002 comes to similar conclusions. In the RAC's survey vans were not seen as major causes of congestion and accidents.

The study found that only 15% of motorists think van drivers are most to blame for accidents while 55% believe that young drivers are the group of motorists who cause most accidents.

Equally van drivers are not being seen as one of the major causes of congestion. To the question "Which group of motorists is most to blame for congestion?" 27% answered parents doing the school run, 17% commuters and only 8% thought the major cause for congestion were lorries and vans.

Growing volumes in e-commerce and home-shopping are likely to increase the number of deliveries being undertaken by vans in residential areas and thus reducing available road space, parking and potentially causing disruptions to residential traffic. However, this is not currently perceived as a major problem. Only 16% said it was always difficult for delivery vans to park in their road. 44% said it was never difficult although this figure falls to 30% in urban areas.

Predictably, under the assumption that an increase in home delivery will lead to an increase of vans and lorries delivering goods in residential roads, support for growth in home shopping is stronger amongst those people who already are home shoppers.

Existing home shoppers would support a growth by 34%, 23% of them oppose an increase in home deliveries. 26% of non home shoppers support growth while 29% of them oppose it.

4.2 Conclusions

- Internet and home shopping in the UK are growing at fast rates. Since a high proportion of home delivery goods are delivered by light commercial vehicles under 3.5 tonnes gross vehicle weight it is likely that the absolute number of light commercial vehicles on the road and their traffic volumes will increase further in the future.

- There is a huge variety of home delivery operations undertaken either by retailers themselves or third party logistics providers. The vehicles deployed in these operations largely depend on the size, weight and specific requirements of the goods carried. For delivery in urban and residential areas small light commercial vehicles provide flexibility and minimise disruption to residents and through-traffic.
- In addition to a variety of operational challenges home delivery companies will face further pressure to make their operations more sustainable through national and European legislation.
- Technology can provide the means to meet these challenges through innovative vehicle and engine technologies, telematics and IT and new concepts which are aiming to reduce vehicle trips generated by home delivery such as collection and delivery points and unattended delivery systems.
- Although van drivers are portrayed with a negative image in the media, recent research found that this is not in line with the public perception. Van drivers are not seen as major causes of for accidents and congestion. Currently home delivery vehicles are not perceived as a major problem by residents.

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5 Appendix

5.1 Driving at work – Guidance provided by DfT and HSE (2003)

5.1.1 Evaluating the risks

Working through this section will help you evaluate whether you are managing work-related road safety effectively. These considerations are not exhaustive and you may be able to think of others.

The driver

Competency

Are you satisfied that your drivers are competent and capable of doing their work in a way that is safe for them and other people?

- Doe the employee have relevant previous experience?
- Does the job require anything more than a current driving licence, valid for the type of vehicle to be driven?
- Do your recruitment procedures include appropriate pre-appointment checks, e.g. do you always take up references?
- Do you check the validity of the driving licence on recruitment and periodically thereafter?
- Do you specifically check the validity of any LGV/PSV driving entitlements as part of your recruitment procedures and periodically thereafter? Such entitlements may not have been restored after a period of disqualification.
- Are your at-work drivers aware of company policy on work-related road safety, and do they understand what is expected of them?
- Should your policy document be supplemented with written instructions and guidance and/or training sessions ort group meetings?
- Have you specified what standards of skill and expertise are required for the circumstances of the particular job?
- How do you ensure that these standards are met?

Training

Are you satisfied that your drivers are properly trained?

- Do you evaluate whether those that drive at work require additional training to carry out their duties safely?
- Do you provide induction training for drivers?
- Do you arrange for drivers to be trained giving priority to those at highest risk, e.g. those with high annual mileage, poor accident records, or young drivers?
- Do drivers need to know how to carry out routine safety checks such as those on lights, tyres and wheel fixings?
- Do drivers know how to correctly adjust safety equipment, e.g. seat belts and head restraints?
- Do drivers know how to use anti-lock brakes (ABS) properly?
- Do drivers know how to check washer fluid levels before starting a journey?
- Do drivers know how to ensure safe load distribution, e.g. when undertaking multi-drop operations?

- Do drivers know what actions to take to ensure their own safety following the breakdown of their vehicle?
- Do you need to provide a handbook for drivers giving advice and information on road safety?
- Are drivers aware of the dangers of fatigue?
- Do they know what they should do if they start to feel sleepy?
- Are drivers fully aware of the height of their vehicle, both laden and empty? There are estimated to be around three to six major bridge strikes every day.
- Has money been budgeted for training? To be effective training should be periodically assessed, including the requirement for refresher training.

Fitness and health

Are you satisfied that your drivers are sufficiently fit and healthy to drive safely and not put themselves or others at risk?

- Do drivers of heavy lorries for which there are legal requirements for medical examinations, have the appropriate medical certificate?
- Although there is no legal requirement, should those at-work drivers who are most at risk, also undergo regular medicals?
- Should staff that drive at work be reminded that they must be able satisfy the eyesight requirements set out in the Highway Code?
- Have you told staff that they should not drive, or undertake other duties, while taking a course of medicine that might impair their judgement? In cases of doubt they should seek the view of their GP.

The vehicle

Suitability

Are you satisfied that vehicles are fit for the purpose for which they are used?

- Do you investigate which vehicles are best for driving and public health and safety when purchasing new or replacement vehicles?
- Is your fleet suitable for the job in hand? Have you thought about supplementing or replacing it, with leased or hire vehicles?
- Do you ensure privately owned vehicles are not used for work purpose unless they are insured for business use and, where the vehicle is over three years old, they have a valid MOT certificate?

Condition

Are you satisfied hat vehicles are maintained in a safe and fit condition?

- Do you have adequate maintenance arrangements in place?
- How do you ensure maintenance and repairs are carried out to an acceptable standard?
- Is planed/preventative maintenance carried out in accordance with manufacturers' recommendations? Remember an MOT certificate only checks for basic defects and does not guarantee the safety of the vehicle.
- Do your drivers know how to carry out basic safety checks?
- How do you ensure that vehicles do not exceed maximum load weight?

- Can goods and equipment which are to be carried in a vehicle be properly secured, e.g. loose tools and sample products can distract the driver's attentions if allowed to move around freely?
- Are windscreen wipers inspected regularly and replaced as necessary?

Safety equipment

Are you satisfied that safety equipment is properly fitted and maintained?

- Is safety equipment appropriate and in good working order?
- Are seatbelts and head restraints fitted correctly and do they function properly?

Safety critical information

Are you satisfied that drivers have access to information that will help them reduce risks?

- Have you thought of ways that information can be made readily available to drivers?
- E.g.:
- Recommended tyre pressure;
- How to adjust headlamp beam to compensate for load weight;
- How to adjust head restraints to compensate for the effects of whiplash;
- The actions drivers should take where they consider their vehicle is unsafe and who they should contact.

Ergonomic considerations

Are you satisfied that drivers' health, and possible safety, is not being put at risk, e.g. from inappropriate seating position or driving posture?

- Do you take account of ergonomic considerations before purchasing or leasing new vehicles?
- Do you provide drivers with guidance on good posture and, where appropriate, on how to set their seat correctly?

The journey

Routes

Do you plan routes thoroughly?

- Could you use safer routes which are more appropriate for the type of vehicle undertaking the journey? Motorways are the safest roads and although minor roads may be fine for cars, they are less safe and could present difficulties for larger vehicles.
- Does your route planning take sufficient account of overhead restrictions e.g. bridges and tunnels and other hazards, such as level crossings, which may present dangers for long vehicles?

Scheduling

Are work schedules realistic?

- Do you take sufficient account of periods when drivers are most likely to feel sleepy when planning work schedules? Sleep-related accidents are most likely to occur between 2 am and 6 am and between 2 pm and 4 pm.
- Have you taken steps to stop employees from driving if they feel sleepy even if this might upset delivery schedules?
- Where appropriate, do you regularly check tachographs to ensure drivers are not cutting corners and putting themselves and others at risk?

- Do you try to avoid periods of peak traffic flow?
- Do you make sufficient allowances for new trainee drivers?

Time

Are you satisfied that sufficient time is allowed to complete journeys safely?

- Are your schedules realistic? Do journey times take account of road types and condition, and allow for rest breaks? Would you expect a non-vocational driver to drive and work for longer than a professional driver? The Highway Code recommends that drivers should take a 15 minute break every two hours. Professional drivers must of course comply with drivers' hours rules.
- Does company policy put drivers under pressure and encourage them to take unnecessary risks, e.g. to exceed safe speeds because of agreed arrival time?
- Can drivers make an overnight stay, rather than having to complete a long road journey at the end of the working day?
- Have you considered advising staff that work irregular hours of the dangers of driving home from work when they are excessively tired? In such circumstances they may wish to consider an alternative, such as a taxi?

Distance

Are you satisfied that drivers will not be put at risk from fatigue caused by driving excessive distances without appropriate breaks?

- Can you eliminate long road journeys or reduce them by combining with other methods of transport? For example, it may be possible to move goods in bulk by train and then arrange for local distribution by van or lorry.
- Do you plan journeys so that they are not so long to contribute to fatigue?
- What criteria do you use to ensure that employees are not being asked to work an exceptionally long day? Remember that sometimes people will be starting a journey from home.

Weather conditions

Are you satisfied that sufficient consideration is given to adverse weather conditions, such as snow or high winds, when planning journeys?

- Can your journey times and routes be rescheduled to take account of adverse weather conditions?
- Where this is possible is it done?
- Are you satisfied that vehicles are properly equipped to operate in poor weather conditions, e.g. are anti-lock brakes fitted?
- Are you content that drivers understand the action they should take to reduce risk, e.g. do drivers of high-sided vehicles know that they should take extra care if driving in strong winds with a light load?
- Are you satisfied that drivers do not feel pressurised to complete journeys where weather conditions are exceptionally difficult?

5.2 Initial Status Review Questionnaire

This questionnaire will help organisations to review their current occupational road risk profile and how well they are managing their organisation's road risk. It will take approximately one hour to complete and should involve all staff with responsibility in this area.

Section A. About your organisation

Organisation name: ……………………………………………………

Type of business: ……………………………………………………...

Address: …………………………………………………………………

Postcode: ………………………………………………………………...

Name of key contact: ……………………………………………….....

Position: …………………………………………………………………

Telephone number: …………………………………………………...

Email: ……………………………………………………………………

Number of employees: ………………………………………………..

2. Your vehicles: (tick all that apply)

2a. Does your organisation operate:

' Cars ' Vans ' Motorcycles/scooters ' Commercial ' Specialist vehicles

2b. Are your organisation's vehicles:

' Company-owned ' Leased ' Hired ' Driver owned ' Other

3. Your drivers: (tick all that apply)

3a. Do you have drivers in your organisation who are:

' Occasional users ' Essential users ' Professional drivers

3b. Do you collect data on drivers':

' Ages ' Gender ' Experience ' Crash involvement (duty and non-duty)

' Enforcement points ' Driver training achievement

4. Your drivers' journeys: (tick as appropriate)

4a. Does your organisation collect data on journeys, including:

' Length of journeys ' Cumulative mileages ' Journey purposes

5. Your organisation's accident experience: (please circle)

5a. Do you collect and analyse data on road accidents, including:

Number	Yes	No
Type (primary causes)	Yes	No
Vehicle characteristics	Yes	No
Driver characteristics	Yes	No
Location	Yes	No
Journey purpose	Yes	No

Date and time of occurrence	Yes	No
Severity (injury and damage)	Yes	No

6. Your organisation's fleet safety costs: (please circle)

6a. Does your organisation identify and analyse the costs of:

Fuel	Yes	No
Servicing	Yes	No
Repairs	Yes	No
Staff absence due to road injury	Yes	No
Preventive measures	Yes	No

Section B Your organisation's MORR policy: (please circle)

1. Has your organisation developed a policy on MORR setting out its corporate road safety objectives?	Yes	No

If yes, go to Question 2. If no, go to Section C

2. Is this part of your organisation's health and safety policy statement?	Yes	No
3. Has the MORR policy been communicated to all staff?	Yes	No
4. Is it clearly understood by managers, staff and volunteers?	Yes	No
5. Does the executive committee actively support the policy?	Yes	No
6. Was it developed through consultation with staff and volunteers?	Yes	No
7. Has a date been set for review of the policy?	Yes	No

Section C Organising for MORR: (please circle)

1. Does the overall responsibility for MORR rest with a named senior manager?	Yes	No
2. Are the responsibilities of the supervisors for MORR clearly spelled out?	Yes	No
3. Have supervisors been trained in MORR?	Yes	No
4. Are supervisors who are responsible for staff and volunteers who drive, held accountable for MORR performance?	Yes	No
5. Do they have the resources (time, budget, staff) to carry out their MORR role?	Yes	No
6. Is the MORR performance of supervisors and drivers regularly assessed (e.g. as part of periodic staff appraisal)	Yes	No

Section D Your organisation's approach to planning and implementation:

1. Does your organisation have a risk assessment procedure in place for work on the road?	Yes	No
2. If so, does it encompass all safety critical features (i.e. journeys and vehicles, not just the driver)?	Yes	No
3. Are responsibilities for carrying out risk assessments clearly defined?	Yes	No
4. Have managers and drivers been trained in risk assessment techniques?	Yes	No
5. Are assessments generic or task specific?	Yes	No
6. Are the results of risk assessments properly recorded?	Yes	No
7. Are they communicated to relevant staff and volunteers?	Yes	No

8. Have assessment results been used to prioritise risk control actions? Yes No

9. Have any of the following control measures been introduced? (please tick)

' Eliminating unnecessary vehicle movements

' Avoiding driving in adverse conditions

' Reducing distances

' Controlling drivers' hours

' Specifying 'safest' routes

' Setting safe schedules (e.g. rest brakes)

' Specifying appropriate vehicles (e.g. fit for purpose/load carrying, additional safety features etc)

' Ensuring effective vehicle maintenance

' Selecting appropriate drivers

' Ensuring driver fitness

' Establishing clear policies on substance abuse

' Banning mobile phone use while driving

' Providing driver training programmes

' Procedures to prevent assault (e.g. harassment of female drivers)

' Providing supervision, briefing, information and guidance

' Award or incentive schemes

10. Have any targets been set (e.g. accident rate reductions, training requirements, new procedures, etc.)

11. Have the timescales been set for achieving these?

12. Have any MORR standards been set for (please tick)

' Driver fitness (e.g. eyesight)

' Driver competence

' Control of speed

' Maximum continuous driving (before breaks)

' Maximum driving time including time out with the organisation

' Maximum daily, weekly, monthly etc driving hours/miles

' Night/adverse conditions driving

' Vehicle safety specifications

' Vehicle maintenance

' Alcohol

' Drugs (including prescription drugs)

' Mobile phones

' Other (Please specify): ……………………………………………………………..

10. Has an MORR action plan been drawn up? Yes No

11. Has it been communicated to all relevant supervisors? Yes No

12. Are appropriate arrangements in place to deal with emergencies? Yes No

Section E How your organisation monitors its performance: (please circle)

1. Is regular monitoring carried out to assess compliance with MORR standards? Yes No

If yes, go to Question 2. If no, go to Question 3

2. Are the results properly analysed/recorded/disseminated? Yes No

3. Have appropriate MORR performance indicators been selected (e.g. accident rates, training targets, actions by managers/drivers/others, costs etc.)? Yes No

4. Are there clear reporting procedures for accidents and incidents? Yes No

5. Do these cover near misses as well as crashes? Yes No

6. Is there a procedure in place to investigate accidents/incidents? Yes No

If yes, go to Question 7. If no, go to Section F

7. Does it cover costs? Yes No

8. Is there a person responsible for investigation? Yes No

9. Are lessons from accidents and incidents fed back into the management system to promote safety learning? Yes No

Section F Your organisation's approach to performance review: (please circle)

1. Does your organisation periodically review its MORR performance against agreed standards and targets? Yes No

If yes, go to Question 2. If no, go to Section G

2. Does the review cover MORR management action (e.g. compliance by managers and drivers with MORR standards) as well as accident rates? Yes No

3. Are conclusion from MORR reviews fed back to assist in future planning? Yes No

4. Are they also fed back within the organisation (for example, through meetings, internal communications, notice boards, house magazines etc.?) Yes No

Section G Auditing your MORR system: (please circle)

1. When your organisation audits its health and safety management systems, does this cover MORR?

Yes No

If yes, go to Question2. If no, go to Section H

2. Are the results considered at executive committee level? Yes No

3. Do results lead to appropriate follow up actions? Yes No

Section H *Any other comments*

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