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POTENTIAL CASUALTY SAVINGS FROM FITTING BLIND SPOT MIRRORS (CLASS V MIRRORS) TO HEAVY GOODS VEHICLES – FINAL REPORT

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Prepared for: Project Record: PPAD 9/33/114 Potential Casualty Savings from Fitting Blind Spot Mirrors to Heavy Goods Vehicles

Client: Transport Technology and Standards Division TTS8 (Ian Knowles)

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<td>Category M₁</td>
<td>Vehicles used for the carriage of passengers and comprising not more than eight seats in addition to the driver’s seat.</td>
</tr>
<tr>
<td>Category M₂</td>
<td>Vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver’s seat, and having a maximum mass not exceeding 5 tonnes.</td>
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<tr>
<td>Category M₃</td>
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Executive summary

The Department for Transport (DfT) commissioned TRL Limited to assess the potential for casualty reductions in collisions between Heavy Goods Vehicles (HGVs) and vulnerable road users, for example pedal cyclists or motorcyclists, if European Union (EU) legislation made it a mandatory requirement for close proximity mirrors to be fitted to all new and existing goods vehicles above 7.5 tonnes.

The original objectives of this study were:

- To assess the casualty reduction potential of compulsory fitting of close proximity blind spot mirrors to heavy goods vehicles (HGVs) not already covered by current requirements (e.g. UK registered vehicles between 7.5 tonnes and 12 tonnes and some visiting EU registered vehicles over 7.5 tonnes).
- To prepare a regulatory impact assessment concerning the European Commission proposal on retrofitting blind spot mirrors.

This report encompasses the following areas:

- A detailed review of current legislation regarding the required indirect field of view from mirrors (or other devices),
- Previous research,
- Accident rates of all goods vehicle categories,
- Computer simulations of the field of view,
- A survey of the numbers of vehicles that could potentially be affected by Directive 2003/97,
- A postal survey on goods vehicle driver use of mirrors.

Analysis of the data has provided an estimate of the potential casualty savings if it were a mandatory requirement for close proximity mirrors to be fitted to all new and existing vehicles above 7.5 tonnes.

The literature review compared old and new legislation and found that Directive 2003/97 increased the indirect field of view of the ground plane by 93%. The review also identified that, in 2003, there were 433,500 goods vehicles licensed in the UK. Of these 265,600 (61%) had a gross weight of more than 12 tonnes, with a further 12,100 (3%) between 7.5 and 12 tonnes. Therefore, up to 12,100 UK licensed vehicles could be affected by any proposed legislation to retro-fit Class V mirrors. With a vehicle population turnover of about seven per cent it would take approximately 14 years for the current fleet of vehicles to be replaced.

The accident analysis, using information from STATS19, has shown that, in injury accidents, when an HGV is turning left, the most likely victim is a pedal cyclist. On average, nine fatalities, 14 serious injuries and 33 slight injuries are caused to pedal cyclists per annum, by an HGV of greater than 7.5 tonnes turning left.

Statistics from Kent Police show that there has been an increase in the frequency of side swiping accidents, from 1 every 2.44 days in 1997-98 to 1 every 1.57 days in 2003, which also corresponds with an 83% increase in the numbers of foreign registered goods vehicles visiting the UK over this six year period. The Kent Police data shoes that eighty-five percent of the foreign LHD goods vehicles involved in side swiping accidents (where fitment was recorded) had a close proximity mirror fitted.

Building on previous DfT research (Drivers field of view from large vehicles - S320E/VE) computer models of DAF, Iveco and Scania goods vehicles were obtained and analysis of the indirect field of view completed, using a 5th percentile female driver, and a 50th and 95th percentile male driver. From the CAD analysis it has been shown that a 7.5 to 12 tonne vehicle without a Class V mirror will have a blindspot by the passenger door. A cyclist would have to be at least a 50th percentile adult male, sat reasonably upright on the bicycle to be seen with direct vision.
The CAD analysis has shown that if the Class IV and Class V mirrors are correctly adjusted then other vehicles should be visible in urban traffic when close to the HGV. However, if the vehicles are on motorways, which have wider carriageways, it is possible for passenger cars to be located in a blind spot when the car is level with the passenger side of the HGV cab. Therefore, TRL believe it would be of benefit if left hand drive vehicles of this size category driving on the left (or vice versa) were fitted with Class V mirrors to reduce this blind spot.

The driver survey suggested that 88% of the respondents (311 responses received in total) agreed that the purpose of the Class V mirror was to check for cyclists or pedestrians by the passenger door, or a car (79%), and the majority of drivers claimed to always check the positioning of the mirror in accordance with expected good practice. Many drivers also reported the benefits of the Class V mirror when manoeuvring or reversing.

Opinions for the HGV drivers surveyed indicated that 61% of drivers claimed that use of the mirror had specifically helped them to avoid a potential accident within the past 12 months. The survey also showed that 90% of HGV drivers agreed the use of close proximity mirrors generally contributes to the reduction of HGV accidents and collisions. Furthermore, drivers of articulated HGVs reported significantly greater accident savings due to the presence of close proximity mirrors than drivers of rigid HGVs (vehicles in the range 7.5 to 12 tonnes will be rigid vehicles). Most of the surveyed HGV drivers agreed that fitting close proximity mirrors to all HGVs in excess of 7.5 tonnes and to coaches would be a good idea. However, there is concern that a minority of drivers do not realise the purpose of the close proximity mirror, and are still failing to use the mirror correctly.

An estimate of the number of 7.5 to 12 tonne goods vehicles that could be affected by any proposal to retro-fit Class V mirrors was not possible because the current number of vehicles with such mirrors already fitted was not known. If it were assumed that the worst case scenario was appropriate then all the 12,100 7.5 to 12 tonne vehicles currently registered in the UK could be affected. Throughout Europe, assuming the vehicle fleet follows a similar distribution to the UK, it is estimated that in the EU15 (members before May 2004) there are approximately 104,100 vehicles in the 7.5 to 12 tonne range, for countries which joined the EU in May 2004 (where vehicle numbers are known), there are 11,700 and for the applicant country, Romania, it is estimated there are 1,800.

Analysis of the STATS19, HVCIS and Kent Police data has provided a ‘best estimate’ of the potential casualty savings if 7.5 to 12 tonne vehicles were fitted with close proximity mirrors. These results indicate that less than one fatality, less than one serious injury, approximately 3 slight injuries and less than one damage only accident may be prevented by fitting the Class V mirror to 7.5 to 12 tonne goods vehicles. Whilst these numbers appear small, it is anticipated that the cost of fitment is also likely to be small and that the ratio of cost to benefit could be more favourable than it appears at first.

Based on the calculations outlined in this report there appears to be a limited annual potential casualty saving. It is recommended that a limited retro-fit program for recently registered vehicle may be of benefit, but it is considered that a full retro-fit program is unlikely to offer substantial benefits.

A further recommendation is that it may be of benefit to the UK if left hand drive goods vehicles in excess of 12 tonnes driving on the left, which were not fitted with a close proximity mirror, were fitted with Class V mirrors conforming to Directive 2003/97. A target information campaign, for UK passenger vehicle drivers and foreign registered goods vehicle drivers, warning of the potential for a side swiping accident on the major routes through Kent, may also be of benefit.
1 Introduction

The Department for Transport (DfT) commissioned TRL Limited to assess the potential for casualty reductions in collisions between Heavy Goods Vehicles (HGVs) and vulnerable road users, such as pedal cyclists, motorcyclists or pedestrians, if proposed modifications to European Union (EU) legislation is implemented to make it a mandatory requirement for close proximity (Class V) mirrors to be fitted to all new and existing goods vehicles above 7.5 tonnes.

The recent EU Directive 2003/97 will make it mandatory to fit Class V and VI mirrors on newly registered vehicles of 7.5 tonne and above as from 26 January 2007. There is currently no requirement in Directive 2003/97 for retro-fitting these mirrors, however it may become a requirement in the future.

In built up urban areas Heavy Goods Vehicles (HGVs) can share the same road space as vulnerable road users such as pedal cyclists or motorcyclists. Although collisions between these types of road user is not common, when such collisions do occur they often result in a severe or fatal injury. Many of these accidents may be caused by the HGV driver being unaware of traffic close to the side of the vehicle, particularly in the ‘blind spot’ caused by the passenger door on high vehicles. All new goods vehicles built since 1988 and with a gross weight above 12 tonnes registered in the UK must have an additional ‘close proximity’ mirror (also known as a Class V or kerbside mirror) on the passenger side to help address this ‘blind spot’ problem. Virtually all UK vehicles in this weight range are now fitted with this mirror. For vehicles in the 7.5 – 12 tonne range the fitting of a close proximity mirror is optional even though they can have a similar blind spot problem.

Not all EU countries have adopted the fitment of close proximity mirrors. For this reason, concern has also been expressed about left-hand drive HGVs visiting the UK. There have been a number of reported cases of HGV drivers attempting an overtaking manoeuvre without noticing the presence of a car in the right hand lane. There is a strong possibility that such incidents could be avoided by fitting a close proximity mirror on the right hand side of the vehicle (the side opposite the driver).

The original objectives of this study were:

- To assess the casualty reduction potential of compulsory fitting of close proximity blind spot mirrors to heavy goods vehicles (HGVs) not already covered by current requirements (e.g. UK registered vehicles between 7.5 tonnes and 12 tonnes and some visiting EU registered vehicles over 7.5 tonnes).
- To prepare a regulatory impact assessment concerning the European Commission proposal on retrofitting blind spot mirrors.

This report covers a detailed review of current legislation regarding the required indirect field of view from mirrors (or other devices), previous research, accident rates of all goods vehicle categories, computer simulations of the field of view, a survey of the numbers of vehicles that could potentially be affected by Directive 2003/97, and a postal survey on goods vehicle driver use of mirrors. Analysis of the data has provided an estimate of the potential casualty savings if it were a mandatory requirement for close proximity mirrors to be fitted to all new and existing vehicles above 7.5 tonnes.
2 Literature review

As part of the investigation into the view from Class V mirrors (project record S0227/VF) TRL reviewed relevant legislation and appropriate literature. The results were published in the six month interim report (Fenn and Dodd, 2003), although relevant information is provided in this document for completeness.

2.1 Legislation

2.1.1 Introduction

The legislation in force at the start of the project, and reported in the six month interim report (Fenn and Dodd, 2003), was:

- UNECE Regulation 46

At the time of writing the interim report (Fenn and Dodd, 2003), a new directive had been proposed, COM (2001) 811, this proposal has since been adopted becoming Directive 2003/97, coming into force on the 26th January 2004 with Directive 71/127 being repealed with effect from 24th January 2010. Directive 2003/97 improved the field of vision of category N2 and N3 vehicles by extending the current fields of vision and fitting an additional mirror, a class VI mirror defined as a “front mirror”, to enable the area in front of the vehicle to be observed.

The established classes of rear-view mirror are:

- Class I – Interior rear-view mirror
- Class II & III – Main exterior rear-view mirror
- Class IV – Wide-angle exterior rear-view mirror
- Class V – Close proximity exterior rear-view mirror

However, Directive 2003/97 states that if the required field of vision for a Class V mirror is met through a combination of a Class IV and Class VI mirror then the Class V close proximity mirror is not compulsory. An indication of the general field of view for Class IV and Class V mirrors is provided in Figure 1.

![Figure 1: General indication of indirect views from Class IV (green and red) and V (blue) mirrors](image-url)
Directive 2003/97 also allows for the use of a supplementary system for indirect vision instead of a front mirror as long as the field of vision requirements are met and that the system conforms to specified technical requirements. In the case of a camera/monitor system the monitor must be capable of showing the field of vision whilst the vehicle is moving forward up to a speed of 30km/h.

The requirements for Directive 2003/97 are summarised below in Table 1.

### Table 1. Minimum number of mandatory rear-view mirrors - Directive 2003/97

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
<th>Class V</th>
<th>Class VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂ (3.5t – 7.5t)</td>
<td>Optional *¹</td>
<td>Compulsory *²</td>
<td>Not permitted</td>
<td>Optional *²</td>
<td>Optional *² *³</td>
<td>Optional *³ 1 front mirror</td>
</tr>
<tr>
<td>N₂ (7.5t – 12t)</td>
<td>Optional *¹</td>
<td>Compulsory *²</td>
<td>Not permitted</td>
<td>Compulsory *²</td>
<td>Compulsory on nearside *³</td>
<td>Optional on offside *³</td>
</tr>
<tr>
<td>N₃ (&gt;12t)</td>
<td>Optional *¹</td>
<td>Compulsory *²</td>
<td>Not permitted</td>
<td>Compulsory *¹</td>
<td>Compulsory on nearside *³</td>
<td>Optional on offside *³</td>
</tr>
</tbody>
</table>

*¹ no requirements for field of vision  
*² one on the nearside and one on the offside  
*³ must be fitted at least 2m above the ground

Directives 71/127 and 2003/97, and UNECE Regulation 46, specify the design requirements for these mirrors and the tests to which they must conform to obtain type approval. There are specifications on their physical dimensions, which depend on the class of mirror. The reflecting surface must either be flat or spherically convex to a specified radius and the mirror must have a minimum coefficient of reflection. The mirrors must also conform to two tests; an impact test and a bending test on the protective housing. The impact test is conducted on all classes of mirror whilst Class IV mirrors are exempt from the bending test.

For Class II – IV mirrors the lower edge of the mirror should not be less than 2m above the ground (when the vehicle is loaded to its maximum permissible weight). In the cases when the mirror is less than 2m above the ground, the rear-view mirror must not project more than 0.2m beyond the overall width of the vehicle as measured without the rear-view mirror. Class V mirrors must always be mounted more than 2m above the ground and if the cab height is such as to prevent this then the mirror must not be mounted.

### 2.1.2 Comparison between 71/127 and 2003/97

A full comparison between the indirect field of view for the old Directive 71/127 and the new Directive 2003/97 was carried out as part of this project and is reported in full in the interim report (Fenn and Dodd, 2003). A summary of that comparison is included here.

Calculations of the ground plane view were made by assuming that the field of view extended to 100m behind the driver’s ocular points, and that the field of view was bounded by the extremities of the vehicle itself. A summary of the increase in ground plane area is shown in Table 2 below.
Table 2. Comparison of road surface area seen from rear view mirrors

<table>
<thead>
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<tbody>
<tr>
<td></td>
<td>Offside</td>
<td>Nearside</td>
</tr>
<tr>
<td>II &amp; III *1</td>
<td>250</td>
<td>308.6</td>
</tr>
<tr>
<td>IV</td>
<td>-</td>
<td>215</td>
</tr>
<tr>
<td>V</td>
<td>-</td>
<td>1.8</td>
</tr>
<tr>
<td>VI</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>775.4 m²</td>
<td></td>
</tr>
</tbody>
</table>

*1: Assuming field of view extends to 100m behind driver’s ocular points
*2: Assuming the width of the vehicle is 2.5m

For Directive 2003/97, the requirements for the ground plan field of vision for the wide-angle exterior rear-view mirror (Class IV) are shown in Figure 2, below.

![Figure 2: Indirect field of view for Class IV external rear-view mirrors (Directive 2003/97 and UNECE Regulation 46.02)](image)

In Table 2, above, the requirements for Class IV mirrors shows that Directive 2003/97 requires nearly three times as much of the ground plane to be seen compared with the requirements for 71/127/EEC. Much of this increase comes from the new proposal specifying an area on the offside of the vehicle that must be seen whereas 71/127/EEC only had a requirement for the nearside.
In Directive 2003/97 the required field of vision for the close-proximity exterior rear-view mirror (Class V) is shown in Figure 3. The nearside field of vision is a flat, horizontal portion of road parallel to the longitudinal axis of the vehicle. Its width extends 2m from the outermost point on the offside of the vehicle. The field extends 1.75m behind the transverse plane passing through the driver’s ocular points and 1m forward of this transverse plane. If the transverse plane passing through the leading edge of the vehicle’s front bumper is less than 1m in front of the transverse plane though the driver’s ocular points then the forward limit of the field of vision is limited to this dimension.

![Figure 3: Field of vision for Class V external rear-view mirrors](image)

Any obstructions to the field of vision caused by bodywork and certain components, such as door handles, direction indicators and extremities of rear bumpers, must not exceed 10% of the specified field of vision.

For Directive 2003/97 the ground plane visible by the Class V mirror increases by over 200% (1.8m$^2$ to 5.5m$^2$) as the minimum width of road to be seen has been more than doubled in addition to an increase in distance behind the driver’s ocular points.

The field of vision for the front mirror (Class VI) is shown in Figure 4. The field of vision is a flat, horizontal portion of road in front of the vehicle. The field extends forward a distance of 2m from the outermost point of the front of the vehicle. Its width extends from the plane through the outermost point on the offside of the vehicle to a parallel plane 2m past the outermost point on the nearside of the vehicle. According to Annex III point 5.6.1 of Directive 2003/97 “the front of the field of vision opposite to the driver’s side may be rounded off with a radius of 2m.”
Figure 4: Field of vision for Class VI front mirrors

Directive 2003/97 also states that if the driver is able to see a straight line in the transverse plane positioned in front of the vehicle then the Class VI mirror is not mandatory. The line that must be seen is positioned 0.3m forward of the foremost point of the front of the vehicle and 1.2m above the road surface. It extends from the longitudinal plane though the outermost point on the offside of the vehicle to a longitudinal plane 0.9m past the outermost point on the nearside of the vehicle.

2.2 Field of view – vehicle statistics & previous research

2.2.1 Accident Data

A comprehensive review of accident data has been carried out and is reported in full in the interim report (Fenn and Dodd, 2003). The data is summarised and updated below.

HGVs account for roughly seven per cent of all vehicle traffic in Great Britain (distance travelled), yet over sixteen per cent of all road accident fatalities occur in accidents involving at least one HGV (Knight, 1999). The Department for Transport Vehicle Licensing Statistics (2004a) shows that in 2003 there were 433,500 goods vehicles licensed in the UK. Of these, 61% (265,600) had a gross weight of more than 12 tonnes. 12,100 UK licensed vehicles weighed between 7.5 and 12 tonnes which could all be affected by the proposed requirements for Class V mirrors to be retrofitted. All of the goods vehicles over 7.5 tonnes licensed in the UK would be affected by the requirement for retrofit Class VI mirrors.

Figure 5 shows the composition of the all UK licensed vehicles with a gross weight of more than 7.5 tonnes. Assuming that the composition of the fleet remains the same, then it would take just under 14 years for 95% of the fleet to be fitted with Class V mirrors assuming that only new vehicles were fitted at the time of manufacture.
Previous research into accident data included a TRL analysis of police files of fatal accidents involving commercial vehicles. This analysis showed that one common accident mechanism reported was the HGV driver failing to see a cyclist as the HGV enters a major road or roundabout. (Knight 1999). The study did not highlight whether the cyclist was already on the nearside of the HGV, but the paper does state that two thirds of pedal cyclists struck the side of the HGV. However, the study did not highlight a significant potential saving of lives for a countermeasure such as ‘improved vision to the side’ as the driver must use the mirrors currently fitted and find the current mirrors to be inadequate. In most of the cases studied, the driver was suspected to have caused the accident by not using his mirrors correctly; however there was rarely enough information given in the police files to state this categorically.

As part of a field of view study carried out by Southall et al. (1998) a number of truck accidents involving pedal cycles were analysed. It showed that nearly two-thirds of accidents occur when the HGV is turning left at a junction, highlighting the blind spot immediately to the nearside of the vehicle, the results of the study are shown in Table 3 below.

As well as the possibility of HGV driver’s failing to use their mirrors correctly, as described by Knight (1999), Danish research (Behrensdorff and Hansen, 1994) suggested a that a large number of mirrors were poorly adjusted. A campaign conducted in 1992 showed that less than half of 2,000 lorries that were studied had correctly adjusted mirrors.

In the Netherlands the number of vulnerable road users that were killed due to right turning vehicles remained fairly constant (Figure 6) over a five year period from 1996 to 2000. By extrapolating these
figures, and correcting them for the high cycle population found in the Netherlands, it is estimated that approximately 500 of the 40,000 fatalities (1%) in the EU arise from large vehicles turning right and colliding with a pedal cyclist.

![Figure 6: Vulnerable road user fatalities in the Netherlands from HGVs turning right](image)

2.2.2 *Mirror Systems*

A study by the University of Nottingham (Case *et al*., 1980) used computer modelling to design and evaluate a number of mirrors for use on commercial vehicles. The study identified extensive blind spots immediately in front of and to the nearside of the cab, caused by the bodywork of the vehicle and the high driving position. Supplementary mirrors, one above the windscreen and one above the nearside door, were designed. A potential problem of unwanted reflections from the road and the vehicle’s own headlights was identified for the windscreen mirror. This was overcome by locating the mirror above the height of the windscreen. This meant that in order to use the mirror the driver would have to lean forwards and look upwards. However, it is TRL’s opinion that if the driver was required to lean forward to use the mirror he would not use it, because it would be easier to lean forward and look down towards the road.

The introduction of additional mirrors can provide an increase in the field of view but their design can alter the size and level of distortion of visible objects (Satoh *et al*., 1982). Satoh *et al*., reported a method of evaluating the field of view around a vehicle which addressed this issue. The first objective of the study was to establish a method for quantifying image distortion and image size. The image distortion was quantified using character boards laid on the road surface around the vehicle. The level to which they were identifiable was recorded, and five levels of distortion were characterised. The character boards were again used to clarify the position relative to the vehicle and to quantify the image size with reference to a spherical sign. A sphere was used because it can be identified as a circle regardless of the direction from which it is viewed. Numeric targets were then set over five levels of grading to allow comparative evaluation.

A two-mirror system evaluated was found to have a restricted field-of-view and large image distortion in the left forward position due to the radius of the mirror. Larger and additional mirrors in a three-mirror system gave improved image size and reduced distortion, however this arrangement had one additional mirror that required monitoring. An experimental periscope system had a smaller image distortion and therefore a more uniform image size.
Previous work carried out for the DfT (Tait & Southall, 1998) evaluated the field of view of nine large vehicles, including buses, coaches and HGVs, using a CAD man-modelling technique. The results showed that most vehicles had some deficiency in their field of view, many of which were common to all vehicles. Southall reported that the use of a very wide angle, semi-circular shaped, convex mirror, mounted internally on the nearside A-pillar would enable the entire external width immediately in front of the vehicle to be seen.

Tait & Southall (1998) showed that the CAD analysis identified a blind spot between the fields of view provided by the Class IV (wide-angle) mirror and Class V (close proximity) mirror which was big enough to allow a pedestrian or cyclist to go undetected. They found that the blind spot zone could be reduced or eliminated by either

- increasing the dimensions of the mirrors,
- mounting the mirrors forward of the A pillar such that they are viewed through the windscreen,
- reducing the curvature of the close proximity mirror.

Reducing the convex mirror’s radius of curvature reduces the image size, which can have an effect on the driver’s perception of object distance, lateral positioning and closing speed. To investigate the effects of changing the mirror dimensions Tait & Southall carried out a series of tests with nine different mirrors, each with different radii of curvature ranging from 2000mm to 150mm. From these tests Tait & Southall recommended that the radius of curvature for a Class II mirror be reduced to a minimum convex radius of 1200mm, which has subsequently been adopted as the radius of curvature for a Class II mirror in Directive 2003/97.

To further investigate the effect of reducing the convex mirror’s radius of curvature, a series of road trials on operational large vehicles were carried out (Tait & Southall, 1999). One articulated HGV and one rigid HGV were used and the trial involved the driver’s going about their normal operational duties for a period of two to three weeks. An additional articulated HGV was used for test-route validation trials; this involved a modified HGV being driven by a number of volunteers around a pre-defined route incorporating a variety of different road classifications.

The two drivers of the articulated HGV were generally in favour of the modifications. However, they expressed concern about judging distance in conditions of dark and/or rain. Tait and Southall suspected that the driver’s judgements had not been significantly degraded by the modifications. However, Tait and Southall also note that one driver of the articulated HGV was initially happy with the modifications but then became dissatisfied. The authors speculated that this was because of the appearance of the prototype rather than its’ functionality. The drivers of the rigid HGV were positive about the changes although they were concerned about the height from the ground of the mirror arm, which was below the height of the average pedestrian head height. For the test route trials the drivers generally felt that the modified vehicle was an improvement over the standard mirror configurations. Some comments noted that less head rotation was required to view both sets of mirrors, but mounting the mirrors forward of the vehicle reduced the turning space available, which they considered particularly important when manoeuvring in a depot or at a tight road junction.

As a result of the computer modelling and field trials Tait and Southall made the following recommendations for the improvement of rear-view mirrors fitted to articulated and rigid HGVs:

**Articulated HGVs**

- Reduce the Class II rear-view mirror’s minimum convex radius of curvature to 1200mm
- Fit an additional Class IV, wide-angle mirror to the offside of the vehicle, mounted below the Class II rear-view mirror
- Fit a forward-viewing mirror with a 200mm (minimum) radius of curvature, to the nearside such that it provides a view to the immediate front of the vehicle
- Mount all nearside mirrors forward of the A-pillars so that they can be viewed through an area of the windscreen swept by the windscreen wipers
- Provide the means to remotely adjust the nearside mirrors from the driver’s seating position

**Rigid HGVs**

- Reduce the Class II rear-view mirror’s minimum convex radius of curvature to 1200mm
- Fit Class IV wide-angle mirrors below the nearside and offside rear-view mirrors
- Fit a Class V close-proximity mirror (450mm radius of curvature) to the nearside
- Fit a forward-viewing mirror, with a 200mm (minimum) radius of curvature, to the nearside such that it provides a view to the immediate front of the vehicle
- Mount all nearside mirrors forward of the A-pillars so that they can be viewed through an area of the windscreen swept by the windscreen wipers
- Provide the means to remotely adjust the nearside mirrors from the driver’s seating position

2.2.3 **Vehicle Design**

As well as improving the field of view through the use of different mirrors, the design of the vehicle can influence the extent of the field of vision.

A study into the field of vision of experimental truck designs was reported at the 1982 ESV conference in Japan (Daigo et al., 1982). Five manufacturers produced two new truck designs each. One design was improved through the use of supplementary windows (visibility-improved vehicle) and the other was improved by lowering the height of the driver’s eye point (low-floored vehicle). Dynamic tests, supported by the results of the subjective tests showed that lowering the height of the eye point, enlarging the window openings and supplementary windows all serve to improve the visibility from the vehicle.

As part of their study into field of view from large vehicles, Southall et al. (1998) conducted a survey of operators, manufacturers and drivers. Its objective was to obtain information on problem areas in current vehicle design, the vehicle manoeuvres where the field of view are a particular issue and any solutions that they felt might improve their vision.

A summary of the findings are shown in Table 4 below.
Southall et al. reported that it appeared that many of the problems are caused by the size and positioning of the mirrors in relation to the driver. It is likely that by changing the design of the vehicle or mirrors that these problems could be reduced to some extent.

Southall et al. (1998) also highlighted that problems identified by the operators included that drivers did not adjust their mirrors correctly and that some drivers installed mascots etc. in the window area, thus contributing to a reduced field of view. Manufacturers contributing to the study stated that remote operated and heated rear-view mirrors would help to mitigate the problem of poorly adjusted mirrors.

### 2.3 Conclusions from the literature review

In 2003 there were 433,500 goods vehicles licensed in the UK. Of these 265,600 (61%) had a gross weight of more than 12 tonnes, with a further 12,100 (3%) between 7.5 and 12 tonnes. This means that up to 12,100 UK licensed vehicles could be affected by the any implemented retrofitting legislation. With a vehicle population turnover of about seven per cent it would take approximately 14 years for the current fleet of vehicles to be replaced.

Accident studies show that for HGV accidents involving pedal cycles, nearly two-thirds of these types of accidents occur when the HGV is turning left, highlighting the blind spot immediately to the nearside of the vehicle.

Surveys of operators show that they believe blind spots around the vehicle are a problem.

Studies of mirror design have suggested that blind spots can be eliminated or substantially reduced using blind spot mirrors without causing other problems.

Studies of vehicle design have shown potential benefits from changes to a vehicle. Enlarging or adding supplementary windows and also lowering the eye point of the driver can increase the field of view for a driver.
3 Accident analysis

3.1 Introduction

The accident analysis conducted for this project was split into two phases. The first phase involved an overview analysis of STATS19 data to identify accident scenarios where it was considered that the fitting of blind spot mirrors could potentially have influenced the cause of the accident, for example, pedal cycles in collision with the nearside of an HGV turning left.

The second phase focussed on an in-depth study of police fatal accident data by interrogation of the HVCIS database. The data from HVCIS generated information on the number of relevant vehicles involved in fatal accidents of different types, and those accidents where the field of view was considered to be an influence were identified. A selection of the most relevant accidents were studied in more detail by returning to the source data and examining the police evidence in detail.

In addition to these two phases of work, further information on non-fatal accidents involving foreign HGVs on motorways has been obtained from Kent Police.

3.2 Phase One accident analysis

3.2.1 General

In depth analysis of the STATS19 data was completed and reported in full in the interim project report (Fenn and Dodd, 2003). The data presented here is a summary of the results.

The data represented in the following analysis covers two reporting periods for STATS19. The first period is from 1994 to 1998, and the second from 1999 to 2001. There are two reporting periods because the method of recording accident data in STATS19 was changed in 1999 (Department for Transport, 2002). Pre-1999, HGVs were covered by a single category (type 13), whereas post-1999, there were two separate reporting categories, one for 3.5 to 7.5 tonnes (type 20), and one for above 7.5 tonnes (type 21). In order to maintain consistency between the two databases and previous research, both of these later two categories (20 and 21) are included in the analysis for the period between 1999-2001.

No distinction is made between UK or foreign registered HGVs, because STATS19 does not include a field to record the registration mark of the vehicle. An overview of the relative number of accidents involving HGVs, in the two recording periods, is shown in Table 5 below.

Table 5. Number of HGV accidents 1994-1998 and 1999-2001

<table>
<thead>
<tr>
<th>Period</th>
<th>Accidents involving at least 1 HGV</th>
<th>Number of collisions between one HGV and another vehicle (any type). For HGV against HGV the collision is counted twice</th>
<th>Accidents including at least one collision involving only one HGV</th>
</tr>
</thead>
<tbody>
<tr>
<td>94-98</td>
<td>64,617</td>
<td>54,572</td>
<td>49,679</td>
</tr>
<tr>
<td>99-01</td>
<td>41,476</td>
<td>34,607</td>
<td>31,676</td>
</tr>
</tbody>
</table>
3.2.2 Accidents involving HGVs and cycles/motorcycles

In this accident analysis, particular emphasis has been placed on the vulnerability of bicycle users. In previous research it had been shown that almost two-thirds of cyclist fatalities struck the side of the vehicle and less than one-third collided with the front (Knight, 1999).

In this section of the analysis the ‘other vehicle’ that the HGV collided with, was selected to be either a bicycle, motorcycle or ‘other motor vehicle’. Other motor vehicles (OMV) were included in the analysis because it was not known what the vehicle could be, but may have included vehicles that were small enough to be contained within the HGV blind spot, such as disabled carriages. Furthermore, accidents were selected where the HGV had collided with another vehicle travelling in the same direction, or when the HGV was in the process of turning left or right. Table 6 below, shows the numbers of accidents where an HGV was in collision with a bicycle/motorcycle/OMV. The table also shows the number of accidents that are included in the database.

Table 6. Accidents where the HGV and bicycle/motorcycle are travelling in the same direction

<table>
<thead>
<tr>
<th>Period</th>
<th>Accidents including at least one collision involving one HGV</th>
<th>Accident in which the other vehicle was a cycle/motorcycle/OMV</th>
<th>Accidents in which the two vehicles travelling in the same direction before the collision</th>
</tr>
</thead>
<tbody>
<tr>
<td>94-98</td>
<td>49,679</td>
<td>5,189</td>
<td>3,097</td>
</tr>
<tr>
<td>99-01</td>
<td>31,676</td>
<td>3,208</td>
<td>1,886</td>
</tr>
</tbody>
</table>

Further analysis of these accidents showed that the majority of the accidents occur on single carriageway roads, with one lane in each direction. The majority of this type of accident also occurred on roads classified as “A” roads.

However, in the STATS19 database, records of the junction detail show that, for the accidents outlined in Table 6 above, a large percentage of accidents that occur have been designated as near a junction but the single largest category was defined as occurring “not at or within 20m of a junction” (1,404 or 45% in 1994 to 1998, 794 or 43% in 1999 to 2001). Given that a large percentage was designated as “not at a junction” further investigation was required to identify the accident mechanism.

When taking into consideration the manoeuvres of the HGV prior to the accident, a better understanding of the accident mechanisms can be gained. High numbers of accidents where the HGV is considered as “going ahead other” or “overtaking a moving vehicle on its offside”, matches well with the high number of accidents designated as “not at a junction”. As STATS19 has limited detail it is difficult to evaluate the exact accident mechanism, but it is thought that the most likely mechanism for the accident was when the HGV stuck the cycle when overtaking, most probably with the latter section of the HGV. This may have been because the driver may have been using his Class IV (wide-angle) mirror but misjudged the length the HGV when compared with the location of the other vehicle, or that the HGV driver overtook in a hurried manner, misjudging the speed of on-coming traffic and then pulled in too quickly causing a collision with the cyclist. However, in relation to close proximity mirrors, the category of the HGV turning left is of most interest.

The most common manoeuvre is the "going ahead other", 62% in 94-98 and 58.6% in 99-2001. This supports the theory that the cycle is often hit by an HGV after the HGV has overtaken it. Furthermore, as the proportion of HGVs turning left is approximately 14% in both 94-98 and 99-01, it is also possible that this indicates that the HGV cuts across the path of the other vehicle. In over 70% of these cases, the ‘other vehicle’, which is being overtaken and is in collision with the HGV, is a pedal cycle.

The results also demonstrate that when an HGV is turning left, it is more likely to be involved in an accident with a pedal cycle than a motorbike. However, when the HGV is turning right, the vehicle
most commonly involved in a collision is a motorcycle of greater than 125cc. This follows the pattern that would be expected. A pedal cycle is more likely to undertake the HGV if the HGV is in slow moving or stationary traffic before turning left, whereas a motorbike is more likely to be overtaking the traffic when the HGV is turning right.

Therefore, as the blind spot of the HGV is on the passenger side, and the vehicle the HGV is most likely to be in collision with is a pedal cycle, the analysis concentrated on this type of accident. This aspect of the blind spot problem is shown particularly well in previous DfT research conducted by Southall et al (1998) and is shown in Figure 7 below.

![Figure 7: Blind spot area (B) for pedal cyclists (Southall et al, 1998)](image)

### 3.2.2.1 Analysis of accidents between a pedal cycle and an HGV turning left

The accident scenario shown in Figure 7 above highlights one of the potential problems with the analysis conducted in this section. Although the cyclist (B) located in the HGV’s blind spot is considered most at risk, there is also the possibility that the second cyclist (D) could be caught between the trailer and any railings on the pavement due to the travel of the semi-trailer. From the current method of accident recording in STATS19, it is not possible to tell which accident type happened to the cyclist.

In the majority of the accidents, the cyclist was either “going ahead other”, “turning left” or “overtaking on nearside”. These three manoeuvre categories make up 503 (91.7%) of the total accidents where the pedal cyclist was in collision with an HGV turning left.

Further investigation was conducted into the time of the accident, which showed that there is no correlation between lighting and the accident rate, and that the majority of accidents involved a pedal cyclist older than 16 years who should be aware of the dangers presented by everyday traffic, and of the possibility of HGVs turning left at junctions.

Nonetheless, the risk that the cyclist faces in this type of accident (HGV turning left) is high. Over the period 1994 to 2001 the fatality rate is 12% and the killed or seriously injured (KSI) rate is 36.5%. This KSI rate is high when compared with the 17.6% for all HGV injury accidents, and is even higher than that for a car-to-HGV frontal collision which has a KSI of 28.6%.

Changes to the methods of recording STATS19 data from 1999 onwards means it is also possible to investigate the gross weight of the HGV which caused an injury to a cyclist when the goods vehicle turned left. This data is presented in Table 7 below.
### Table 7. Accident severity for HGVs turning left, between 1999 and 2001

<table>
<thead>
<tr>
<th>Severity code</th>
<th>Maximum severity of bicycle occupant(s)</th>
<th>HGV between 3.5 to 7.5 tonnes Years 99/01</th>
<th>HGV greater than 7.5 tonnes Years 99/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fatal</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>Serious</td>
<td>6</td>
<td>41</td>
</tr>
<tr>
<td>3</td>
<td>Slight</td>
<td>30</td>
<td>99</td>
</tr>
<tr>
<td><strong>Total accidents</strong></td>
<td></td>
<td><strong>36</strong></td>
<td><strong>167</strong></td>
</tr>
</tbody>
</table>

From Table 7 above, it can be seen that on average, 9 fatalities, 14 serious injuries and 33 slight injuries occur to pedal cyclists per annum, when in collision with a 7.5+ tonne goods vehicle turning left. According to Department for Transport Vehicle Licensing Statistics (2003a), in 2002, there were a total of 276,700 goods vehicles with a gross weight in excess of 7.5 tonnes and 156,100 with a gross weight between 3.5 and 7.5 tonnes. Therefore, vehicles of greater than 7.5 tonne form 64.9% of the goods vehicle fleet but are involved in 82.3% of the injury accidents to pedal cyclists when the goods vehicle is turning left.

#### 3.2.3 HGV lane change accidents

In this section the analysis concentrates on accidents in which the two vehicles were coming from the same direction before the collision and the pre-impact manoeuvre was coded as changing lane. Table 8, below, shows the numbers of accident where the HGV changed lane to either the left or the right.

### Table 8. Number of accidents when the HGV changes lane

<table>
<thead>
<tr>
<th>Class</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Accidents involving at least 1 HGV</td>
<td>Accidents including at least one collision involving one HGV</td>
<td>Accidents in which the two vehicles were coming from the same direction before the collision</td>
<td>Accidents in which the HGV was changing lane to the left</td>
<td>Accidents in which the HGV was changing lane to the right</td>
</tr>
<tr>
<td>94-98</td>
<td>64,617</td>
<td>49,679</td>
<td>29,671</td>
<td>1,986</td>
<td>1,795</td>
</tr>
<tr>
<td>99-01</td>
<td>41,476</td>
<td>31,676</td>
<td>19,844</td>
<td>1,385</td>
<td>1,909</td>
</tr>
</tbody>
</table>

When comparing the manoeuvres of the vehicles it can be seen that lane change accidents are more frequent when the HGV, rather than the other vehicle, performs a lane change, see Figure 8 below. However, it not possible to identify the registration of the HGV, and therefore the prevalence for left hand drive (LHD) vehicles changing lane to the right, or right hand drive (RHD) vehicles changing lane to the left, is not known. However, in the cases where the HGV was changing lane, it is possible that the blind spot of the HGVs mirrors may have influenced the accident.
Further analysis of accidents with these codes was conducted on those accidents where the HGV was changing lane to the left or to the right (columns D and E from Table 8 above). Virtually all the lane change accidents occurred on either a motorway, or on an ‘A’ class road. Unsurprisingly, the location of these types of accidents was frequently (greater than 60%) classed as “not at a junction”, although there were also accidents occurring at roundabouts, on slip roads or T/staggered junctions.

Of the accidents that did occur at roundabouts or T/staggered junctions, it is unclear how many of these were due to the HGV having to either make a sudden lane change to avoid vehicles in front, or while negotiating the manoeuvre the HGV driver misjudged the behaviour of the trailer.

Clearly, when the HGV was changing lane to the left, the majority of other vehicles were going ahead. However, when changing lane to the right, there are a number of vehicles that were overtaking the HGV. As mentioned earlier in this section, it is unclear how many of these are actually foreign registered vehicles. However, it is known that Kent has a higher proportion of foreign HGV traffic than most places in the UK because of the presence of the docks at Dover, and Kent Police have identified blind spots on the passenger side of LHD HGVs as a substantial problem. The STATS19 database is able to determine the number of injury accidents that have occurred in Kent Police’s jurisdiction. Of the 3,704 injury accidents in the period 1994 to 2001 and where the HGV changed lane to the right, 8.99% (333) occurred in Kent Police’s jurisdiction. Only the Metropolitan Police (427, 11.54%) and Surrey Police (368, 9.94%) had a higher number of injury accidents involving an HGV changing lane to the right. Further information on Kent Police data is presented in Section 3.4 of this report.

When an accident is caused by the HGV changing lane, and the other vehicle going ahead in the same direction as the HGV, it is the occupants of the other vehicle who are most likely to suffer an injury and the data for this is presented in Table 9 below.
Table 9. Distribution of accidents according to the maximum severity of the occupants of the other vehicle and HGV

<table>
<thead>
<tr>
<th>Severity code</th>
<th>Maximum other vehicle injury severity</th>
<th>Occupants of other vehicle</th>
<th>Occupants of HGV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HGV left</td>
<td>HGV right</td>
<td>HGV left</td>
</tr>
<tr>
<td>0</td>
<td>94/98</td>
<td>99/01</td>
<td>94/98</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>serious</td>
<td>133</td>
<td>70</td>
</tr>
<tr>
<td>3</td>
<td>slight</td>
<td>1,738</td>
<td>1,231</td>
</tr>
<tr>
<td>total</td>
<td>1,986</td>
<td>1,385</td>
<td>1,795</td>
</tr>
</tbody>
</table>

It can be seen from Table 9 that on average, 5 fatalities, 71 serious injuries, and 1,022 slight injuries are caused per annum, based on the 1999 to 2001 data, when an accident is caused by an HGV changing lane to either the left or right.

3.3 Phase Two accident analysis

The second phase of the accident analysis used the Heavy Vehicle Crash Injury Study (HVCIS) database to generate information on the number of HGVs involved in fatal accidents of different types, with particular focus on those accidents where the field of view was considered to have been an influence.

The analysis was carried out on fatal accidents that occurred between 1994 and 1996 inclusive and involved at least one Heavy Goods Vehicle (HGV). In this period there are 751 accidents recorded on the HVCIS database, and the type and weight of the HGVs involved is shown in Table 10 below.

Table 10. HVCIS database breakdown by vehicle and weight (1994-1996)

<table>
<thead>
<tr>
<th>Weight category (tonnes)</th>
<th>Articulated</th>
<th>Draw-bar</th>
<th>Rigid</th>
<th>Tractor</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 – 7.49</td>
<td>0</td>
<td>2</td>
<td>73</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>7.5 – 12</td>
<td>0</td>
<td>3</td>
<td>32</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>12 – 17</td>
<td>1</td>
<td>0</td>
<td>31</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>17 +</td>
<td>357</td>
<td>12</td>
<td>197</td>
<td>9</td>
<td>575</td>
</tr>
<tr>
<td>unrecorded</td>
<td>19</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>377</td>
<td>20</td>
<td>341</td>
<td>13</td>
<td>751</td>
</tr>
</tbody>
</table>

Accident cases were identified where it was thought that poor visibility along the nearside, may have contributed to the accident.

Included in the HVCIS database is an assessment of potential safety improvements to the vehicles involved in the accidents and their effectiveness. The assessment is partially subjective, based on the data available and a comprehensive set of guidelines. A probability scale is applied to weight the results dependant on the likelihood of any particular measure being capable of influencing the accident. A range of vehicle design changes are considered for every case and a single vehicle may
have more than one potential safety improvement. For this analysis, the safety improvement that was considered most appropriate was “improve side vision”. However, it is acknowledged that “improve side vision” could apply to either the Class IV or Class V mirror as the HVCIS does not record to which mirror the improvement applied.

The initial analysis considered accidents where a car occupant was the fatality, and of these only one (of 470 car occupant fatalities) had “improve side vision” as a potential safety improvement as well the impact being with the nearside of the HGV.

The next stage was to identify vulnerable road user (VRU) casualties in the database. There are 95 pedal cyclist or motorcyclist fatalities in the HVCIS database as well as 101 pedestrian. To ensure consistency between the HVCIS analysis and the STATS19 analysis, accidents where the HGV was turning left, or changing lane to the left, were considered which showed that 17 pedal cyclist or motorcyclist fatalities collided with an HGV turning left or changing lane to the left, and that there were 12 pedestrian fatalities.

Further study of the 29 VRU fatalities showed that 11 of the 17 pedal cyclist or motorcyclist fatalities could have been avoided by improving side vision and that 5 of the 12 pedestrian fatalities could have been avoided. Therefore, in total, 16 of 29 (55.2%) of those vulnerable road users in collision with an HGV that was turning left or changing lane to the left could have been prevented by improved side vision. However, none of these cases involved an HGV with a gross weight of between 7.5 and 12 tonnes, and there were only 32 cases of this category vehicle in the entire HVCIS database at the time of analysis.

By further analysis it was possible to eliminate cases that were not considered relevant to the study of close proximity mirrors for smaller HGVs. These included cases where the vehicle was an articulated HGV or where the accident description indicated the accident was outside of the HGV driver’s control, for example, one case was where a strong wind had blown a cyclist into the side of the HGV.

Ten cases were identified and original case notes pertaining to the fatality were examined. The details of four cases that involved HGVs with a gross vehicle weight (GVW) less than or equal to 17 tonnes where visibility and the use of mirrors were an issue are summarised below. Note that one of the cases (94198) is for a tractive unit without a semi-trailer.
### Case Number 96217 15994

**Vehicle Type and Mass**
- Rigid skip carrier
- 17000kg

**Mirrors present**
- 2 N/S mirrors horizontal and vertical

**Use of mirrors**
- Yes

**Accident description**
- A pedal cyclist rode between the HGV and nearside kerb. HGV driver claimed to see a cyclist in the nearside mirrors, but thought he was “quite a distance behind” so continued to turn left. There was a second cyclist further behind, and it was evident that the HGV did not see the cyclist adjacent to the nearside of the cab. When the HGV turned left, the cyclist continued straight on and a collision occurred halfway along the length of the HGV, after which the nearside rear wheels ran over the cyclist.

**Photograph**
(Single photograph taken from driver’s position. Although image clarity is poor, TRL consider that there is sufficient ground plane view in the Class V mirror to conform with Directive 71/127)

### Case Number 94400 11771

**Vehicle Type and Mass**
- Rigid skip carrier
- 7490kg

**Mirrors present**
- 2 N/S horizontal and vertical

**Use of mirrors**
- Yes

**Accident description**
- HGV collided with pedal cyclist as the HGV turned left at a roundabout. Driver insists that he checked his mirrors prior to and during the manoeuvre. Cyclist travelled up the nearside of the HGV as it was queuing for the roundabout, in the period between the driver checking his mirrors prior to and during the manoeuvre. Driver said the cyclist must have been in a blind spot. Witnesses state that the HGV had previously overtaken the cyclist.

**Photograph**
- No photograph
<table>
<thead>
<tr>
<th>Case Number</th>
<th>94128</th>
<th>23931</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Type and Mass</td>
<td>Rigid</td>
<td>17000kg</td>
</tr>
<tr>
<td>Mirrors present</td>
<td>2 N/S mirrors</td>
<td></td>
</tr>
<tr>
<td>Use of mirrors</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Accident description</td>
<td>HGV overtook a pedal cyclist and stopped at traffic lights behind a number of cars. The pedal cyclist rode up the nearside of the stationary traffic and stopped on the nearside of the HGV. The HGV moved away from traffic lights where the cyclist and HGV came into contact with each other (it is unclear if the cyclist lost balance and fell against the HGV or the if the HGV moved toward the cyclist) at the HGVs nearside front wheel causing the cyclist to fall. The nearside rear wheel of the HGV then ran over the cyclist. It was noted in the police file that “the Class V mirror was out of alignment; it could be argued that if the mirror was correctly adjusted, the cyclist may have been seen”.</td>
<td></td>
</tr>
</tbody>
</table>

| Photograph | No photograph |
In the four summaries outlined above, the HVCIS database has coded improving side vision as a potential method of reducing the scale of, or even avoiding, the accident. The conclusion from these four cases is that the cyclists are in the HGVs blind spot usually because the cyclist moved up on the nearside. However, it must also be noted that in some cases the HGV overtook the cyclist some way before the location of the accident and therefore, from the drivers or witness statements, the driver should have been aware that the cyclist would be likely to be in close proximity to their vehicle at the junction. If this is the case then it could be argued that the driver may not have been taking sufficient care. In all cases the drivers claim to have used their mirrors and not seen the cyclist who became the fatality. Some of the case notes had photographs provided, and for one case (96217) a photograph was taken from the driver’s position. In this case, although the photograph clarity is not good, it would appear that the Class IV mirror is not correctly adjusted (the majority of the mirror views the side of the HGV), greatly reducing the available indirect visibility. Furthermore, for one case (94128) the police file states the close proximity mirror was misaligned.

As described in Section 2.1 the requirements in Directive 2003/97 are for an increase in the ground plane area visible through the Class IV and Class V mirrors, and it is thought that, when correctly adjusted the field of view would be greatly improved. CAD analysis has shown (Section 4) that the Class V mirrors are of benefit to vehicles of 7.5 to 12 tonne to enable them to see into the area obscured by the passenger door.

The data from the HVCIS database did not contain any accidents where a Class V mirror fitted to a 7.5 to 12 tonne vehicle could have influenced the accident. However, the total of this type of accident recorded on the database is low so it is not known whether the lack of 7.5 to 12 tonne vehicles shows that side vision is not a problem for this size of vehicle or whether it is random chance that no such vehicles appear in the sample.

However, from the four cases presented, two issues are highlighted. The first is that mirrors, when fitted, have to be correctly aligned to maximise the field of vision. Secondly, it would be beneficial for pedal cyclists to be advised not to ride along the nearside of HGVs.

### 3.4 Accidents involving left hand drive vehicles

Over eighty-seven percent (1.525 million of 1.812 million) of powered goods vehicles leaving the UK for mainland Europe in 2003 did so via the Dover Strait (Department for Transport, 2004b), and it has been unofficially reported that an accident involving a left-hand drive goods vehicle is occurring almost every other day (Hagan, 2002a). Hagan also estimated that, at any one time, one in ten HGVs operating in the UK is registered abroad.

Previously Kent Police had contacted TRL regarding accidents involving foreign HGVs on motorways where they had collided with another vehicle as the HGV changed lanes to the right in an attempt to overtake a slower moving vehicle. This type of accident is also referred to as a “side swiping” accident. Kent Police consider this type of accident as a problem due to the numbers of LHD foreign registered goods vehicles that pass through the Dover Strait.

Data from Kent Police has been analysed in order to assess the influence of close proximity mirrors in accidents involving LHD vehicles. Kent Police have conducted three data capture exercises in an effort to gather evidence for accidents of this type regardless of whether an injury has occurred. If the accident is considered “damage-only” then the data would not have been entered into STATS19. The accident data is entered by the attending officer on an accident report card (ARC), an example of which is shown in Annex A1. However, some of the ARCs are of an older type which contains considerably less information.

The results of the analysis of the first two data capture exercises are summarised here and were reported in full in the interim report (Fenn and Dodd, 2003). The third data capture by Kent Police had not been completed at the time of writing of the interim report and is, therefore, fully reported below.

An accident analysis of injury accidents from STATS19 has shown that 333 injury accidents caused by the HGV changing to the lane to the right, occurred within the jurisdiction of Kent Police between 1994 and 2001 (approximately 42 per annum). Only the Metropolitan Police and Surrey Police had a higher number of injury accidents with this type of accident.

Kent Police investigated the frequency and circumstances of this type of accident. Their first data capture was over a period from April 1997 to May 1998 and involved a total of 161 accidents, equating to 1 accident every 2.44 days (from the date of the first accident to the date of the last accident). The number of casualties was 60 from 47 accidents. Of these casualties, 6 were in the serious category and 54 in the slight. Only one of the casualties was not from the UK, they were Dutch and in the slight injury category. Fifty nine of the accidents occurred as the HGV was travelling to the coast, and 36 when travelling towards London. These results were from accidents on the A20, A2, M2, M20 and M26, where the direction of travel is easily recognisable.

The second data capture was over a period of six months, from January to July 2000, involving 100 accidents, equating to approximately 1 accident every 1.82 days. Thirty-five of the accidents occurred whilst the vehicle was travelling toward the coast and 27 when the vehicle was travelling toward London. There were a total of 39 casualties in 30 of the accidents, 2 from a serious accident and 37 from a slight accident. All the casualties were from the UK. However, in both sets of data, it was unclear if the HGV had been fitted with a Class V mirror.

In general the majority of foreign registered HGVs leaving the UK are from France (30.9% in 2002, see Section 5.2), and therefore it can be reasonably expected that they appear in the accident rates most frequently. However, in 2002, Spanish registered vehicles were the 6th most common HGV leaving the UK, but in the Kent Police data, Spanish HGVs were involved in 21.7% of side-swiping accidents. Both France and Spain have national requirements to fit Class V mirrors, although it is not known from which date this became a requirement, and hence what percentage of the vehicle population possess Class V mirrors. Figure 9, below, shows the percentage of foreign registered HGVs, as a proportion of all foreign HGV side-swiping accidents for both sets of data.

![Figure 9: Country of vehicle registration involved in side-swiping accidents 1997 to 1998 and 2000](image-url)
3.4.2 Kent Police Data (2003-2004)

Further to their previous investigations, Kent Police instigated a third data capture exercise which ran for six months from 01 August 2003 through to 31 January 2004. As with the previous data collection schemes, Kent Police used their normal accident report cards (ARCs) to record the accident. However, on this occasion, police officers were requested to provide additional details of the HGV involved in the accident. This form is provided in Annex A2.

3.4.2.1 Accident details

In the period from 01 August 2003 to 31 January 2004 (184 days) there were 117 accidents that were reported as side-swiping / lane changing accidents, therefore, occurring at a frequency of 1 every 1.57 days. This compares with 1 every 1.82 days in 2000, and 1 every 2.44 days in 1997-1998.

According to Department for Transport statistics (2004b), the numbers of foreign registered goods vehicles visiting the UK are increasing every year. The latest figures indicate that in 2003, 1,340,700 non-UK registered powered goods vehicles visited the UK, whereas it was 1,060,600 in 2000, and 730,200 in 1998, an increase of over 83% in six years. Based on these data, it appears that side-swiping accidents are likely to increase in frequency as the numbers of foreign registered visiting the UK increase.

The majority of these accidents were between two vehicles. However, there were five accidents that involved more than two vehicles, as shown in Table 11 below.

<table>
<thead>
<tr>
<th>Number of vehicles involved in accident</th>
<th>Number of accidents</th>
<th>Total number of vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>112</td>
<td>224</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>117</strong></td>
<td><strong>241</strong></td>
</tr>
</tbody>
</table>

The majority of accidents were non-injury (damage only) accidents. However, of the 117 accidents, there were 30 injury accidents involving a total of 42 casualties, as shown in Table 12.

<table>
<thead>
<tr>
<th>Type of accident</th>
<th>Number of casualties in accident</th>
<th>Number of accidents</th>
<th>Total number of casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>30</strong></td>
<td><strong>42</strong></td>
<td></td>
</tr>
</tbody>
</table>

Although there were 42 casualties in the six months of the data capture, the number of accidents and casualties remained reasonably consistent across all months, as shown in Table 13. However, in
August a single accident involved 4 casualties, and there is no obvious explanation for the rise in casualties in January, but this may be associated with adverse environmental conditions.

Table 13. Monthly distribution of accidents and casualties

<table>
<thead>
<tr>
<th></th>
<th>Accidents</th>
<th>Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>September</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>October</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>November</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>December</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>January</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Totals</td>
<td>117</td>
<td>42</td>
</tr>
</tbody>
</table>

The analysis also showed that, in three accidents the HGV failed to stop, but no casualties were caused. However, in a further four of the accidents, the HGVs had tachograph inconsistencies or were issued with prohibitions, and these four accidents caused 2 slight casualties. The nationalities of these drivers were Greek, German, French, and Danish.

3.4.2.2 Accident Location

Hagan (2002a) noted that the majority of accidents of this type occurred on the M20. This is to be expected because it is the major route from the Dover Straits into the UK and is shown below in Figure 10.

Figure 10: Major routes from the Dover Strait ports

Figure 10 is reproduced by permission of Ordnance Survey on behalf of The Controller of Her Majesty’s Stationery Office © Crown Copyright AL 100021177.
The general location of accidents in this data capture is shown in Table 14. Note that the major routes (‘A’ roads or motorways) also have an extra character after their main designation. This is to show the carriageway on which the accident occurred.

<table>
<thead>
<tr>
<th>Road class</th>
<th>Direction</th>
<th>Number of accidents</th>
<th>Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>A20A</td>
<td>Coast bound</td>
<td>3 (2.5%)</td>
<td>zero</td>
</tr>
<tr>
<td>A249</td>
<td>Coast bound (Sheerness)</td>
<td>1 (0.8%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>A282A</td>
<td>Clockwise</td>
<td>3 (2.5%)</td>
<td>zero</td>
</tr>
<tr>
<td>A2A</td>
<td>Coast Bound</td>
<td>7 (6.0%)</td>
<td>3 (7.1%)</td>
</tr>
<tr>
<td>M2</td>
<td>Unknown</td>
<td>1 (0.8%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>M20A</td>
<td>Coast bound</td>
<td>32 (27.3%)</td>
<td>13 (30.9%)</td>
</tr>
<tr>
<td>M20B</td>
<td>London Bound</td>
<td>32 (27.3%)</td>
<td>10 (23.8%)</td>
</tr>
<tr>
<td>M25A</td>
<td>Clockwise</td>
<td>7 (6.0%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>M25B</td>
<td>Anti-clockwise</td>
<td>21 (17.9%)</td>
<td>9 (21.4%)</td>
</tr>
<tr>
<td>M2A</td>
<td>Coast clockwise</td>
<td>1 (0.8%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>A20B</td>
<td>London Bound</td>
<td>2 (1.7%)</td>
<td>zero</td>
</tr>
<tr>
<td>M2B</td>
<td>London Bound</td>
<td>1 (0.8%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>M26K</td>
<td>Coast bound</td>
<td>3 (2.5%)</td>
<td>2 (4.8%)</td>
</tr>
<tr>
<td>M26L</td>
<td>London Bound</td>
<td>2 (1.7%)</td>
<td>zero</td>
</tr>
<tr>
<td>A282B</td>
<td>Anti-clockwise</td>
<td>1 (0.8%)</td>
<td>zero</td>
</tr>
</tbody>
</table>

Total 117 (99.4%) 42 (100%)

Unsurprisingly the majority of accidents occur on the main motorway network, which carries the highest density of HGV traffic. The observations of Kent Police are supported by this data, with the major route between the M25 London orbital and the ports (M20) accounting for approximately 55% of accidents and casualties in the recording period.

Drivers coming from overseas may have been on very long journeys and it is possible that they may not be adequately rested and that fatigue was a factor in some of the accidents. However, data from Table 14 shows that 47 of the accidents occurred on the coast bound carriageways, 37 on the London bound carriageways, 32 on the orbital motorway network, of which 22 were in an anti-clockwise direction and 10 in a clockwise direction. The direction of one accident was unknown.

Using the information recorded on the ARC, it is possible to narrow down the location of the accident even further. Kent Police believe that a potential cause is the need for a lane change when approaching a junction. Attending officers reference the accident by locating and recording the nearest marker post on the motorway, although not all data sheets contained this information. TRL obtained data on the position of emergency telephones on the motorway network, but were unable to find data on the marker post position. However, by using the emergency telephone location it was possible to estimate the location of the accident.

A total of nineteen accidents did not record the location of the marker post. However, of the remaining accidents the calculation showed that 31 occurred within 300 metres of a junction. The full results are shown in Figure 11 below.
It is clear to see that the largest group of accidents, thirty-one, occur at less than 300m from a junction, and that the majority of these, nineteen, occur at the ‘on slip road’. This may be due to the foreign registered vehicles having to change lanes at short notice, either as they approach a junction, or as the other vehicles join the motorway from the slip road forcing the HGV into the next carriageway. Alternatively, the foreign registered HGV may be attempting to overtake vehicles that have not yet reached motorway speeds.

Also, analysis of the M25 accidents (within Kent borders) shows that all accidents where the marker post was recorded occur either between junctions 2 and 3, where the M20 joins the M25 (9 accidents), or junctions 5 and 6 between Clackett Lane motorway services and where the M26 joins the M25 (16 accidents). This appears to support the theory that foreign HGV drivers may have to change lanes to ensure they are following their correct route.

Analysis of the accidents on the M20 show that, for the London bound traffic, the most common area for the accidents was between junctions 4 to 5 (9 accidents) and junctions 3 to 4 (5 accidents). However, the accidents, in both cases, seem to be evenly distributed over the length between the junctions. Checks of the gradients did not indicate any significant gradients that would have caused a reduction in vehicle speed. Analysis of the time of day did indicate that accidents were more frequent during rush hours.

For the coast bound traffic on the M20, junctions 1 to 2 (6 accidents) and 2 to 3 (6 accidents) were the most common areas. For junctions 1 to 2 there did not appear to be any prevalent reason for the accidents, however, for junctions 2 to 3, where the M20 joins the M26, five occurred between the times of 16:45 and 18:30 which would indicate that the volume of traffic during the rush hour would have been a contributory factor.

3.4.2.3 Mirror fitment and country of vehicle registration

During the data capture, police officers were asked to complete an additional form that indicated if the Class V mirror was fitted, and for any additional comments. Occasionally these forms were omitted from completion at the time of the report of the accident, but were later completed retrospectively.

Analysis shows that in the majority of accidents, 79% (85% where the mirror fitment was recorded), the HGV was fitted with a class V mirror (Table 15). However, this data also shows that all of the HGVs in this data set, where it is known, were left-hand drive vehicles.
Table 15. Number of accidents: Class V mirror fitment versus drive type of HGV

<table>
<thead>
<tr>
<th>Class V mirror fitted?</th>
<th>HGV drive type</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LHD</td>
<td>unknown</td>
<td>Total</td>
</tr>
<tr>
<td>No not entered</td>
<td>16</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>unknown</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>93</td>
<td></td>
<td>93</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>3</td>
<td>117</td>
</tr>
</tbody>
</table>

However, whether the mirror was adjusted correctly was not recorded on the accident form and so actual view from the mirror, for each individual driver, can not be accurately established. For the purposes of this analysis, it is assumed that the mirrors are adjusted such that the ground plane as required by Directive 71/127 could be seen by the driver.

In the six month interim report by Fenn and Dodd (2003) a matrix of nationalities that require the fitment of Class V mirrors through national legislation was provided and is reproduced in Annex B. The majority of nationalities did require Class V mirrors to be fitted, but it was not possible to ascertain when these national requirements came into force. Therefore, it is not possible to calculate the numbers of foreign registered vehicles fitted with Class V mirrors. However, as shown in Table 15, a brief analysis of the Kent Police data shows that there are a number of vehicles without the mirror fitted.

Conversely, the majority of foreign registered goods vehicles involved in side swiping accidents did have the Class V mirror fitted, which suggests either the passenger vehicle struck was genuinely in a blind spot, or that the HGV driver was not using their mirror appropriately, if at all.

Surprisingly, in this analysis, there were vehicles without class V mirrors registered in countries where it was expected that Class V mirrors were required to be fitted, for example Netherlands and Germany. It was not possible to discover the age of these vehicles and they may have been constructed before the introduction of the national requirement.

A breakdown of the country of vehicle registration, and the driver nationality, is provided in Table 16 below.
### Table 16. Mirror fitment by country of registration and driver nationality

<table>
<thead>
<tr>
<th>HGV Registered</th>
<th>HGV Driver nationality</th>
<th>Class V mirror fitted</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>not entered</td>
<td>unknown</td>
</tr>
<tr>
<td>Austria</td>
<td>Austrian</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>German</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Hungarian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Belgium</td>
<td>Belgium</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>British</td>
<td>UK</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Bulgarian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Czech</td>
<td>Czech</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Denmark</td>
<td>Danish</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>French</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Germany</td>
<td>Austrian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>German</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Greece</td>
<td>Greek</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hungary</td>
<td>Hungarian</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Italy</td>
<td>Belgian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Polish</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Yugoslav</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>German</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Spanish</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Dutch</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>German</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Polish</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Poland</td>
<td>Polish</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Portugal</td>
<td>Portuguese</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Hungarian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Slovakian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Spain</td>
<td>French</td>
<td>2</td>
<td>2</td>
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<td></td>
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<td>1</td>
</tr>
<tr>
<td>unknown</td>
<td>unknown</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
<td>1</td>
</tr>
</tbody>
</table>

Unexpectedly, there was a large reduction in the numbers of Spanish vehicles involved in side-swiping accidents when compared with 1997/98 and 2000 data (35 in 1997, 25 in 2000, and 8 in 2003). As a percentage of accidents, the main vehicles registered were from France and Germany whose accident rate remained consistent with the 2000 data. However, the countries that showed an increase in accident rates were those registered in former Eastern bloc countries, Poland, Hungary and the Czech Republic, and were due to join the EU in May 2004. It is thought that these countries may have an increased presence on the UK roads as the EU market opens up. A comparison of data between 1997/98, 2000 and 2003 is shown below in Figure 12.
The nationality of the HGV driver is also shown in Table 16, above. This data shows that the most frequently involved nationality is German (25 accidents), followed by French (15 accidents) and Polish (12 accidents). Thus, over 44% of HGV drivers involved in these accidents were one of these nationalities. Table 16 shows that the vast majority of these HGVs had class V mirrors fitted. It is possible that the drive type of the vehicle combined with the driver’s potential unfamiliarity with the road network may be a more important contributory factor to the accident than class V mirror fitment.

Checks with the driver of the HGV to see if this was their first visit to the UK were made and recorded as additional information on the ARC form. Of the HGV drivers involved in the 117 accidents, four indicated that this was their first visit to the UK. Fifteen were recorded as unknown, usually because the HGV had failed to stop, or the driver did not speak English. Of the remaining 98, eleven indicated that they had had five or less visits to the UK. This shows that the majority of HGV drivers involved in accidents have made at least 6 trips to the UK, which would indicate at least some familiarity in driving on the left hand side of the road.

3.4.2.4 Driver Fatigue

The 2003-2004 Kent Police data were analysed to determine the length of time which had passed between the time of the end of the last driver rest break and the time of the accident. This data was recorded for 77 of the accidents and by using 1 hour bands for the last rest break, we can identify the actual numbers involved. The results of this analysis are presented in Figure 13, below.
Analysis of this data reveals that the mean time passed between the last driver’s rest break and the time of the accident was 2 hours 28 minutes. The median value was 1 hour 58 minutes.

The majority of drivers complied with the legal requirement of rest breaks, as can be seen in Figure 13, however, there were nine of the 77 (12%) drivers involved in accidents who had exceeded four hours driving time since their last rest break, and one whose last rest break was 14 hours and 25 minutes previously.

Although there has been no detailed investigation of the cause of each accident there is a greatly increased likelihood that driver fatigue was a contributory factor in these accidents. As a comparison, previous accident research studying fatal accidents involving commercial vehicles across the whole of England and Wales had shown that driver fatigue and/or excess hours contributed to just under 4% of accidents (Knight 1999).

### Kent Police data conclusions

In the period 01 August 2003 to 31 January 2004, there were a total of 117 side swiping accidents recorded by Kent Police, of which 87 were damage only, 28 slight accidents and 2 serious accidents, causing a total of 42 casualties.

In 79% of accidents, the HGV was fitted with a class V mirror (85% where mirror fitment was recorded). However, no information is available on the accuracy of mirror adjustment, and whether the mirror was used appropriately is not known.

Virtually all of the HGVs involved in side swiping accidents within Kent Police’s jurisdiction involve foreign registered, left-hand drive vehicles. These vehicles are likely to have a higher accident risk because of the drive type of the HGV and difficulties with viewing surrounding traffic at an appropriate time before and during any lane change manoeuvre.

The data for 2003 showed there was a reduction in the numbers of Spanish vehicles involved in side-swiping accidents when compared with the previous data. The vehicles most frequently involved in side swiping accidents were registered in France and Germany and the involvement of these vehicles remained reasonably consistent in all three data captures. However, the countries that showed an
increase in accident rates were those registered in former Eastern bloc countries, Poland, Hungary and the Czech Republic, which were due to join the EU in May 2004.

In 2003-2004, the most frequently involved driver nationality in accidents was German (25 accidents), followed by French (15 accidents) and Polish (12 accidents). Over 44% of HGV drivers involved in accidents were one of these nationalities.

The increase in numbers of side-swiping accidents follows a trend of increasing numbers of foreign registered goods vehicles visiting the UK. Therefore, it is likely that side-swiping accidents will increased in frequency as the numbers of foreign registered goods vehicles visiting the UK increases.

The M20 accounts for approximately 55% of the side swiping accidents recorded by Kent Police. This reflects the high volume of HGV traffic between the M25 and the Dover Strait ports. However, the sampling regime of Kent Police is not known and so an assessment of any bias towards the M20 as a recording area cannot be made.

There were isolated cases in which driver fatigue was considered a contributory factor. However, the mean time expired between the time of the last break and the accident occurring was just over 2 hours. This is consistent with current regulations concerning the frequency of HGV driver rest stops.
4 Geometrical analysis

4.1 Introduction

Previous research has shown that HGVs should have a clear view of all adjacent traffic, even when conducting slow speed manoeuvres, such that the likelihood of spotting vulnerable road users is greatly increased. For this reason legislation required the fitment of Class V mirrors to HGVs in excess of 12 tonnes gross weight.

However, the size of the blind spot for a vehicle in the 7.5 to 12 tonne range is expected to be smaller than that for an HGV that is greater than 12 tonnes if neither vehicle is fitted with a close proximity mirror. Seven point five to 12 tonne vehicles are generally both smaller and lower than 12+ tonne HGVs. If the area of the blind spot is less for 7.5 to 12 tonne vehicles then there may also be less benefit in fitting the close proximity mirror to these smaller vehicles.

Previous research into the field of view of large vehicles has been conducted on behalf of the DfT (Southall et al., 1998), which included buses and coaches as well as HGVs. By building on this work and using the CAD models already generated for this previous research, the relative size of the blind spot for 7.5 to 12 tonne vehicles can be compared with that of vehicles in excess of 12 tonnes.

4.2 Methodology

4.2.1 Vehicle models

In the previous research three models were identified as being typical examples of the HGV fleet. These vehicles are shown in Figure 14, Figure 15 and Figure 16. The Scania is representative of vehicles of 44 tonnes, the Iveco representative of 17 tonnes, and the DAF of 7.5 tonnes.

![Figure 14: Scania 4 series](image1)

![Figure 15: Ford Iveco Eurotrakker](image2)

![Figure 16: Leyland DAF FA45](image3)
For the models provided, and further to the previous research, TRL set the radii of curvature of the mirrors \((r)\) to the minimum level permissible by the directives. For Class IV and V mirrors this corresponds to a curvature of 400mm in Directive 71/127 and 300mm in Directive 2003/97.

### 4.2.2 Analysis method

The 3D geometry of the vehicles was imported into SAMMIE CAD, an ergonomics package with specialist tools for analysis of mirrors. For analysis with different occupant sizes the extreme positions of the driver’s seat were digitised. The seat positions used are shown in Table 17.

<table>
<thead>
<tr>
<th>Occupant size</th>
<th>Vertical</th>
<th>Horizontal</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th percentile female</td>
<td>Fully up</td>
<td>Fully forward</td>
</tr>
<tr>
<td>50th percentile male</td>
<td>Mid point</td>
<td>Mid-point</td>
</tr>
<tr>
<td>95th percentile male</td>
<td>Fully down</td>
<td>Fully rearwards</td>
</tr>
</tbody>
</table>

These ranges of occupant size were selected to ensure that the full range of likely drivers of these vehicles were included in the analysis. However, it is acknowledged that the likelihood of 5th percentile female driving these types of vehicle is low, as can be found in Section 7 where, of the 2,000 HGV drivers surveyed by postal questionnaire, there were 324 replies received by TRL, but only one was female.

To calculate the visible ground plane, lines are projected from the human eye point to the mirror surface and then on to the ground plane to determine the visible area. The vehicle models are wireframe, so mirror projections pass through the vehicle surface. The visible area on the ground plane has, therefore, been truncated at the widest point of the vehicle (excluding exterior mirrors).

Additionally, the visible area in the Class IV mirrors effectively extends to infinity in SAMMIE CAD so the calculated area has been truncated at 200m rearwards and 120m laterally from the ocular point. These distances were chosen to consider a substantial area around the vehicle.

For the ground plane plots, the effect of a lack of correct mirror adjustment was considered, because this was identified as a possible problem. The effect of a lack of correct adjustment was investigated by setting up each of the computer models with the mirrors correctly adjusted to the position required for the 50th percentile male to see the area specified by Directive 71/127 and Directive 2003/97. The results for the 50th percentile male were considered as the ‘baseline’ for each of the Directives. Using this mirror positioning, the 50th percentile occupant was replaced by the 5th percentile or the 95th percentile, without adjustment of the mirrors, and the visible ground plane measured and compared with the baseline.

Analysis was also performed with pedal cyclist and car models alongside the HGV to show whether they would be visible with and without the Class V mirror. The full test matrix is outlined in Table 18 below.
Table 18. Matrix of cases analysed

Matrix 1: ground plane plots and visible area (m²)

<table>
<thead>
<tr>
<th></th>
<th>Mirrors to conform to Directive 71/127</th>
<th>Mirrors to conform to Directive 2003/97</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50% male 95% male 5% female</td>
<td>50% male 95% male 5% female</td>
</tr>
<tr>
<td>Scania</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>Iveco</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>DAF</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
</tbody>
</table>

Matrix 2: ground plane plots with Class V mirror

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>with pedal cyclist in potential blind spot</td>
<td>with motor car in potential blind spot</td>
<td></td>
</tr>
<tr>
<td>Scania</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>Iveco</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>DAF</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
</tbody>
</table>

Matrix 3: ground plane plots without Class V mirror

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>with pedal cyclist in potential blind spot</td>
<td>with motor car in potential blind spot</td>
<td></td>
</tr>
<tr>
<td>Scania</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>Iveco</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
<tr>
<td>DAF</td>
<td>1 1 1</td>
<td>1 1 1</td>
</tr>
</tbody>
</table>

Therefore, a total of 54 ground plane plots were produced along with a further 18 sets of results for the visible area (m²).

4.3 Results

4.3.1 DAF results

The first stage of the indirect field of view investigation was to validate the model supplied. TRL procured a DAF 45 vehicle and projected the field of view onto the ground plane. Measurements made of this real life field of view were checked against the model for the DAF 45 in SAMMIE CAD. The vehicle procured was fitted with mirrors that conformed to Directive 71/127.

It was found that the field of view for the SAMMIE model was similar to the results of the real life test, and therefore confidence in the models was established. The SAMMIE plot is shown in Figure 17 below, with the SAMMIE projected field of view in red and the ground plane as measured from the procured DAF vehicle in yellow. Although it can be seen that the ground plane projections for the Class V mirrors are not identical, thought to be because of differences in driver eye height, seat position and mirror angle, the shape of the projections are similar. To give a relative sense of scale in each of the vehicle ground plane plots, each square in the grid encompassing the vehicle cabs is 1 metre by 1 metre, therefore the total grid size is 10 metres by 10 metres.

In Figure 17 the solid black ground plane is the view required by Directive 71/127, and the red ground plane is the view obtained by the 50th percentile occupant using the Class IV and Class V mirrors. For all figures provided in this section the ground plane area that must be visible is marked in black for the relevant Directive.
Once confidence in the models was established, further investigation of the field of view was pursued. For the DAF, the radius of curvature for the Class IV and Class V mirrors was altered to 300mm in accordance with the minimum specified in Directive 2003/97. As before the requirement for the visible ground plane in Directive 2003/97 was marked on the plot in black. The effect of a lack of correct mirror adjustment, by substituting a 5th percentile or 95th percentile occupant, is shown in Figure 18 below.

Figure 17: DAF 45 model, confirmation of validity of models (ground plane 71/127, model 50th percentile driver – red, measured ground plane - yellow)

Figure 18: DAF 45, the effect of a lack of correct adjustment of Class IV and V mirrors for 5th percentile and 95th percentile occupants (2003/97)
The ground plane plot for the 50th percentile occupant is marked in red, the 5th percentile is marked in green and the 95th percentile in blue. It was found that the 5th percentile ground plane for the Class IV mirror did not comply with the requirement in Directive 2003/97. However, when combined with the ground plane of the Class V mirror, there was no ‘blind spot’.

Furthermore, when the visible area, measured in m², was compared, the area visible to the 5th percentile female increased in comparison with that of the 50th percentile male for both the Class IV and Class V mirrors. The results for all the vehicle models are shown in Table 19 and Table 20.

In Directive 2003/97 there is a requirement that Class V mirrors will be fitted to all new 7.5 to 12 tonne vehicles registered after 26 January 2007, such that the ground plane described in 2003/97 can be viewed. Although it is acknowledged that a number of these vehicles already have Class V mirrors fitted, a retro-fit program may also be required. Therefore a comparison of the ground plane view with and without the Class V mirrors was completed. In Figure 19, it can be seen that the ground plane plots for the Class IV and Class V mirrors overlap and that at least some portion of the cyclist is visible in either of the mirrors.

![Figure 19: DAF 50th percentile male, Directive 2003/97 mirror compliance including cyclist](image)

The ground plane plot for the Class V mirror was then removed, shown in Figure 20, demonstrating that, if based purely on a ground plane view, a cyclist may be unseen by the driver.
Figure 20: DAF, 50th percentile male HGV without Class V mirror

However, consideration has to be given to the geometry of vehicles in the range 7.5 to 12 tonnes. These vehicles are generally smaller than heavier goods vehicles and are often lower to the ground. It follows therefore, that the blind spot, created by the passenger door, is not as large. By further CAD analysis it is possible to consider the direct vision of the driver as shown in Figure 21. Note that because the vehicle CAD models are wireframe it is possible to see more of the cyclist in Figure 21 than it would be in real life. Only the portion visible through the side window should be considered. By using the DAF model, the direct vision model shows that the cyclists head can just be seen. The cyclist used in this analysis is a 50th percentile adult male. In Figure 21 the view from the Class V mirror shows that all of the cyclist could be seen. However, if the Class V had not been fitted, it becomes apparent that any cyclist smaller than a 50th percentile male, is obscured by the passenger door. Furthermore, in the model the rider is in a fairly upright position whereas, in reality they may be bent further over the handlebars thus taking them out of direct view.

Figure 21: DAF direct vision including Class V mirror
4.3.2 **Iveco results**

A similar set of analyses to that of the DAF model, was completed for the Iveco CAD model. However, in general terms the results were unremarkable, as shown here in Figure 22.

*Figure 22: Iveco model 50th percentile male with mirrors conforming to Directive 71/127*

All the mirrors were found to conform to either Directive 71/127 or 2003/97 as required, even in the case of a lack of correct mirror adjustment using the 5th percentile female and 95th percentile male, the results of which are shown in Table 19 and Table 20.

4.3.3 **Scania results**

A repeat of the analysis completed for the DAF and Iveco model was conducted on the Scania model which represents a 44 tonne vehicle. As with the DAF and Iveco models, and as expected, the mirrors on the Scania complied with Directive 71/127, shown in Figure 23 below.

*Figure 23: Scania model 50th percentile male, mirrors conforming to Directive 71/127*
However, it was found that the Class V mirror for the Scania model did not appear to be as complete as those for the DAF model, and so the rear most portion of the ground plane projection was at an angle rather than perpendicular to the vehicle (Figure 23). This anomaly was not considered to be detrimental to the CAD analysis.

The effect of lack of correct adjustment was investigated, and it was found that the 95th percentile male did not conform to the ground plane requirements of Directive 2003/97, although by a very small margin when the possible Class V mirror anomaly is taken into account. The results of this plot are shown in Figure 24 below, note that the ground plane plots for the 5th percentile and 50th percentile are omitted for clarity of the image.

![Figure 24: Scania 95th percentile male, with Directive 2003/97 - worst investigated lack of correct mirror adjustment](image)

Even though, in this model, the 95th percentile did not conform to Directive 2003/97, it was not considered to be a major safety issue because the area of non-conformity was extremely small.

However, one area of concern highlighted by Kent Police, as reported in Section 3.4, was the number of incidents of side-swiping accidents, generally caused by foreign vehicles. CAD analysis showed that, if the vehicles were in close traffic and when the mirrors conformed to Directive 2003/97, there was sufficient ground plane view to identify a vehicle (Figure 25).
However, given that the location of side swiping accidents is almost exclusively on the motorway network, consideration should be given to the road geometry. The second CAD plot, as shown in Figure 26 shows that an HGV in the middle of a motorway lane, with each motorway lane 3.6 metres wide. It can be seen that, if the car moves away from the HGV to give it as much room as possible but remained in its own lane, then the car is not visible to the HGV driver when the mirrors conform to Directive 71/127 (green), but it is possible that a small area of the car could be seen using mirrors that conform to Directive 2003/97 (red) as Figure 26 is showing.

Further CAD analysis of the indirect view through the Class V mirror fitted to the Scania is illustrated in Figure 27.
Figure 27: Scania, with Class V conforming to Directive 2003/97

It can be seen that although in the model the position of the cyclist can be seen ‘through’ the passenger door, in reality this view would be obstructed. For larger HGVs, it is plain that due to the greater height of the cab a cyclist would not be seen without the Class V mirror. It is also highly likely that without the Class V mirror a lower profile vehicle, for example a car, would not be seen either. Therefore, this shows that there would be a clear benefit if left hand drive vehicles of this size category driving on the left (or vice versa) were fitted with Class V mirrors conforming to Directive 2003/97.

4.4 Results summary

The area of the visible ground plane was calculated through SAMMIE CAD, by truncating the ground plot at 200m rearwards and 120m laterally from the ocular point, and at the widest point of the vehicle (excluding exterior mirrors). For each CAD analysis of the mirror requirements in the Directives, 71/127 and 2003/97, the 50th percentile male was considered the baseline and the mirrors adjusted for this driver. When the 50th percentile male was substituted with either the 95th percentile male or the 5th percentile female, the mirror position remained unchanged and the ground plane area visible calculated.

The results for the ground plane area observed using the Class IV mirror are shown in Table 19 and those results for the Class V mirrors in Table 20.

<table>
<thead>
<tr>
<th>Table 19. Summary of ground plane areas visible (m²) with Class IV mirror</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directive 71/127</strong></td>
</tr>
<tr>
<td>5th</td>
</tr>
<tr>
<td>DAF</td>
</tr>
<tr>
<td>IVECO</td>
</tr>
<tr>
<td>SCANIA</td>
</tr>
</tbody>
</table>
Table 20. Summary of ground plane areas visible (m²) with Class V mirror

<table>
<thead>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>5th</td>
<td>50th</td>
</tr>
<tr>
<td>DAF</td>
<td>8.00</td>
<td>7.75</td>
</tr>
<tr>
<td>SCANIA</td>
<td>5.46</td>
<td>5.24</td>
</tr>
</tbody>
</table>

An interesting result was that the ground plane area seen with Class V mirror was smaller for the Scania model than for the DAF model. It was expected that visible area would be smaller for the DAF model because it represented much smaller vehicles of 7.5 to 12 tonnes. It is not known why this result occurred but the primary reason is most likely due to the model’s Class V mirror shape being irregular because of the possible anomaly. However, the area visible with the Class IV mirror increased for the DAF model, as expected. Logically then, the blind spot area by the passenger door is smaller for the vehicles in the range 7.5 to 12 tonne.

For both tables it is clear that the effect of a lack of corrective mirror adjustment for the 5th percentile female and 95th percentile male on an already well adjusted mirror for a 50th percentile male is small. Generally the change in visible area is calculated as less than a 7% change for the Class IV and 9% for the Class V. Of greater concern is when the mirror is badly adjusted such that other aspects as well as the ground plane are visible, this is investigated in Section 6 or when the mirror is badly aligned such that the vision is severely restricted, as noted in the accident summaries in Section 3.3.

4.5 Conclusions

By changing the permitted radius of curvature in Directive 2003/97 the blind spot gap between the ground plane for the Class IV and Class V mirrors has been eliminated.

The blindspot for 7.5 to 12 tonne HGVs is smaller than that for the 44 tonne vehicle.

A 7.5 to 12 tonne vehicle without a Class V mirror will have a blindspot by the passenger door. A cyclist would have to be at least a 50th percentile adult male, sat reasonably upright on the bicycle to be seen with direct vision.

The CAD analysis has shown that if the mirrors are correctly adjusted then other vehicles should be visible in urban traffic and close to the HGV. However, on wider carriageways, such as motorways, it is possible for passenger cars to be located in a blind spot.

The CAD analysis has also demonstrated that Class V mirrors conforming to Directive 2003/97 fitted to goods vehicles in excess of 12 tonnes, shows a clear benefit for vulnerable road users and would be of benefit if right hand drive vehicles of this size category driving on the left (or vice versa) were fitted with Class V mirrors.
5 Vehicle Survey

The primary purpose of the vehicle survey was to assess the number of vehicles, between 7.5 and 12 tonnes, in the UK and rest of Europe that will be affected by any proposal to retro-fit class V mirrors. When analysing the Kent Police accident data, it became apparent that data on the numbers of HGV vehicles visiting the UK would be of benefit.

5.1 UK vehicles


The most recent publication states that in 2003 there were 12,100 vehicles with a gross weight between 7.5 and 12 tonnes. Figure 28 shows that the number of such vehicles has been slowly declining since 1991, and in 2003 there had been approximately a 35% drop from 1991, in the numbers of 7.5 to 12 tonne vehicles registered in the UK. For the same period, the numbers of HGVs over 12 tonnes registered since 1991 has increased by 5% from 253,000 to 265,600 in 2003.

![Number of 7.5 to 12 tonnes goods vehicles licensed in the UK (1991 – 2003)](image)

Figure 28: Number of 7.5 to 12 tonnes goods vehicles licensed in the UK (1991 – 2003)

It is possible that the decrease in numbers of 7.5 to 12 tonne vehicles may be because operators seek to take advantage of the increased permitted weights for larger vehicles. From the 1st January 1999, vehicles were permitted to operate at maximum of 41 tonnes, and from 2001 at a maximum of 44 tonne. The data from the vehicle licensing statistics (2004a) shows that, in 1998 there were 3,300 vehicles registered with a gross weight in excess of 38 tonnes, in 1999 there were 25,200 registered and in 2003 69,900.

All of the 12,100 7.5 to 12 tonne vehicles registered in 2003 were rigid vehicles, almost all of which had two axles. The five most common types of 7.5 to 12 tonne vehicles are shown in Table 21.
Table 21. Breakdown of 7.5 to 12 tonne vehicles by most populous body type

<table>
<thead>
<tr>
<th>Body Type</th>
<th>Number of vehicles registered (Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>end 2002</td>
</tr>
<tr>
<td>Box Van</td>
<td>5.2</td>
</tr>
<tr>
<td>Flat lorry</td>
<td>1.1</td>
</tr>
<tr>
<td>Insulated van</td>
<td>1</td>
</tr>
<tr>
<td>Tipper</td>
<td>0.9</td>
</tr>
<tr>
<td>Dropside lorry</td>
<td>0.9</td>
</tr>
</tbody>
</table>

The only exemptions for the fitment of blind spot mirrors relate to the mounting position on the vehicle. Point 3.7 in Annex III of Directive 2003/97 states: “Class V and Class VI mirrors shall be mounted on vehicles in such a way such that, regardless of their position after adjustment, no part of these mirrors or their holders is less than 2m from the ground when the vehicle is under a load corresponding to its maximum technical permissible mass.”

The Leyland DAF FA LF45 Series lorry has a cab height, from the top of the truck bed of 1.89m. The height of the truck bed could be estimated to be no less than 0.5m therefore this type of vehicle would not be exempt from fitting the Class V close proximity mirror. Other manufacturers have similar dimensions to their vehicles. The Mercedes Benz Atego 918 and 1018 Rigid Trucks with Gross Vehicle Weights (GVW) of 9.5 tonnes and 10.5 tonnes respectively, have a similar unladen cab height of 2.5m from the ground. Another example is the Iveco ML 100E17S which has a GVW of 10 tonnes and a cab height of 2.5m when unladen. Even the smaller vehicles in this range have similar cab heights. The Iveco ML 65E15S has a GVW of only 6.8 tonnes and yet its cab height is also 2.5m when unladen.

It can be reasonably expected that these examples are representative of the cab dimensions seen on 7.5 to 12 tonne vehicles in the UK and as such there would be very few exemptions from the fitment of Class V close-proximity mirrors. Although the precise number of 7.5 to 12 tonne vehicles already fitted with Class V mirrors is not known, it can be estimated that, in the worst case, less than 12,100 UK registered vehicles, between 7.5 and 12 tonne, will be affected by any proposal for inclusion in Directive 2003/97 to retro-fit Class V mirrors.

5.2 Visiting EU vehicles

Foreign registered vehicles visiting the UK have been increasing year on year. The Department for Transport has been collating the statistics since 1989, and report that the number of vehicles travelling to mainland Europe has grown by 106 per cent since 1989 (Department for Transport 2004b). Vehicles above 3.5 GVW are recorded as a goods vehicle. The increase in both powered vehicles and unaccompanied trailers is shown in Figure 29 below.
The DfT also report that for powered goods vehicles travelling to Europe, the UK share has dropped from 50.5% in 1994 down to 26% in 2003.

In 2002 it was reported that 1,174,000 EU registered vehicles (not including UK vehicles) left the UK travelling to mainland Europe (Department for Transport, 2003a). The total number of powered goods vehicles, excluding UK vehicles but including non-EU vehicles, was 1,308,200.

A breakdown of these vehicles by country of registration can be seen in Figure 30, below.

**Figure 29: Total vehicles travelling to Europe (Department for Transport 2004b)**

**Figure 30: Powered goods vehicles leaving the UK in 2002 by country of registration (non-UK vehicles)**
From the latest figures published by the Department for Transport (2004b), in 2003, there were a total of 1,340,700 powered goods vehicles visiting the UK, the percentages by country of registration are shown in Figure 31 below.

![Non-UK powered vehicles 2003](image)

**Figure 31: Powered goods vehicles leaving the UK in 2003 by country of registration (non UK vehicles)**

As can be seen, there is an increase for non EU vehicles from 8.88% to 10.79%, which may be due to former Eastern Bloc countries, for example Poland and the Czech Republic, who were due to join the EU in May 2004, beginning to explore the EU marketplace. There was also an increase in the number of Dutch registered vehicles visiting the UK (increased from 14.24% of the total to 15.68%), but there was a reduction in the number of vehicles from Ireland (3.41% to 2.3%) and from Belgium & Luxembourg (9.28% to 7.78%). All other countries of registration were within 1% of the previous year’s total. French vehicles account for the majority of non-UK powered goods vehicles journeys from (and therefore to) the UK with 27.09%. The next highest is the Netherlands at 15.68% and then Germany at 11.61%.

All powered vehicles above 3.5 tonnes GVW and leaving the UK were recorded in the DfT statistics. If it were assumed that the EU and non-EU vehicle population follows a similar distribution to the UK then it is possible to estimate the number of vehicles with a gross weight between 7.5 and 12 tonnes that left the UK bound for mainland Europe in 2003. The Vehicle Licensing Statistics (Department for Transport, 2004a) show that approximately 2.82% of all UK registered good vehicles have a gross weight between 7.5 and 12 tonnes. Therefore, if the vehicle fleet had a similar distribution to the UK then there were 37,600 vehicles with a gross weight between 7.5 and 12 tonnes that left the UK bound for mainland Europe.

Investigations into the national law requirements for the fitment of Class V mirrors of the 15 EU member states (before May 2004) resulted in responses from 11 countries. Of the responses, only Sweden has no requirement by national law to fit Class V mirrors to HGV vehicles, although it is not known from which date the other states required fitment (see Annex B). However, reports indicate that the close proximity mirror is fitted as standard by the manufacturers to some vehicles when produced for this market. Therefore, it can be assumed that the majority of foreign registered HGVs entering the UK should have Class V mirrors fitted.
According to Eurostat (2000), the stock of commercial vehicles in the UK was 2,861,000, which includes goods vehicles of less than 3.5 tonnes. Department for Transport statistics (2004b) put the total number of UK registrations goods vehicle registrations in 2000 at 2,787,000. Although these figures are not identical, they are considered to be a good indication of the numbers of goods vehicle throughout Europe.

Without concise figures showing the European breakdown of 7.5 to 12 tonne vehicles, it has been assumed that European levels of 7.5 to 12 tonne goods vehicles follow a similar percentage to the UK (12600/2861000 = 0.44%, based on the 2002 level). The estimated values are shown in Annex B of this report and indicate that there are approximately 104,100 vehicles in the 7.5 to 12 tonne range for the EU members before May 2004 (the EU15), and for countries which joined the EU in May 2004 (where vehicle numbers are known), there are 11,700. As an applicant country the numbers for Romania should be considered, and it is estimated that there are 1,800 7.5 to 12 tonne vehicles in Romania.
6 Driver survey

6.1 Introduction

One of the factors under consideration within the current research project is the effectiveness of close proximity mirrors (also known as Class V mirror or a kerbside mirror) as a primary safety intervention in the design of Heavy Goods Vehicles (HGVs). Close proximity mirrors are intended to reduce the number of accidents where a contributory factor is the driver’s inability to see another road user (e.g. cyclists, pedestrians) in the blind spot to the nearside of the vehicle. Although an investigation of the actual accident reductions attributed to the use of close proximity mirrors would be the most desirable method for evaluating their effect as a safety feature, this would also prove the least feasible for a number of reasons. For example, the actual value of a Class V mirror in a potential or actual accident situation is likely to be extremely subjective and the required data for any such comparison is not available.

For these reasons, this study conducted a survey of HGV drivers to investigate their knowledge, use of and attitudes towards close proximity mirrors. This section presents the results of that survey.

6.2 Method

The names and addresses of 2,000 registered HGV licence holders of category C and C+E (1,000 in England, 500 in Scotland and 500 in Wales) were obtained from the Driver and Vehicle Licensing Agency (DVLA). Each HGV licence holder was selected from the DVLA drivers’ database using the HGV licence marker and provided to TRL in accordance with TRL’s registration under the Data Protection Act 1998.

In October 2003, each of the 2,000 HGV drivers were sent a covering letter explaining the objectives of the survey (Annex C1), a self-completion questionnaire (Annex C2) and a freepost reply envelope. The questionnaire was designed by TRL specifically for the survey and contained two sections of questions.

Section A asked for general information:

- General demographic information (e.g. age)
- Type and duration of driving licence categories held
- HGV driving experience
- HGV accident involvement

Section B contained a number of questions investigating aspects relating to the use of close proximity mirrors, including:

- Whether these mirrors were fitted to the vehicles they had driven
- The use respondents made of close proximity mirrors when fitted
- General opinions on the use of the mirrors
- Accident or near miss situations where respondents felt the use of these mirrors had been beneficial

Although it is likely that most HGV drivers know that they ought to use the close proximity mirror, whether the mirrors are used and, if so, whether the mirrors are used for the purposes intended has been investigated. The questionnaire was designed with this issue in mind. When respondents were
asked about their use of close proximity mirrors, other mirror use behaviours were investigated in addition to those safety behaviours for which the mirrors are intended.

When answering some of the questions, respondents were invited to make more than one response. Consequently, when the answers to some questions are reported, numbers can exceed 100% of the sample size. It should be noted that self-report surveys are dependent upon respondents providing truthful answers. In some cases respondents may describe their behaviours inaccurately and may instead provide what are known as ‘socially acceptable’ answers whereby they present themselves as behaving in a way that they think they should behave rather than how they actually do. In order to reduce the likelihood of this factor biasing the results, the survey was designed and presented in a non-judgemental way and all efforts were made in the wording of each question and the presentation of the survey to encourage truthful reporting as much as possible.

All completed questionnaires received at TRL by the stated reply date of 7th December 2003 were coded and entered for data analysis. Only a small number (nine) of responses have been received since this date with the majority of responses having been received within the generous reporting window. It was not possible to include responses received after this date because analysis had commenced.

6.3 Results

6.3.1 Response rate

Of the 2,000 questionnaires sent out, 324 (16%) were completed and returned by the response date. However, of these respondents 13 claimed that they ‘never’ drove an HGV. These respondents were removed from further analysis and the ‘usable’ response rate was therefore 311 (16%). As some questions were not answered by all respondents the percentages or totals reported in some cases are based upon a sample size less than 311.

An additional forty-nine questionnaires were returned uncompleted. Most of these questionnaires had been returned because the respondent was either no longer driving HGVs or no longer held an HGV licence. This provides some indication that the DVLA database was not completely up to date. Additionally a small number of questionnaires were returned because drivers in the sample had died and either their family had not notified the DVLA of this at the time of the survey, or their DVLA records not yet been updated. In a small number of cases the names and addresses provided by the DVLA were incorrect and questionnaires had been returned ‘addressee not known’.

6.3.2 Demographics

All but one of the HGV drivers who responded to the survey was male. Respondents’ ages were normally distributed and ranged between 20 and 68, with an average of 44 years (Figure 32).
When asked about the type of HGV licence held, the most commonly held was the Class 1 (that is, the respondent passed their HGV driving test before April 1991). Table 22 presents the number of respondents claiming to possess each licence type and the average length of time that each had been held for by respondents. Some respondents had gained a further licence later in their career, so the last two columns have been produced to show the highest level HGV licence held by each individual (NB. Where respondents had ticked both a pre- and post- April 1991 licence the latter has been presented in the last two columns).

Table 22. HGV licence held by respondents

<table>
<thead>
<tr>
<th>Licence type</th>
<th>Number of respondents with licence</th>
<th>Average length of time held (years)</th>
<th>Number of respondents with each licence as highest level (n=311)</th>
<th>Average length of time highest level licence held (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test passed before April 1991</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 3 (rigid)</td>
<td>103</td>
<td>29.1</td>
<td>29</td>
<td>23.6</td>
</tr>
<tr>
<td>Class 2 (rigid)</td>
<td>105</td>
<td>19.6</td>
<td>56</td>
<td>21.0</td>
</tr>
<tr>
<td>Class 1 (artic)</td>
<td>139</td>
<td>19.4</td>
<td>131</td>
<td>20.2</td>
</tr>
<tr>
<td><strong>Test passed after April 1991</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category C (rigid)</td>
<td>77</td>
<td>3.8</td>
<td>44</td>
<td>3.1</td>
</tr>
<tr>
<td>Category C+E (artic)</td>
<td>52</td>
<td>4.3</td>
<td>51</td>
<td>4.2</td>
</tr>
</tbody>
</table>

6.3.3 HGV driving experience

When asked about the type of HGV regularly driven, all respondents had some level of regular experience driving goods vehicles (including foreign registered HGVs). The type of HGV most commonly driven by respondents was a 2-axle rigid, which almost two thirds of respondents (200, 64%) ‘regularly’ drove. Indeed, half of all respondents drove this type of HGV at least once a week. Table 23 presents the number of drivers who ‘regularly’ drove various types of HGV.

Table 23. Type of HGV ‘regularly’ driven by respondents

<table>
<thead>
<tr>
<th>HGV type</th>
<th>Number ‘regularly’ driving (n=311)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monthly or more frequently</td>
</tr>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>2 axles rigid</td>
<td>200</td>
</tr>
<tr>
<td>3 axles rigid</td>
<td>92</td>
</tr>
<tr>
<td>4 axles rigid</td>
<td>37</td>
</tr>
<tr>
<td>3 axles artic</td>
<td>42</td>
</tr>
<tr>
<td>4 axles artic</td>
<td>39</td>
</tr>
<tr>
<td>5 or more axles</td>
<td>90</td>
</tr>
<tr>
<td>Drawbar vehicle</td>
<td>42</td>
</tr>
<tr>
<td>Foreign registered HGV</td>
<td>2</td>
</tr>
</tbody>
</table>

1 ‘Regularly’ in this instance is defined as driven by respondents at least once a month.
As is shown in Table 23 more than a quarter (81.26%) of respondents ‘regularly’ drove an articulated HGV, whilst 42 (14%) ‘regularly’ drove a draw bar combination. The average mileage driven in the previous year was just over 61,000 miles (median 33,244 miles). In a very small number of cases the self-reported mileage was in excess of the number of weekly miles that could actually have been driven (assumed for the purposes of this survey as 60mph x 48hrs/wk x 52 weeks = 149,760 miles). Due to overtime variations an exact maximum cannot be calculated precisely and therefore all responses were analysed regardless of reporting errors. Because of this the average mileage driven by respondents may actually be slightly lower than the 61,000 miles calculated.

When asked about their type of employment as an HGV driver (‘employment status’), the majority (245, 81%) worked as a driver within an organisation, three quarters of whom (185, 76%) worked for a large organisation employing 10 or more HGV drivers. One in ten respondents (29, 10%) worked as an agency driver, whilst only 6% (18) respondents operated using their own HGV. Overall almost half of the respondents (136, 47%) usually drove the same cab. The percentage of drivers who usually drove the same, rather than different cabs varied dependent upon their type of employment as an HGV driver. Unsurprisingly, the most likely to drive the same cab were owner/operators of whom 67% usually drive the same cab. In contrast, albeit not unexpectedly, all of the agency drivers claimed to usually drive different cabs.

Table 24 shows the types of loads typically carried by the drivers as part of their work. Of the 61 respondents that did not carry a load as defined in the listed options, almost all drove specialist vehicles such as fire engines and military transport vehicles.

### Table 24. Type of load carried by respondents

<table>
<thead>
<tr>
<th>Typical load</th>
<th>Number carrying load type (n=311)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
</tr>
<tr>
<td>Construction and waste goods</td>
<td>107</td>
</tr>
<tr>
<td>Foodstuffs</td>
<td>96</td>
</tr>
<tr>
<td>Machinery and vehicles</td>
<td>69</td>
</tr>
<tr>
<td>Consumer or ‘white’ goods</td>
<td>67</td>
</tr>
<tr>
<td>‘Other’</td>
<td>61</td>
</tr>
<tr>
<td>Chemicals (incl. Hazchem)</td>
<td>29</td>
</tr>
<tr>
<td>Livestock</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 33 illustrates how often respondents drive on various types of road. Overall, roads in built up areas and dual carriageways are driven on most frequently by respondents.
Respondents were also asked how many accidents and near-misses (the impression of only just avoiding an accident) they had experienced during the previous 12 month period. Only a quarter (77, 25%) of respondents claimed not to have had a ‘near miss’ during that period, whilst almost half (141, 46%) claimed to have had ‘1 or 2’ near miss incidents. Only 43 (14%) respondents claimed to have had more than 5 near misses in the previous 12 month period.

Table 25 presents information on the number of near misses reported by drivers, subdivided by employment status.

Table 25. Percentage of reported near misses

<table>
<thead>
<tr>
<th>Employment type</th>
<th>None</th>
<th>1 or 2</th>
<th>3 to 5</th>
<th>6 to 10</th>
<th>More than 10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner/operator</td>
<td>6</td>
<td>33</td>
<td>12</td>
<td>67</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>8</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fleet Owner (employs 2+ drivers)</td>
<td>5</td>
<td>42</td>
<td>4</td>
<td>33</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>%</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Agency driver</td>
<td>7</td>
<td>24</td>
<td>13</td>
<td>45</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>%</td>
<td>10</td>
<td>9</td>
<td>14</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Employed by large company (&gt;10)</td>
<td>43</td>
<td>23</td>
<td>79</td>
<td>43</td>
<td>29</td>
<td>16</td>
</tr>
<tr>
<td>%</td>
<td>59</td>
<td>57</td>
<td>58</td>
<td>77</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Employed by small company (&lt;10)</td>
<td>12</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>%</td>
<td>16</td>
<td>22</td>
<td>26</td>
<td>15</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total (100%)</td>
<td>73</td>
<td>138</td>
<td>50</td>
<td>13</td>
<td>30</td>
<td>304</td>
</tr>
</tbody>
</table>
When asked about accidents, the majority of HGV drivers (233, 75%) had not had any accidents during the past 3 years. Unsurprisingly, the number of reported near misses and accidents were both significantly correlated with the number of miles driven\(^2\). This shows that increased exposure (e.g. mileage) is associated with increased numbers of reported near misses and accidents. The number of reported near misses and accidents were also correlated\(^3\). This finding shows that those drivers who report a greater number of near misses also report a higher level of accidents. Table 26 shows the percentage of drivers having an accident during the previous 3 years by their type of employment as an HGV driver.

**Table 26. Percentage of accidents reported by different groups of HGV drivers**

<table>
<thead>
<tr>
<th>Employment type</th>
<th>None</th>
<th>1 or 2</th>
<th>3 to 5</th>
<th>6 to 10</th>
<th>More than 10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner/operator</td>
<td>16</td>
<td>89</td>
<td>2</td>
<td>11</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>%</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fleet Owner (employs 2+ drivers)</td>
<td>11</td>
<td>92</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>%</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Agency driver</td>
<td>21</td>
<td>72</td>
<td>5</td>
<td>17</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>%</td>
<td>9</td>
<td>12</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Employed by large company (&gt;10)</td>
<td>129</td>
<td>70</td>
<td>27</td>
<td>15</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>%</td>
<td>57</td>
<td>63</td>
<td>85</td>
<td>100</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Employed by small company (&lt;10)</td>
<td>50</td>
<td>83</td>
<td>8</td>
<td>13</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>%</td>
<td>22</td>
<td>19</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total (100%)</td>
<td>227</td>
<td>43</td>
<td>26</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

When respondents’ employment status was considered in relation to the number of reported near misses and accidents, it was shown to be a significant factor in the number of near misses\(^4\) and accidents\(^5\) reported. When investigated further, the results indicate that owner/operators in particular are less likely to have been involved in a near miss than drivers within an organisation (large or small). Additionally, both owner/operators and those defined as owners of a trucking company were significantly less likely to have been involved in an accident in the previous 3 years than drivers employed by a large HGV organisation. It is likely that this difference may reflect the heightened burden of vehicle down time and accident costs faced by both owner/operators and truck company owners in the event of an accident. However, this finding does not take into account any differences in terms of different exposure faced by these different groups in terms of both annual distances and also the type of journeys that are made.

\(^2\)Investigation of the relationship between accidents, near misses and the number of miles driven was carried out using Pearson’s Rho (\(r\)) correlation test statistic ‘accidents’ \(r = .196, p<.01\) and ‘near misses’ \(r = .221, p<.01\).

\(^3\)\(r = .374, p<.01\)

\(^4\)This is found to be statistically significant when investigated using an Analysis of Variance (ANOVA) test \(F=2.03, p<.1\).

\(^5\)\(F=2.99, p<.05\).
6.3.4 **Experience of using close proximity mirrors**

In order to investigate the use of close proximity mirrors amongst HGV drivers, respondents were asked a number of questions about how and when they use them.

6.3.4.1 **Level of mirror fitment**

Almost all of the HGV drivers (287, 92%) claimed to have some experience of driving an HGV fitted with close proximity mirrors. Furthermore, almost two thirds of respondents (202, 65%) *always* drove an HGV with these mirrors fitted. Only 24 HGV drivers (8%) ‘never’ drove an HGV with a close proximity mirror fitted. Figure 34 below shows the level of close proximity mirror fitment on vehicles driven by the respondents.

![Figure 34: How often do HGV drivers drive an HGV with close proximity mirrors fitted? (n=311)](image)

Of respondents who ‘never’ drive a HGV with Class V mirrors fitted, over half (14, 58%) were licenced to drive Class 1 or Category C+E vehicles. When the HGV type most frequently driven by this group was considered, one third drove a 2-axle rigid (7, 35%). Despite this, overall this group were equally split between driving rigid and articulated HGVs of any axle number.

When the level of close proximity mirror fitment is investigated according to whether respondents usually drive the same cab or different cabs, most drivers in both groups claim that close proximity mirrors are ‘always’ fitted to the vehicles they drive. However, the overall level of close proximity mirror fitment is less common amongst those drivers who usually drive different cabs\(^6\) (Figure 35).

\(^6\) F=18.46, p<0.001.
How often HGV drivers drive HGVs with close proximity mirrors fitted

Figure 35: Histogram showing how often respondents drive HGVs with close proximity mirrors fitted.

Similarly, the level of close proximity mirror fitment on vehicles usually driven by respondents was significantly different when employment status was considered. Those respondents employed by a large haulage organisation drove HGVs fitted with close proximity mirrors on a more frequent basis. Statistical analysis showed that owner/operators were significantly less likely to drive vehicles with close proximity mirrors fitted than HGV drivers employed within both small and large haulage organisations. From this it can be assumed that those driving their own HGVs are less likely to have a close proximity mirror fitted than those working in haulage organisations. Although less likely to drive a close proximity mirror fitted HGV, the HGVs driven by agency drivers were not found to be significantly less likely to drive vehicles with the mirrors installed. This is despite the fact that all agency employed drivers responding to the survey claimed usually to drive different cabs (Figure 36).

Figure 36: How often respondents of different employment status groups drive HGVs with close proximity mirrors fitted.
6.3.4.2 Use of close proximity mirrors when fitted

Of those who drove with close proximity mirrors fitted, including those who only rarely drive HGVs with close proximity mirrors fitted, the majority of HGV drivers (181, 63%) claimed to ‘always’ check the positioning of the mirror when getting into the cab. In addition, another third (101, 36%) of respondents claimed to check the mirrors at least ‘rarely’ or ‘sometimes’, perhaps reflecting the fact that on some occasions they felt that the mirror did not need to be checked because they drove the same vehicle, or were the only driver of a particular vehicle (Figure 37).

![Figure 37](image_url)

**Figure 37: When fitted, how often do HGV drivers check the positioning of the close proximity mirror when getting into the cab? (n=287)**

When investigated further, over two thirds (107, 70%) of those respondents who usually drove different cabs claimed to check the positioning of the close proximity mirror ‘every time’ they got into the vehicle, this was compared with just over half (76, 55%) of those respondents who usually drove the same vehicle. The difference between these two groups in terms of their frequency of checking the positioning of the Class V mirror was found to be statistically significant, whereby those who usually drove different cabs were significantly more likely to check the mirror’s position. Overall, only 7 HGV drivers (2%) claimed never to check the positioning of the close proximity mirror when entering the cab. Of these, 4 usually drove the same vehicle without any close proximity mirrors fitted, whilst one additional respondent always drove the same vehicle and may therefore have felt that they did not need checking.

Of the 202 respondents that always drove HGVs with close proximity mirrors fitted, almost two thirds (132, 65%) claimed to check the positioning of the close proximity mirrors ‘every time’ they got into the cab. Only 3 respondents stated that they ‘never’ checked the positioning of the mirror, 2 of whom usually drove different cabs.

Of those drivers who always drove vehicles fitted with close proximity mirrors and who checked the positioning of the mirrors on at least some occasions (n=190), those who usually drove different cabs needed to adjust the positioning of the mirror significantly more often than those who drove the same vehicle. Indeed, a third of the former group (27, 33%) had to adjust the mirror’s position ‘every time’ they got into the cab compared with only one sixth (18, 17%) of those who drove the same vehicle.

---

7 $F=2.76, p<0.1$
8 $F=12.48, p<0.01$
In contrast, all respondents claimed to check the positioning of ‘other’ mirrors on at least some occasions when getting into their cab. Indeed, most drivers (241, 83%) claimed to always check the positioning of other, non-close proximity, mirrors when getting into the cab.

Investigation of how the drivers used close proximity mirrors when fitted to their vehicle showed that the majority of HGV drivers use these mirrors in accordance with their primary safety intentions. Of those with close proximity mirrors fitted to their vehicle, the most common use of the mirrors was to check for obstacles by the passenger door. Almost 9 out of 10 drivers (247, 88%) used the mirrors ‘often’ or ‘very often’ for this purpose. Only 1% of respondents with close proximity mirrors fitted to their HGV ‘never’ used the mirror for this purpose (Figure 38). Although observing obstacles is not the primary safety intention of the mirrors, it is likely that many respondents would have viewed the word ‘obstacle’ as possibly referring to cyclists, pedestrians and moving vehicles on the nearside of the driver’s vehicle.

**Figure 38: Proportion of HGV drivers that use the mirrors to see obstacles by the passenger door.**

Most HGV drivers ‘often’ or ‘very often’ used the mirrors to check for cyclists or pedestrians by the passenger door, the close proximity mirrors primary safety intention, when manoeuvring (246, 86%), shown in Figure 39 below. In this case there was a very slight increase in the number of drivers who claimed ‘never’ to use the mirror for this purpose (11, 4%). Of these 11 drivers, all but one (10, 91%) drove for a haulage organisation. The remaining HGV driver was an owner/operator whose vehicle did not have close proximity mirrors fitted. In contrast, of the 10 employed by a HGV operator 7 ‘always’ drove a HGV with close proximity mirrors fitted. Of this group 5 usually drove the same vehicle.

**Figure 39: Proportion of HGV drivers that use the mirrors when manoeuvring to check for cyclists or pedestrians by the passenger door (n=287).**
Most respondents also claimed to use the mirrors ‘often’ or ‘very often’ in order to check for cars by the passenger door before manoeuvring (241, 85%). Again only a small proportion of drivers ‘never’ used close proximity mirrors for this purpose when fitted (9, 3%).

The percentage of respondents that reported using the close proximity mirrors for various purposes as presented within the questionnaire is shown in Figure 40. In addition to those uses described above, ‘reversing’ refers to using the mirror to position the vehicle while reversing, ‘turning RIGHT/LEFT’ refers to using the mirror to check the distance of the wheel from the kerb when turning right and left respectively, and ‘deflating tyre’ refers to use of the mirror to check that the nearside tyre is not deflating. Each of these options are viewed as potential, but not important, uses of close proximity mirrors. When differences in use of the mirror by different types of driver (for example, employment status) were investigated, the frequency with which the mirrors were used for each purpose was not found to be significantly different between each group. There was one exception to this in that owner/operators used the mirror significantly more often to check whether the nearside tyre was deflating. This non-essential use of the mirrors perhaps reflects the ownership of the vehicle by this group.

![Figure 40: Frequency close proximity mirrors used for each purpose (n= 287).](image)

As the fitment of close proximity mirrors to new vehicles was introduced in 1988, differences in the use of the mirrors by those HGV drivers who had obtained a licence before and after this date were investigated. Although it could be the case that those drivers who began driving HGVs before the widespread fitment of close proximity mirrors may not use them in line with their intended safety benefits, no statistically significant differences were found to exist between the two groups.

### 6.3.5 Opinions on close proximity mirrors

In addition to their use of close proximity mirrors, respondents’ knowledge and opinions of the mirrors was also investigated. Almost all HGV drivers who had some experience of driving an HGV fitted with a close proximity mirror (278, 96%) believed that it is ‘very important’ or ‘important’ to be able to see obstacles close to the passenger door in the mirror (Figure 41). Similarly, 98% (196) of those drivers who ‘always’ drove a close proximity mirror fitted vehicle also believed that it is ‘very important’ or ‘important’ to be able to see this in the mirror. A slightly smaller, yet still large proportion of respondents felt that it was important to be able to see the near-side wheel (246, 88%) in the close proximity mirror. Lower proportions of respondents felt that it was important to be able to see the passenger steps (191, 72%), or the passenger door (153, 57%) within the mirror.
When differences in the opinions of those drivers who obtained their HGV licence either before or after the introduction of the mirrors were investigated, both groups of drivers felt equally strongly on the importance of close proximity mirrors for seeing obstacles close to the passenger door. However, those drivers who had obtained their HGV licence since the mandatory introduction of close proximity mirrors in 1988 felt more strongly about the importance of being able to see the near side wheel in the mirror.10

Respondents were also asked to state their strength of agreement with a number of statements relating to the use of close proximity mirrors. Of those who had some experience of driving HGVs fitted with a close proximity mirror, more than three quarters (225, 79%) of respondents agreed that close proximity mirrors are useful (Figure 42) and almost all respondents agreed that close proximity mirrors help prevent accidents (260, 91%). Of those who felt that close proximity mirrors were useful, over two thirds (162, 69%) ‘always’ drove HGVs with close proximity mirrors fitted. However, those who felt these mirrors were useful did not check the mirrors positioning significantly more or less frequently when compared with those who did not. Nor did they use the mirror significantly more or less frequently to check for obstacles in the near side blind spot.

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9 F= 4.38, p<0.05
10 Measured on a 5-point scale ranging from ‘Strongly Agree’ to ‘Strongly Disagree’. 
In relation to the purpose of close proximity mirrors, strongest agreement was that the mirrors are used to see obstacles by the passenger door (253, 89%). More than three quarters of respondents also agreed that the purpose of the mirrors is to check for cyclists or pedestrians (251, 88%) and cars (225, 79%) by the passenger door. Table 27 presents the level of agreement with a number of other possible purposes of close proximity mirrors that respondents were presented with as well. Overall, it can be seen that driver’s opinions on the purpose of close proximity mirrors are in line with their intended safety function, however, the drivers also believe that mirrors are useful for other purposes such as manoeuvring.

Table 27. Level of agreement with statements relating to purpose of close proximity mirrors

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>See obstacles by passenger door</td>
<td>n=127</td>
<td>45%</td>
<td>n=126</td>
<td>44%</td>
<td>n=18</td>
<td>6%</td>
</tr>
<tr>
<td>Check for cyclists/pedestrians</td>
<td>n=166</td>
<td>59%</td>
<td>n=85</td>
<td>30%</td>
<td>n=22</td>
<td>8%</td>
</tr>
<tr>
<td>Check for cars</td>
<td>n=120</td>
<td>42%</td>
<td>n=105</td>
<td>37%</td>
<td>n=44</td>
<td>15%</td>
</tr>
<tr>
<td>Help positioning when reversing</td>
<td>n=54</td>
<td>19%</td>
<td>n=101</td>
<td>35%</td>
<td>n=72</td>
<td>25%</td>
</tr>
<tr>
<td>Check kerb distance when turning left</td>
<td>n=25</td>
<td>9%</td>
<td>n=67</td>
<td>23%</td>
<td>n=109</td>
<td>38%</td>
</tr>
<tr>
<td>Check kerb distance when turning right</td>
<td>n=14</td>
<td>5%</td>
<td>n=38</td>
<td>13%</td>
<td>n=114</td>
<td>40%</td>
</tr>
<tr>
<td>Check near side wheel not deflating</td>
<td>n=5</td>
<td>2%</td>
<td>n=14</td>
<td>5%</td>
<td>n=76</td>
<td>27%</td>
</tr>
</tbody>
</table>

At present only HGVs 12 tonnes and over are required by law to have close proximity mirrors fitted. When asked whether other large vehicles should be fitted with the mirrors, the majority of respondents agreed that both HGVs over 7.5 tonnes (278, 91%) and coaches (260, 85%) should also have them fitted. Strength of opinion on all of these aspects was not found to differ significantly between those drivers who obtained their HGV licence before and after the change in the law on close proximity mirrors. Nor was it found to differ significantly between those respondents driving rigid compared with articulated HGVs, or drivers of different employment status.

Table 28 presents this information in relation to presented statements relating to the use of the mirror.

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11 Total is not 100% in all cases due to minor rounding errors.
Table 28. Level of agreement with statements relating to the use of close proximity mirrors

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>close proximity mirrors help prevent accidents</td>
<td>182</td>
<td>60</td>
<td>93</td>
<td>31</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>close proximity mirrors should be fitted to all vehicles over 7.5 tonnes</td>
<td>177</td>
<td>58</td>
<td>101</td>
<td>33</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>close proximity mirrors should be fitted to coaches</td>
<td>168</td>
<td>55</td>
<td>92</td>
<td>30</td>
<td>40</td>
<td>13</td>
</tr>
</tbody>
</table>

The data presented in Table 27 and Table 28 is also shown graphically below.

Figure 43: Level of agreement with statements relating to close proximity mirror use

Key:
- a) Purpose of close proximity mirror is to see obstacles by the passenger door
- b) Purpose of close proximity mirror is to help position when reversing
- c) Purpose of close proximity mirror is to check distance from kerb when turning right
- d) Purpose of close proximity mirror is to check distance from kerb when turning left
- e) Purpose of close proximity mirror is to check near side wheel is not deflating
- f) Purpose of close proximity mirror is to check for cyclists/pedestrians before manoeuvring
- g) Purpose of close proximity mirror is to check for cars before manoeuvring
- h) Close proximity mirrors help prevent accidents
- i) Good idea to fit close proximity mirrors to all HGVs over 7.5 tonnes
- j) Good idea to fit close proximity mirrors to coaches

Within the survey respondents were also asked to rate their perceptions of close proximity mirrors on seven bipolar 5 point scales, which asked them to rate the extent to which they thought close proximity mirrors were ‘positive’ or ‘negative’ in relation to seven word pairs, e.g. ‘beneficial’ to ‘harmful’, and ‘valuable’ to ‘worthless’. The aim of this categorisation was to enable to investigate respondents overall feelings towards the use of close proximity mirrors. Over half of respondents
gave the use of close proximity mirrors the maximum score (7x5) in terms of the perceived ‘positiveness’ of the mirrors (167, 57%).

When their use of the close proximity mirrors was also investigated, strength of positive feeling towards the safety feature was found to be significantly correlated with the rate of checking the positioning of the close proximity mirror when getting into the cab\(^{12}\). This demonstrates that those who generally view close proximity mirrors more positively were more likely to check their position when getting into a cab. Differences between groups of HGV driver were also investigated in terms of their overall perceptions of close proximity mirrors. Although no significant differences were found between drivers in terms of their employment status, or whether they drove rigid or articulated HGVs, those drivers who always drove close proximity mirrors fitted vehicles viewed the use and benefits of the mirrors significantly more favourably than those who ‘never’ drove vehicles fitted with close proximity mirrors\(^{13}\).

### 6.3.6 Perceived contribution of close proximity mirrors to accident avoidance

Ninety percent of HGV drivers surveyed agreed that the use of close proximity mirrors contributes to accident reduction. When asked whether the use of close proximity mirrors had actually contributed to the avoidance of an accident in their own experience during the past 12 months, over half (174, 61\%) claimed that they had avoided an object or accident due to its use. When asked for more detail on these incidents, respondents gave examples of either specific ‘near miss’ situations or a more general belief that regular use of the mirror had undoubtedly contributed to accident or object avoidance. All such descriptions are presented in Annex C3; and some comments are listed below:

“Delivering to pubs everyday and therefore doing a lot of tight close proximity manoeuvring in car parks and in between parked cars on the road, in nine out of ten cases if it wasn’t for the close proximity mirror it would be very difficult not to have an accident. There are too many times when the mirror has helped me to avoid an accident. It happens every day many times a day. Need I say more?”

“[I was] coming down (A14) in Kettering area when approaching slow moving traffic as well as slip road. Traffic was giving way to some cars trying to join carriageway merging from left when the named car (ford fiesta) decided to push in a gap that was not there. Without my close proximity mirror I would not have seen this car …”

“When turning left at a junction I avoided hitting a cyclist. I also avoided hitting a car on the motorway on my nearside when a motorway lane joined from the left. As I make deliveries on building sites I use my close proximity mirror to avoid obstacles e.g. newly laid kerbs, packs of bricks, and brain dead labourers.”

“Nearly every junction, traffic lights etc. in the ‘rush hour’ cars and cycles come up your inside. Even when indicating to turn left at a tight turn for HGV. At Runcorn Bridge cars will not give way to you when wanting to move out of feeder lane (heading north) onto bridge so you can get into correct lane for exit just after bridge. Roundabouts if you want to turn off at ‘3 o’clock’ they try to beat you round because HGV’s hold them up as being too slow. Nearly every entry slip road onto busy motorways cars now expect HGVs to give way to them. If the situation does not allow HGV to move into middle lane incoming traffic will try to force HGV to slow down so they can ‘get on’...”.

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\(^{12}\) r=2.6, p<0.01

\(^{13}\) F=3.51, p<0.01
Respondents were also asked whether they knew of other HGV drivers who had avoided an accident or obstacle due to the use of close proximity mirrors. This question hoped to overcome any individual’s reluctance to admit to situations that they were involved in. Despite this, only a quarter (79, 27%) of respondents claimed that they did know of another driver who had benefited from the use of close proximity mirrors. Only 10 (9%, 116) of these respondents had claimed that they had not been involved in a situation whilst driving an HGV when use of the close proximity mirrors had avoided an accident. From this it is inferred that self-report of accident situations to this survey have been unbiased.

Investigation of whether perceived accident savings differed between those respondents regularly driving articulated HGVs compared with those licenced to drive rigid HGVs showed that a significant difference did exist in the number of accidents avoided due to the presence of close proximity mirrors\(^{14}\). Specifically, drivers of articulated HGVs reported significantly greater accident savings due to the presence of close proximity mirrors than drivers of rigid HGVs.

There was not, however, a significant correlation between perceptions of the close proximity mirror and actual numbers of reported accidents within the previous 3 years or near misses during the previous 12 months when defined as ‘any’ near miss rather than those specifically avoid through use of the close proximity mirror.

6.4 Discussion and conclusions

This section has presented the results of a survey of over 300 HGV drivers who responded to a postal survey of 2,000 HGV licence holders randomly selected from the DVLA drivers’ database. The primary aim of this survey was to investigate HGV drivers’ use of close proximity mirrors as a safety feature allowing drivers to observe the blind spot existing by the nearside of the driver’s cab. In addition, HGV drivers’ views on the use of close proximity mirrors as a safety measure have also been investigated, as have their opinions on the safety feature’s ability to help reduce the risk of a collision.

Although greater than anticipated, the low response rate may indicate the reluctance of less safety motivated drivers to take part in the survey. If this is the case it is likely that responses to the survey may be biased towards those individuals who are more safety conscious and who have a greater appreciation for the use of safety related features such as close proximity mirrors. Without a detailed investigation of the reasons for non-response to the survey, it will not be possible to investigate the level of any response bias and its potential effect upon the results of the survey. Despite this fact, those responding to the survey did represent a wide range of ages and HGV driving experience indicating that a representative sample of the HGV driving population did respond to the survey.

Responses to the survey have shown that most HGV drivers have had experience of driving a HGV with a close proximity mirror fitted, indeed of those responding to the survey, two thirds \textit{always} drove a HGV with this safety feature installed and only 8% of respondents \textit{never} drove a HGV fitted with close proximity mirrors. Interestingly, close proximity mirror fitment levels were found to be significantly higher within vehicles owned by a HGV operating organisation and significantly lower among owner/operators vehicles. This finding may reflect an increased safety culture within HGV operating organisations, or may simply reflect the age of vehicles which tend to be older for owner/operators.

When driving an HGV equipped with a close proximity mirror, the majority of drivers claimed to always check the positioning of the mirror in accordance with expected good practice. Although there is a high overall reported rate of checking the positioning of close proximity mirrors when fitted, as would be hoped those individuals who regularly drive different cabs were found to check close proximity mirror’s position significantly more often.

\(^{14}\) F=7.81, p<0.01
Driver’s use and understanding of close proximity mirrors was also found, in the vast majority of cases, to be in line with recommended practice. For example, most drivers regularly use the mirror for its primary purpose of checking for obstacles including cyclists, pedestrians and cars that have entered the nearside blind spot. The vast majority of HGV drivers both recognise this as the main reason behind the installation of the safety feature and also appreciate the importance of close proximity mirrors as a primary safety measure. In addition, it was also shown that the majority of respondents found close proximity mirrors to be useful when manoeuvring and reversing. Overall, those who always drove close proximity mirror fitted vehicles viewed the benefits of the safety features significantly more positively than those who never drove vehicles fitted with close proximity mirrors. Furthermore, those drivers who viewed close proximity mirrors more positively were significantly more likely to check the position of close proximity mirrors on a regular basis.

Reassuringly, the results of this survey have provided no evidence for differences in the opinions of those drivers who gained their HGV licence before the law was changed to make the fitment of close proximity mirrors compulsory on HGVs of 12 tonnes and over. Although some differences were observed between these groups, they did not relate to views on the key aspects of these mirrors’ effective use.

When specifically considering the potential accident savings to be gained from effective and correct use of close proximity mirrors, the HGV drivers surveyed viewed the safety feature positively. This was demonstrated by the survey’s finding that 90% of HGV drivers agreed the use of close proximity mirrors generally contributes to the reduction of HGV accidents and collisions, whilst 61% of drivers claimed that use of the mirror had specifically helped them to avoid a potential accident within the past 12 months. Significantly greater accident savings resulting from the presence of close proximity mirrors were reported by those drivers of articulated HGVs when compared with rigid vehicles.

Unsurprisingly, those who claimed greater accident saving resulting from close proximity mirror use also viewed the safety feature significantly more positively. Perhaps in recognition of the fact that the vast majority of HGV drivers viewed close proximity mirrors as an effective safety feature, most HGV drivers surveyed agreed that it would be a good idea to have close proximity mirrors fitted to all HGVs in excess of 7.5 tonnes and to coaches.

Overall, HGV drivers’ knowledge of close proximity mirrors, and their use of this feature, is in line with what would be expected for near maximum safety benefits. However, it may be of concern that awareness of the safety benefits and the effective use of the mirrors, when installed, are not universally recognised by 100% of the HGV drivers surveyed. Although this is certainly not true of almost all HGV drivers responding to this survey, there is evidence that a minority of drivers are still failing to use the mirrors as an important and effective safety measure.

This survey has demonstrated that those HGV drivers who have close proximity mirrors fitted to the vehicles they drive view the safety feature more positively. The survey has also provided evidence that those who view the safety feature more positively are more likely to check the position of the close proximity mirror on a more regular basis. In addition, those who use the mirrors effectively and view them more positively are significantly more likely to have avoided accidents as a direct result of using the close proximity mirror.

The results of the current survey provide some evidence for the advantages to be gained by encouraging wider fitment of close proximity mirrors and increased awareness of the benefits and effectiveness of close proximity mirror use, targeting in particular those groups of HGV drivers that never drive vehicles with close proximity mirrors fitted. On this basis, consideration may need to be given as to whether public awareness needs to be further increased by careful use of publicity or training materials in order to address the knowledge gap of HGV drivers who do not currently have close proximity mirrors fitted to their vehicles. As owner/operators are significantly less likely to have close proximity mirrors fitted to their vehicles it may be worth targeting this group of HGV drivers specifically.

In conclusion, this survey has shown that close proximity mirrors are widely fitted to HGVs and that HGV drivers are positive to their use as a safety feature. The survey has also provided evidence that,
when installed, close proximity mirrors are used correctly and effectively as a primary safety measure by the majority of HGV drivers.
7  Class V mirror fitment – predictions of possible benefits

7.1  General
An estimate of the potential casualty savings is possible, based on information in the sections above, using estimates of the whole vehicle stock for 7.5 to 12 tonne vehicles, and information from the STAS19 and HVCIS database.

7.2  Accidents involving Vulnerable Road Users
Accidents recorded in the STAS19 accident database (1999-2001) were examined for accident configurations in which it was considered that a close proximity blind-spot mirror may have provided a benefit. Between 1999 and 2001 accidents involving a bicycle, pedestrian or motorcycle and an HGV, which was both greater than 7.5 tonnes and turning left or changing lanes to the left at the time of the accident, resulted in a total of 55 fatalities, 114 seriously injured, and 346 slightly injuries. These statistics relate only to accidents in which the VRU and HGV had been travelling in the same direction prior to the accident.

Thus, the average number of casualties per annum which the fitment of blind spot mirrors may affect can be estimated at 18 fatalities, 38 seriously injured, and 115 slight casualties. If all these casualties were prevented (i.e. if close proximity mirrors were 100% effective) then this figure is a maximum, or best case, figure since it assumes that the casualties were all injured in accidents with HGVs of between 7.5 and 12 tonnes (i.e. those HGVs not currently fitted with a class V mirror).

However, the total HGV fleet comprises 425,000 vehicles, of which 263,000 are in excess of 12 tonnes and therefore already have class V mirrors fitted. The vehicles between 7.5 and 12 tonnes to which these proposals relate, comprise an estimated 12,000 vehicles (Vehicle Licensing Statistics, 2003b). If it is assumed that the casualties caused by HGVs where the HGV was turning left are distributed uniformly with respect to vehicle weight, then if all HGVs between 7.5 and 12 tonnes were fitted with class V mirrors, 2.82% of the potential benefit might be realised (12,000/425,000). This calculation leads to a revised estimate of potential casualty savings, if close proximity mirrors were 100% effective, of less than 1 fatality (0.5), approximately 1 serious injury and 3 slight injuries per annum.

An analysis of the HVCIS database which includes an expert assessment of fatal HGV accidents showed that 55.2% (16 of 29) of accidents involving vulnerable road users related to accidents in which improved side visibility may have prevented the accident. Thus, if this 55.2% estimate is applied to the potential casualty savings above, then less than 1 fatality (0.28), less than 1 serious injury (0.59) and less than 2 slight injuries (1.79) could be prevented per annum.

It should be noted that the accident involvement frequency of HGVs currently not fitted with mirrors is unknown. If the current fatalities recorded in the STAS19 database are biased towards vehicles without class V mirrors (HGVs between 7.5 and 12 tonnes) then the cost saving has the potential to be significantly greater than estimated.

7.3  Accidents involving cars
The lack of blind spot mirror may also influence the frequency of accidents in which the HGV was changing lane. Data from two sources (covering Great Britain and visiting foreign vehicles) was examined to estimate the potential savings as a result of close proximity mirror fitment.
7.3.1 Great Britain data (STATS19 database 1999-2001)

According to the STATS19 database (1999-2001) there were 14 fatal, 198 serious, 2925 slight and 157 damage only accidents associated with HGV lane changes in which the car and HGV were travelling in the same direction. Thus, these data suggest that there are 5 fatal, 66 serious, 975 slight, and 52 damage only accidents per annum.

As previously, if it is assumed that the accidents are distributed uniformly with respect to vehicle weight, then if all HGVs between 7.5 and 12 tonnes were fitted with class V mirrors, 2.82% of the potential benefit might be realised (12,000/425,000). This calculation leads to a revised estimate of potential casualty savings, if close proximity mirrors were 100% effective, less than 1 fatality (0.14), approximately 2 serious (1.86), 27 slight (27.5), and approximately 1 damage only (1.46) accidents per annum to vehicle occupants.

Further analysis of the HVCIS database showed that 0.21% (1 of 470) of accidents involving cars related to accidents in which improved side visibility may have prevented the accident. However, this value is likely to be an underestimate because of the difficulty of assessing this contributory factor in these accidents. It is considered that the true percentage of accidents which may be affected by improved side visibility may be similar to that identified for vulnerable road users (see Section 7.2). Therefore, the percentage of accidents which may be affected with improved side visibility is estimated to be between 0.21% and 55.2% and for the purposes of this assessment, a conservative value of 5% has been selected because, although the current numbers of HGVs not fitted with Class V mirrors will be low compared with the numbers fitted, a number of HGVs will still have mirrors which are not correctly adjusted. Thus, when a 5% estimate is applied the adjusted estimated potential casualty savings are nominally zero fatalities (0), nominally zero serious injuries (0.09), 1 slight (1.37), and nominally zero (0.07) damage only accidents per annum to vehicle occupants.

7.3.2 Foreign HGV data

Based on data collected by Kent Police, there were 117 accidents involving left-hand drive HGVs between August 2003 and January 2004, of which 93 (79%) were fitted with Class V blind spot mirrors. Sixteen (14%) were recorded as not having Class V mirrors fitted, with the remainder of the accidents having unknown mirror fitment. Thus, this data suggests that at most, 14% of accidents involving foreign HGVs may be avoided by the fitment of Class V blind spot mirrors.

The Kent Police data shows that 87 damage only, 28 slight and 2 serious accidents occurred during the period August 2003 to January 2004. Thus, an annual estimate would be expected to be twice these values; 174 damage only, 56 slight and 4 serious accidents. Assuming only 14% of these accidents relate to HGVs without Class V mirrors fitted, an estimated potential casualty saving of approximately 24 damage only, 8 slight and less than 1 serious injury accidents. Applying the same fleet demographics to the foreign vehicles, it can be estimated that foreign goods vehicles in the range 7.5 to 12 tonnes cause less than 1 damage only (0.69), less than 1 slight (0.22) and less than 1 serious injury accidents (0.02) per annum.
7.4 Estimated potential casualty savings from fitting Class V mirrors to 7.5 to 12 tonne vehicles

If the potential casualty saving estimated in the preceding sections are summed, these form the best estimate of potential casualty savings which may be conferred if all registered HGVs between 7.5 and 12 tonnes were fitted with a Class V mirror and the fitment of this mirror prevents all those accidents where it was considered that the absence of a class V mirror may have been contributory to the accident (55.2% of VRU accidents and 5% of car accidents). These totals are presented in Table 29, below.

<table>
<thead>
<tr>
<th>Best Estimate Savings (Per Annum)</th>
<th>Fatalities</th>
<th>Serious</th>
<th>Slight</th>
<th>Damage only</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRU accidents</td>
<td>0.28</td>
<td>0.59</td>
<td>1.79</td>
<td>No data</td>
</tr>
<tr>
<td>Car accidents</td>
<td>0</td>
<td>0.09</td>
<td>1.37</td>
<td>0.07</td>
</tr>
<tr>
<td>All foreign vehicle accidents*</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Foreign vehicle accidents (7.5 to 12 tonne)*</td>
<td>0</td>
<td>0.02</td>
<td>0.22</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>0.28</strong></td>
<td><strong>0.68</strong></td>
<td><strong>3.16</strong></td>
<td><strong>0.07</strong></td>
</tr>
</tbody>
</table>

* Foreign vehicles accidents are not included in the potential casualty saving and are shown here for information only.

Earlier calculations had shown that, for the rate of turnover for the 7.5 to 12 tonne fleet, it would take 14 years for the 95% of the vehicles to be fitted with Class V mirrors. In this 14 year period, if ratios of mirror fitment are ignored, the fitment of the close proximity mirror may prevent approximately 4 fatalities, 10 serious injuries, 44 slight injuries and 1 damage only accident.

However, consideration has to be given to the fact that the HVCIS database indicated that no vehicles in the range 7.5 to 12 tonnes had “improve side vision” as a potential safety improvement, and that the data gathered by Kent Police did not record any vehicles in this range involved in accidents within their jurisdiction. Therefore, it is possible, that this represents a worst case, and that potentially no fatalities or injuries to vulnerable road users could be prevented by the fitment of Class V mirrors to vehicles in the 7.5 to 12 tonne range.

It is clear from the calculations shown in Table 29 that the potential casualty savings for the fitment of close proximity mirrors to 7.5 to 12 tonne vehicles appears small. However, a full cost benefit analysis is provided in the Partial Regulatory Impact Assessment, and as the cost for fitting a Class V mirror is likely to be small, it is expected that the potential benefits of mirror fitment will appear more favourable.
8 Discussion

One objective for this study was to assess the casualty reduction potential of compulsory fitting of close proximity blind spot mirrors to heavy goods vehicles (HGVs) not already covered by current requirements, that is UK registered vehicles between 7.5 tonnes and 12 tonnes and some visiting EU registered vehicles over 7.5 tonnes.

The accident analysis has shown that, in injury accidents, when an HGV is turning left, the most likely victim is a pedal cyclist. Nine fatalities, 14 serious injuries and 33 slight injuries to pedal cyclists per annum, are caused by an HGV of greater than 7.5 tonnes. This analysis is consistent with previous research (Southall, 1998) who found that two-thirds of accidents involving a pedal cycle involved an HGV turning left at a junction and that there was a blind spot on the HGVs nearside between the ground plane projections of the Class IV and V mirrors, in which vulnerable road users could be ‘hidden’. Furthermore, the analysis has shown that it is possible that the HGV turns across the path of the cyclist, and that analysis of time of the accident did not suggest that this type of accident is related to conspicuity.

The analysis has also shown that when an HGV changes lane to the left or right, the majority of other vehicles were going ahead. However, when changing lane to the right, there are a number of vehicles that were overtaking the HGV but it is unknown how many of these HGVs were actually foreign registered vehicles. Kent Police had already highlighted that side swiping accidents were considered a problem in their jurisdiction, and this is probably because 87% of continental traffic passes through the Dover Strait. Between 1994 and 2001 there were 3,704 injury accidents where the HGV changed lane to the right and 8.99% (333) occurred in Kent Police’s jurisdiction. Only the Metropolitan Police (427, 11.54%) and Surrey Police (368, 9.94%) had a higher number of injury accidents of this category.

However, Kent Police have also kept records of side swiping accidents where there were no injuries reported (as well as injury accidents), and these non injury accidents do not appear on STATS19. Data gathered by Kent Police between August 2003 and January 2004 shows that there were 117 side swiping accidents, 87 were damage only, 28 slight accidents and 2 serious accidents, with a total number of 42 casualties. The data shows a side swiping accident is occurring approximately twice every three (1:1.57) days. The frequency of this type of accident has increased from 1 every 2.44 days in 1997-98, and corresponds to an 83% increase in the numbers of foreign registered goods vehicles visiting the UK over a six year period (1,340,700 in 2003, and 730,200 in 1998).

The largest number of side swiping accidents occurs with German registered vehicles (19.7%), whereas according to Department for Transport statistics, German vehicles were the 3rd most common vehicle leaving the UK. French registered vehicles were the most populous vehicle leaving the UK at 27.09%, and the second were Dutch at 15.68%. When compared to the side-swiping data, French vehicles were second most likely to be involved in this type of accident in Kent (13.7%), and Dutch vehicles equal third with Italian vehicles at 9.4%. Spanish vehicles, in the 2000 data from Kent Police, were most likely to be involved in a side-swiping accident (25%), but in the 2003 survey, Spanish vehicles were the 6th most likely registered vehicle to be involved at 6.8%. It is unclear why there has been a substantial reduction. In the future it is possible that the frequency and numbers involved in offside swiping accidents will increase further as there is a continuing increase in the number of LHD HGV vehicles visiting the UK.

Kent Police felt that this type of accident could occur because of one of three factors, location near a junction, lack of Class V mirrors or driver fatigue. Additional information recorded for the 2003 Kent Police data showed that in 79% of the accidents the Class V mirror was fitted. Also, inspections of the tachographs found that in nine cases, the driver had been driving for more than 4 hours, indeed one had driven for 14 hours 25 minutes. Therefore, fatigue was considered to be a possible contributory factor in approximately 10% of accidents.

For the location of the accident, approximate calculations of the distance to the nearest junction showed that 31 (32%) occurred within 300m of a junction, and that the majority of these (19) were located at ‘on’ slip roads. Therefore it is possible that the foreign registered vehicles have to change
lanes at short notice, either as they approach a junction, or as the other vehicles join the motorway from the slip road.

Analysis using CAD software has also shown that it is possible for a passenger car to be located within an adjacent lane to the HGV and still be in a blind spot, even if the HGV mirrors conform to Directive 71/127. Therefore, in the case of side swiping accidents it is difficult to judge whether the HGV driver did not use their Class V mirror, or whether the car was genuinely in a blind spot before the accident.

The CAD analysis was also performed on three classes of HGV, for both mirrors conforming to both Directive 71/127 and 2003/97. This analysis showed that the ground plane area visible had increased, and that the ground plane areas for Directive 2003/97 would overlap. However, the analysis also showed that Class V mirrors for vehicles in the range 7.5 to 12 tonne could be of benefit, as the direct view through the passenger window would only be able to view cyclists of at least 50th percentile where the cyclist was sitting relatively upright on the pedal cycle.

Furthermore, the effect of lack of correct mirror adjustment appeared to be minimal, if the HGV driver was a 50th percentile male baseline and the mirrors were correctly adjusted, then drivers of 5th to 95th percentile would still have a good indirect view of the ground plane as required in Directive 2003/97. Clearly it is possible for the mirrors to be misadjusted to such an extent that indirect field of view would be negligible. However, indications from the driver survey suggest that 88% of the respondents (311 responses received in total) agreed that the purpose of the Class V mirror was to check for cyclists or pedestrians by the passenger door, or a car (79%), and the majority of drivers claimed to always check the positioning of the mirror in accordance with expected good practice. Many drivers also reported the benefits of the Class V mirror when manoeuvring or reversing.

It has been considered that the responses to the driver survey may have been by those HGV drivers who are more safety conscious and who have a greater appreciation for the use of safety related features. Nonetheless, those responding to the survey did represent a wide range of ages and HGV driving experience indicating that a representative sample of the HGV driving population did respond to the survey.

The respondents to the survey indicated that two thirds always drove an HGV with a Class V mirror fitted, whereas only 8% never drove an HGV with a Class V mirror fitted. Close proximity mirror fitment appeared to be higher amongst those driving for an operating organisation, and significantly lower among owner/operators vehicles. This may simply reflect the age of vehicles which tend to be older for owner/operators and it may be worth targeting this group of HGV drivers specifically to highlight the benefits of Class V mirror fitment.

Opinions for the HGV drivers surveyed indicated that 90% of HGV drivers agreed the use of close proximity mirrors generally contributes to the reduction of HGV accidents and collisions, whilst 61% of drivers claimed that use of the mirror had specifically helped them to avoid a potential accident within the past 12 months. Furthermore, drivers of articulated HGVs reported significantly greater accident savings due to the presence of close proximity mirrors than drivers of rigid HGVs, noting that vehicles in the range 7.5 to 12 tonnes will be rigid vehicles. Most agreed that it would be a good idea to have close proximity mirrors fitted both to all HGVs in excess of 7.5 tonnes and to coaches. However, there is concern that a minority of drivers do not realise the purpose of the close proximity mirror, and are still failing to use the mirror correctly.

With regard to the numbers of 7.5 to 12 tonne goods vehicles that could be affected by any proposal to retro-fit Class V mirrors, in the UK the numbers of vehicles already fitted was not possible to find, although some vehicles have been observed with the Class V mirror fitted. If it were assumed that the worst case scenario was appropriate then all the 12,100 7.5 to 12 tonne vehicles currently registered in the UK could be affected. Throughout Europe, assuming the vehicle fleet follows a similar distribution to the UK, it is estimated that there are 104,100 in the EU15 (members before May 2004), 11,700 in the 10 new member states (joined the EU in May 2004) and 1,800 for Romania, which is an EU applicant country.
Analysis of the STATS19 and HVCIS databases has provided a ‘best estimate’ of the potential casualty savings if 7.5 to 12 tonne vehicles were fitted with close proximity mirrors. These results indicate that less than 1 fatality, less than one serious injury, approximately 3 slight injuries and less than one damage only accidents may be prevented by the Class V mirror fitment. Whilst these numbers appear small, it is anticipated that the cost of fitment is also likely to be small and that the ratio of cost to benefit could be more favourable than it appears at first. Furthermore, calculation of the annual turnover of these vehicles shows that it would take 14 years for 95% of the 7.5 to 12 tonne fleet to be fitted with Class V mirrors. In this 14 year period, if ratios of mirror fitment are ignored, the fitment of the close proximity mirror may prevent 4 fatalities, 10 serious injuries, 44 slight injuries and 1 damage only accident.

The Kent Police data has indicated that, if all foreign registered goods vehicles were fitted with Class V mirrors, then it is estimated 1 serious, 8 slight and 24 damage only accidents could be prevented per annum in the area of Kent Police’s jurisdiction. However, the majority of foreign registered goods vehicles involved in side swiping accidents did have the Class V mirror fitted. It may be that the passenger vehicle struck was genuinely in a blind spot, or it may be that the HGV driver was not using their mirror appropriately, if at all. Therefore, if all drivers, of foreign registered HGVs and UK registered passenger cars, were informed of the danger of this type of accident, most probably when exiting the UK port, then this could prevent up to 4 serious, 56 slight and 174 damage only accidents in Kent per annum.

However, it must be noted that the HVCIS database indicated that no vehicles in the range 7.5 to 12 tonnes had “improve side vision” as a potential safety improvement, and that the data gathered by Kent Police did not record any vehicles in this range involved in accidents within their jurisdiction. Therefore, as a worst case, it is entirely possible that the fitment of Class V mirrors to 7.5 to 12 tonne vehicles may not confer any casualty savings.
9 Conclusion

In 2003 there were 433,500 goods vehicles licensed in the UK. Of these 265,600 (61%) had a gross weight of more than 12 tonnes, with a further 12,100 (3%) between 7.5 and 12 tonnes. With a vehicle population turnover of about seven per cent it would take approximately 14 years for the current fleet of vehicles to be replaced.

Information on the number of existing 7.5 to 12 tonne vehicles with Class V mirrors fitted is not available although some have been observed with a fitment. It could be assumed that the worst case scenario is appropriate then all the 12,100 7.5 to 12 tonne vehicles currently registered in the UK could be affected. Estimated figures for Europe are 104,100 for the EU15, 11,700 for countries which joined the EU in May 2004 and for Romania (an applicant country) it is estimated there are 1,800. These figures are estimated assuming that the European vehicle fleet follows a similar distribution to the UK.

The accident analysis has shown that, in injury accidents, when an HGV is turning left, the most likely victim is a pedal cyclist. Nine fatalities, 14 serious injuries and 33 slight injuries to pedal cyclists per annum, are caused by an HGV of greater than 7.5 tonnes turning left.

In Kent Police’s jurisdiction, there is an increase in the frequency of side swiping accidents, from 1 every 2.44 in 1997-98 to 1 every 1.57 days in 2003, which corresponds with an 83% increase in the numbers of foreign registered goods vehicles visiting the UK over this six year period. Eighty-five percent of the vehicles involved in side swiping accidents (where fitment was recorded) had a close proximity mirror fitted.

From the CAD analysis it has been shown that a 7.5 to 12 tonne vehicle without a Class V mirror will have a blindspot by the passenger door. A cyclist would have to be at least a 50th percentile adult male, sat reasonably upright on the bicycle to be seen with direct vision.

The CAD analysis has shown that if the mirrors are correctly adjusted then other vehicles should be visible in urban traffic and close to the HGV. However, on wider carriageways, such as motorways, it is possible for passenger cars to be located in a blind spot. Therefore, it would be of benefit if right hand drive vehicles of this size category driving on the left (or vice versa) were fitted with Class V mirrors conforming to Directive 2003/97.

However, indications from the driver survey suggest that 88% of the respondents (311 responses received in total) agreed that the purpose of the Class V mirror was to check for cyclists or pedestrians by the passenger door, or a car (79%), and the majority of drivers claimed to always check the positioning of the mirror in accordance with expected good practice. Many drivers also reported the benefits of the Class V mirror when manoeuvring or reversing.

Opinions for the HGV drivers surveyed indicated that 90% of HGV drivers agreed the use of close proximity mirrors generally contributes to the reduction of HGV accidents and collisions, whilst 61% of drivers claimed that use of the mirror had specifically helped them to avoid a potential accident within the past 12 months. Furthermore, drivers of articulated HGVs reported significantly greater accident savings due to the presence of close proximity mirrors than drivers of rigid HGVs, noting that vehicles in the range 7.5 to 12 tonnes will be rigid vehicles. Most agreed that it would be a good idea to have close proximity mirrors fitted both to all HGVs in excess of 7.5 tonnes and to coaches.

However, there is concern that a minority of drivers do not realise the purpose of the close proximity mirror, and are still failing to use the mirror correctly.

Analysis of the STATS19 and HVCIS databases has provided a ‘best estimate’ of the potential casualty savings if 7.5 to 12 tonne vehicles were fitted with close proximity mirrors. These results indicate that less than one fatality, less than one serious injury, approximately 3 slight injuries and less than one damage only accidents may be prevented by the Class V mirror fitment. Whilst these numbers appear minor, it is anticipated that the cost of fitment is likely to be small.
10 Recommendations

Based on the calculations outlined in this report there appears to be a limited annual potential casualty saving, if Class V mirrors were fitted to currently registered vehicles in the 7.5 to 12 tonne range. TRL recommend that a limited retro-fit program for recently registered vehicles may be of benefit, which is dependant on the results of the Partial Regulatory Impact Assessment, but would not recommend a full retro-fit program.

Improvements in indirect visibility using Class V mirrors conforming to Directive 2003/97 for goods vehicles in excess of 12 tonnes has been demonstrated, therefore, TRL believe it may be of benefit to the UK if left hand drive vehicles of this size category driving on the left, that were not already fitted with a close proximity mirror, were fitted with Class V mirrors conforming to Directive 2003/97, which it is estimated would prevent 24 damage only, 8 slight and 1 serious accident per annum.

TRL would also recommend that an information campaign be conducted to inform both foreign registered goods vehicle drivers and UK passenger vehicle drivers, of the potential risk of a side swiping accident. It is thought that the most benefit from this type of campaign would come from informing drivers on their entry to the UK through one of the UK ports.
References


Websites:

www.Swedespeed.com
Volvo Safety Concept Car

http://europa.eu.int/comm/index_en.htm
Eurostat, 2000
Annex A1: Accident report card (ARC) – Kent Police
1. Mr/Mrs/Miss: Surname: 
   Forenames: 
   Address: 
   Home Tel: 
   Work: 
   Location of Witness: 
   Age: 
   Explanation: 

2. Mr/Mrs/Miss: Surname: 
   Forenames: 
   Address: 
   Home Tel: 
   Work: 
   Location of Witness: 
   Age: 
   Explanation: 

3. Mr/Mrs/Miss: Surname: 
   Forenames: 
   Address: 
   Home Tel: 
   Work: 
   Location of Witness: 
   Age: 
   Explanation: 

Other Explanations (if O.I.C. not obtaining statements):
   Driver One: 
   Driver Two: 
   Casualty One: 
   Casualty Two: 

Accident reported at: 
   Hrs on: 
   by: 
   If reported 'Over the counter': Officer recording: 
   Station: 
   OIS Ref: 

Initial sketch plan completed: Yes: 
   No: 
   Measurements by: 
   Defendant present?: Yes: 
   No: 

REPORING OFFICER'S SUBMISSIONS
The O.I.C. must indicate the actions that C.J.O. should complete:
   Send N.I.P. Yes: 
   Veh No: 
   QQ1: 
   Driver: 
   Obtain Statements/Send Questionnaires: 
   Send 1216: 
   Veh No: 
   QQ1: 
   Veh No: 
   Other (Specify): 

Check list (Tick if included)
   Statutory form (fill in: RTA/3) 
   Sketch Plan: 
   Other (Specify): 
   Preferential Statement: 
   Copy of PNB: 
   Witness Statements: 
   Contempo Notes: 

Reporting Officer's signature: 
   Name: 
   Force No: 

AREA SUPERVISOR'S DECISION
Comments: 
   Registration & Return to O.I.C.
   (e.g.) Pol.Acc., Fatal, Other: 

To C.J.O. for: 
   a) Prosecution 
   b) Caution - Letter 
   c) NPA - Letter 
   d) Obtain further evidence 

Supervisor's signature: 
   Name: 
   Force No: 

Criminal Justice Office: 
   Final Disposal: 

FORM CJ1111 CRIMINAL JUSTICE CJ 07/96
Annex A2: Additional information form – Kent Police

FOREIGN LGV - BLIND SPOT CRASHES

ADDITIONAL INFORMATION

VEHICLE

Country of Origin __________________________________________________

Is a Close Proximity (downward looking) Mirror fitted?                        Yes/ No *

Left Hand Drive/ Right Hand Drive *

DRIVER

Nationality _____________________________________________________________

Details of last Rest Break

Time Finished ________hrs      Duration _________   Location ______________

Destination _______________________

First visit to UK?      Yes/ No *

Approx No of visits to UK ____________

* Delete as appropriate

Please photocopy the ARC/S172 form, attach this questionnaire to it and forward to PS HOLLANDS, Safety Camera Team, Phoenix House. (There’s a tray marked SEU on top of the pigeonholes).
## Annex B: Estimated numbers of 7.5 to 12 vehicles in Europe and EU member states requiring Class V mirror fitment

<table>
<thead>
<tr>
<th>EU Status</th>
<th>Country</th>
<th>Commercial vehicle stock (Eurostat, 2000)</th>
<th>Estimated number of 7.5 to 12 tonne vehicles</th>
<th>Class V mirror required by national law</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member States</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria (A)</td>
<td></td>
<td>327,000</td>
<td>1,439</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Belgium (B)</td>
<td></td>
<td>503,000</td>
<td>2,213</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Germany (D)</td>
<td></td>
<td>2,527,000</td>
<td>11,119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark (DK)</td>
<td></td>
<td>373,000</td>
<td>1,641</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Spain (E)</td>
<td></td>
<td>3,780,000</td>
<td>16,632</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Greece (EL)</td>
<td></td>
<td>1,043,000</td>
<td>4,589</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France (F)</td>
<td></td>
<td>5,456,000</td>
<td>24,006</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Finland (FIN)</td>
<td></td>
<td>304,000</td>
<td>1,338</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Italy (I)</td>
<td></td>
<td>3,298,000</td>
<td>14,511</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Ireland (IRL)</td>
<td></td>
<td>205,000</td>
<td>902</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luxemburg (L)</td>
<td></td>
<td>20,000</td>
<td>88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands (NL)</td>
<td></td>
<td>939,000</td>
<td>4,132</td>
<td>Yes</td>
<td>Also National demand (1/1-03), Front mirror acc proposal 2001/0317</td>
</tr>
<tr>
<td>Portugal (P)</td>
<td></td>
<td>1,658,000</td>
<td>7,295</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Sweden (S)</td>
<td></td>
<td>374,000</td>
<td>1,646</td>
<td>No</td>
<td>Standard on all vehicles</td>
</tr>
<tr>
<td>United Kingdom (UK)</td>
<td></td>
<td>2,861,000</td>
<td>12,588</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Member in May 2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus (CY)</td>
<td></td>
<td>110,100</td>
<td>484</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech republic (CZ)</td>
<td></td>
<td>268,300</td>
<td>1,181</td>
<td>?</td>
<td>Standard on all vehicles</td>
</tr>
<tr>
<td>Estonia (EE)</td>
<td></td>
<td>81,000</td>
<td>356</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hungary (HU)</td>
<td></td>
<td>322,100</td>
<td>1417</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Latvia (LV)</td>
<td></td>
<td>80,100</td>
<td>352</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Poland (PL)</td>
<td></td>
<td>1,597,900</td>
<td>7031</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Slovakia (SK)</td>
<td></td>
<td>157,700</td>
<td>694</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Slovenia (SI)</td>
<td></td>
<td>47,900</td>
<td>211</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Applicant country</td>
<td>Romania (RO)</td>
<td>410,200</td>
<td>1,805</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Not Member states</td>
<td>Switzerland (CH)</td>
<td>266,100</td>
<td>1,171</td>
<td></td>
<td>Standard on all vehicles</td>
</tr>
<tr>
<td>Norway (N)</td>
<td></td>
<td>156,500</td>
<td>689</td>
<td>No</td>
<td>Standard on all vehicles</td>
</tr>
</tbody>
</table>

NB: Numbers for EU member states are from 2000, all other countries are from 1999.
Annex C1: Covering letter for HGV Driver postal survey

October 30, 2003

Dear Person,

Re: Survey of HGV licence holders

The Transport Research Laboratory (TRL) is currently conducting a postal survey of 2,000 HGV licence holders on behalf of the Department for Transport. The enclosed questionnaire is investigating HGV drivers' behaviours and opinions on the use of ‘close proximity mirrors’ on HGVs. The quality of this research depends on getting a good sample of HGV drivers’ experiences and your response is very important. By responding to the survey you will increase its ability to influence future DfT policy.

We would be very grateful for your help in this survey by filling out the questionnaire and sending it back to us in the freepost envelope provided. No stamp is required. The questionnaire should only take about 15 minutes to complete. Any information that you give will remain strictly confidential and will be used for the purposes of this research study only.

The names and addresses of registered HGV licence holders have been provided by the DVLA in accordance with conditions of the Data Protection Act (DPA) 1998. As an independent research organisation, TRL is registered under the DPA to obtain such information for research purposes. All work involving personal details is only undertaken within the terms of its registration and your personal details will not be passed on to any other organisation.

If you have any queries about this survey, please contact our survey co-ordinator Su Buttress on 01344 770049, or myself on 01344 770681.

Thank you for your help.

Yours faithfully,

Barry Fenn
Research Engineer
Annex C2: Postal Questionnaire

REF: HGV_________________

A SURVEY OF HGV LICENCE HOLDERS

As part of its ongoing research into road safety, TRL Limited (formerly the Transport Research Laboratory) is conducting a survey into HGV drivers’ attitudes and opinions about close proximity mirrors on HGVs (i.e. the mirror on the passenger side above the door). As an HGV licence holder, we would like to invite you to take part in this survey by completing this questionnaire. It should only take 15 minutes to complete. This questionnaire is **anonymous** and your answers will be used for statistical purposes only. All questions will require your response by ticking the appropriate boxes to indicate your answer or by writing in the spaces provided.

**Thank you for your time in completing this questionnaire.**

**SECTION A: YOU AND YOUR DRIVING**

**A1** Are you:

(Please tick ONE box)

- Male
- Female

**A2** How old are you?

(Please write in your answer in the space provided)

__________ Years

**A3** Please indicate below: (a) what type(s) of driving licence you have to drive an HGV and (b) how long you have held each type of licence for

(a) What driving licence(s) do you have? (Please tick all that apply)

(b) How long have you held these licence(s) for? (Please write in your answer in the space provided if applicable)

<table>
<thead>
<tr>
<th>Tests passed before April 1991</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3 (rigid)</td>
<td></td>
<td>Years</td>
</tr>
<tr>
<td>Class 2 (rigid)</td>
<td></td>
<td>Years</td>
</tr>
<tr>
<td>Class 1 (artic)</td>
<td></td>
<td>Years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tests passed after April 1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category C (rigid)</td>
</tr>
<tr>
<td>Category C + E (artic)</td>
</tr>
</tbody>
</table>
### A4 How often do you drive the following types of vehicle?

*(Please tick ONE box on EACH line)*

<table>
<thead>
<tr>
<th>Never</th>
<th>Less than once a month</th>
<th>About once a month</th>
<th>About once a fortnight</th>
<th>1-3 days a week</th>
<th>4-6 days a week</th>
<th>Every day</th>
</tr>
</thead>
</table>

**(a)** Goods vehicles:
- 2 axles rigid
- 3 axles rigid
- 4 axles rigid
- 3 axles artic
- 4 axles artic
- 5 or more axles artic
- Drawbar vehicle

**(b)** Foreign registered HGVs

**(c)** Light vans (not exceeding 3,500kgs gross vehicle weight)

**(d)** Buses and coaches

**(e)** Cars

**(f)** Motorcycles

### A5 How often do you drive an HGV on the following road types?

*(Please tick ONE box on EACH line)*

<table>
<thead>
<tr>
<th>Never</th>
<th>Less than once a month</th>
<th>About once a month</th>
<th>About once a fortnight</th>
<th>1-3 days a week</th>
<th>4-6 days a week</th>
<th>Every day</th>
</tr>
</thead>
</table>

**(a)** On roads in built-up areas

**(b)** On country / rural roads

**(c)** On dual carriageways with national speed limits

**(d)** On motorways

### A6 Which of the following best describes your employment as an HGV driver?

*(Please tick ONE box)*

- Owner/operator (own vehicle only)
- Owner of trucking company (2 or more HGV drivers employed)
- Agency driver
- Employed by large company (10 or more HGV drivers employed)
- Employed by small company (less than 10 HGV drivers employed)
A7 What type of goods do you haul?
(Please tick all that apply)
Foodstuffs
Livestock
Construction and waste goods
Chemicals (including Hazchem)
Machinery & vehicles
Consumer or ‘White’ goods
Other (please specify) ____________________________

A8 What mode of operation do you drive?
(Please tick all that apply)
Multi-drop / delivery
Single-drop
Trunking
Tipping

A9 How often do you drive an HGV on roads in the following places?
(Please tick ONE box on EACH line)

<table>
<thead>
<tr>
<th>Place</th>
<th>Never</th>
<th>Less than once a month</th>
<th>About once a month</th>
<th>About once a fortnight</th>
<th>1-3 days a week</th>
<th>4-6 days a week</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) In England</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>(b) In Scotland</td>
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<td>☐</td>
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<tr>
<td>(c) In Wales</td>
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<tr>
<td>(d) In Europe</td>
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<td>☐</td>
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<tr>
<td>(e) Somewhere else (please specify)</td>
<td>☐</td>
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</tbody>
</table>

A10 About how many miles did you drive an HGV in the last 12 months? Please estimate your total miles for driving all types of HGV. If you are not certain, please give as good an estimate as you can
(You can give your answer in miles or kilometres. Please write in your answer in ONE of the spaces provided)

__________ Miles __________ Kilometres
(If you prefer to give your answer in Km)
A11  Many drivers have had the impression of only just avoiding an accident (e.g. having a "near miss"). How many times has this happened to you while driving an HGV in the last year?

(Please tick ONE box)

Never  ☐
1 or 2 times ☐
3 to 5 times ☐
6 to 10 times ☐
More than 10 times ☐

A12  How many accidents were you actually involved in when driving an HGV in the last 3 years?

Please include all accidents, regardless of how they were caused, how slight they were or where they happened.

(Please tick ONE box)

None ☐
One ☐
Two ☐
Three ☐
More than three ☐

SECTION B: CLOSE PROXIMITY MIRRORS
(i.e. the mirror on the passenger side above the door)

B1  How often do you drive HGVs which have close proximity mirrors fitted?

(Please tick ONE box)

Never  ☐
Rarely ☐
Sometimes ☐
Often ☐
Very often ☐
All the time ☐

If ‘Never’, please go to B8

B2  When you drive HGVs, do you usually drive...

(Please tick ONE box)

The same cab ☐
Different cabs ☐
### B3  When you get into the cab, how often do you…

*(Please tick ONE box on EACH line)*

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
<th>Every time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Check to see if the positioning of the close proximity mirror is correct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Check to see if the positioning of other mirrors are correct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Adjust your close proximity mirror</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Adjust other mirrors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### B4  How important do you think it is to be able to see the following in your close proximity mirror?

*(Please tick ONE box on EACH line)*

<table>
<thead>
<tr>
<th></th>
<th>Very important</th>
<th>Important</th>
<th>Not very important</th>
<th>Not at all important</th>
</tr>
</thead>
<tbody>
<tr>
<td>The near-side wheel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The passenger door</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The passenger steps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstacles close to the passenger side of the vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### B5  How often do you use your close proximity mirror for the following?

*(Please tick ONE box on EACH line)*

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>To see obstacles by the passenger door</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>To position the HGV when reversing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>To check the distance of the wheel/vehicle from the kerb when turning RIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>To check the distance of the wheel/vehicle from the kerb when turning LEFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>To check the near-side wheel is not deflating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>To check for cyclists/pedestrians by the passenger door before manoeuvring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>To check for cars by the passenger door before manoeuvring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B6  In the last year, how many times have you avoided an accident or avoided hitting something on your near-side due to using your close proximity mirror? (i.e. has there ever been a situation when you used your close proximity mirror but if you had not you would have hit something – for example, a cyclist)  
(Please tick ONE box)  
Never  □  
1 or 2 times  □  
3 to 5 times  □  
6 to 10 times  □  
More than 10 times  □  

B7  Please use the box below to describe any situations you have been involved in while driving an HGV where you have avoided an accident or avoided hitting something on your near-side due to using your close proximity mirror? (use a separate sheet if necessary)  

B8  Do you know anyone who has avoided an accident or avoided hitting something on their near-side due to using the close proximity mirror?  
(Please tick ONE box)  
Yes  □  
No  □
B9 Please use the box below to describe any situations you know of (e.g. that someone has told you about) where someone has avoided an accident or avoided hitting something on their near-side due to using the close proximity mirror?

B10 Please indicate how much you agree or disagree with the following statements by ticking ONE box for each statement (Please answer this question even if you do not drive HGVs with close proximity mirrors)

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree or disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Close proximity mirrors are not very useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>The purpose of the close proximity mirror is to see obstacles by the passenger door</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>The purpose of the close proximity mirror is to help a driver position the HGV when reversing</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>D</td>
<td>The purpose of the close proximity mirror is to check the distance of the wheel/vehicle from the kerb when turning RIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>The purpose of the close proximity mirror is to check the distance of the wheel/vehicle from the kerb when turning LEFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>The purpose of the close proximity mirror is to check the near-side wheel is not deflating</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>G</td>
<td>The purpose of the close proximity mirror is to check for cyclists/pedestrians before manoeuvring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>The purpose of the close proximity mirror is to check for cars before manoeuvring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Close proximity mirrors help prevent accidents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>At present, it is required that all HGVs, 12 tonnes in weight and over, are fitted with close proximity mirrors. It would be a good idea to have close proximity mirrors on HGVs that are between 7.5 and 12 tonnes in weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>It would be a good idea to have close proximity mirrors on coaches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B11  Generally, close proximity mirrors are:

(Please complete the above sentence by ticking ONE box on each line - e.g. the closer the tick is to the word "good" the more the you think it close proximity mirrors are a good thing, the closer the tick is to the word "bad" the more you think they are a bad thing)

<table>
<thead>
<tr>
<th>Bad</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Harmful</td>
</tr>
<tr>
<td>Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Negative</td>
</tr>
<tr>
<td>Safe</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Unsafe</td>
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<tr>
<td>Worthless</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Valuable</td>
</tr>
<tr>
<td>Stupid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensible</td>
</tr>
<tr>
<td>Useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Useless</td>
</tr>
</tbody>
</table>

B12  We would like to know what kind of HGV driver you think you are by putting a tick somewhere on each of the lines below.

At either end of each line there is a word that describes a way of driving, and these words are opposites. Put your tick nearer to the word that best describes your driving. The closer your tick is to the word, the more you agree with this description of the way you drive.

| Attentive |         |         |         |         |         |         | Inattentive |
| Careful |         |         |         |         |         |         | Careless |
| Decisive |         |         |         |         |         |         | Indecisive |
| Experienced |         |         |         |         |         |         | Inexperienced |
| Irritable |         |         |         |         |         |         | Placid |
| Nervous |         |         |         |         |         |         | Confident |
| Patient |         |         |         |         |         |         | Impatient |
| Responsible |         |         |         |         |         |         | Irresponsible |
| Safe |         |         |         |         |         |         | Risky |
| Selfish |         |         |         |         |         |         | Considerate |
| Slow |         |         |         |         |         |         | Fast |
| Tolerant |         |         |         |         |         |         | Intolerant |

Thank you very much for taking the time to complete this questionnaire
Please return your completed questionnaire to TRL Limited in the pre-paid envelope provided (no stamp is needed) by 07 December 2003
Annex C3: Specific situations where use of Class V mirror has avoided an accident

- Just missed car pulling out of junction.
- Turning left at traffic lights- cyclist crept up side before lights turned green.
- When a driver was trying to get into his vehicle whilst I was moving along in slow moving traffic in a high street.
- I drive a 4 axle rigid mixer on a Scandia 114c delivering concrete, at one site in the middle of Edinburgh we had to reverse into the site, for safety reasons it being a one way with 3 lanes they had a man with a stop board. As I was watching a man in my offside mirror starting to direct me back as I started to turn the steering wheel right hand down I just noticed this car come alongside me just in time in my close proximity mirror and managed to brake in time. Unfortunately we did not see the man standing with stop board in front of a van. If it had not been for my mirror there would have been an accident.
- When reversing in a customer’s site I avoided hitting a fire hydrant on the nearside. It was clearly visible in my close proximity mirror but not in any other mirrors.
- Cyclist leaning on cab at traffic lights. Cyclist 'undertake' whilst I am turning left. Pedestrian picking up something from road as traffic lights changed. Car driver squeezing past in traffic despite my indicating to turn left.
- Short metal post, too short to see in normal mirrors, spotted in proximity mirror.
- Using mirror stopped me from hitting pillar (gatepost).
- When reversing I could see lamppost in the nearside mirror. Could not see railings, except in close proximity mirror.
- While turning left a motorcycle came up my inside and I was able to stop the motorcyclist seen my indicator was on but he thought I was not turning.
- I was parked in services went to pull away, looked in mirrors but lost a car in blind spot and hit him.
- Cyclist on nearside about to turn left right by door would have run over if not for mirror.
- Cyclist had ridden along side of me at traffic lights where I was to turn left, if I had not seen him in my mirror above nearside door I could have run over him.
- Whilst reversing was able to pick out a low level rock sticking out through hedge which could have caused body-long damage.
- Coming down (A14) Kettering area when approaching slow moving traffic as well as slip road and traffic merging from left giving way to some cars trying to join carriageway when the named car (ford fiesta) decided to push in a gap that was not there and without my close proximity mirror I would not have seen this car and ending up in a accident due to this car being in my blind spot to start off with.
- This car pulled out as he did not see me. Approached corner he did emergency stop. I missed him due to mirror.
- A motorcyclist coming up the nearside, unable to get all the way past stopped near the passenger door, until the traffic moved on.
- A cyclist came off the footpath onto the road from side on which I saw in my mirror from the nearside on my close proximity mirror.
• I had to reverse out of an alleyway and cars were double parked. My second man backed me out as to where there was no danger to pedestrians other vehicles. I used my close proximity mirror on this occasion.

• Whilst reversing I nearly hit a concrete post.

• Turning left motorcyclist came up on inside of vehicle.

• Avoided hitting a cyclist.

• Positions in nearside lane at traffic lights. Left gap of about one room between lorry and kerb. Noticed cyclist approaching from behind in nearside mirror. Watched in mirror as cyclist used side of lorry to pull them up the gap, and then rest against passenger door step.

• Near miss with low wall while reversing.

• When turning left at a junction I avoided hitting a cyclist. I also avoided hitting a car on the motorway on my nearside when a motorway lane joined from the left. As I make deliveries on building sites I use my close proximity mirror to avoid obstacles e.g. new kerbs, packs of bricks, and brain dead labourers.

• Avoided hitting cyclist which came up the inside of the vehicle while stood at traffic lights also a pedestrian that slipped off the pavement.

• Whilst turning left into a tight side turning a car tried to undertake me even though all my nearside indicators were working. But because of the angle I was at my ordinary rear view mirrors could not pick the vehicle up. My wide angle did and my close proximity mirror gave me a chance to brake and stop thereby saving an accident.

• While reversing signals sounding young boy shot behind my lorry but because we have a rear camcorder I was able to stop in time and others tried to do the same. It is very helpful with the above nearside mirrors.
Annex C4: General descriptions of Class V mirror safety benefits

- Delivering to pubs everyday and therefore doing a lot of tight close proximity manoeuvring in car parks and in-between parked cars on the road, in nine out of ten cases if it wasn't for the close proximity mirror it would be very difficult not to have an accident. There are too many times when the mirror has helped me to avoid an accident. It happens every day many times a day. Need I say more?

- While driving through built up areas to check for cyclists and pedestrians and while reversing into tight places on building sites and private drives.

- I use my close proximity mirror when reversing in yards when lots of objects about.

- I find the close proximity mirror invaluable when performing reversing manoeuvres in tight spaces ie avoiding bollards and other low obstacles. I also find it very useful for spotting cyclists and pedestrians who appear to come from nowhere at traffic lights.

- Mainly use in tight reversing areas where there are obstacles such as pallets and cages.

- Overtaking and pulling back in on motorways and slip roads.

- Reversing in a residential street where I need the close proximity mirror to check for cars, small posts, cyclists and people etc. Without this mirror, I would be blind down that side of the lorry. This is only one example. I would not be comfortable driving an HGV without a close proximity mirror.

- Always at traffic lights. Motorcyclists and cyclists creep up on the nearside and offside to get a better position. Pavement bollards too close to kerb.

- Reversing onto loading docks and manoeuvring in confined spaces.

- Overtaking on the motorway.

- Pedestrians edging over the kerb, in slow moving traffic.

- Majority of times I use the nearside step mirror when reversing into loading bays. Cars are sometimes parked on one side of the road, so when reversing on right hand lock I use the mirror to avoid them.

- At traffic lights when cyclists have appeared near the nearside door from thin air. When reversing and turning the steering wheel right, so the cab swings left, I have avoided parked cars, posts/bollards etc. by using the mirror.

- Driving a lorry in a road with cars parked on both sides of road. Turning left into road I avoid a moped rider being silly. Reversing on motorway when picking up TM I avoid lots of dropped cones.

- Whilst reversing and whilst travelling with vehicles parked on both sides of a narrow road.

- We also have a round mirror sticking out from the nearside door so we can see the nearside front of the truck also the nearside door.

- Avoided kerbs or bollards e.g. in factories or congested area.

- As a tipper driver I am on building sites nearly every day and have to avoid pallets of everything. I also have to look out for steel pins and uncovered drains. It is impossible to see every obstacle but it helps to have mirrors that are in the right place to give a good view.

- While reversing in tight spaces e.g. skips, trees, other vehicles that may be obstructing your manoeuvre.

- New kerbs and fencing on tight sites and general mess left by builders.
• Cars joining motorways from slip roads and undertaking?

• Every time you stop at a junction to turn left you end up with a vehicle or cyclist coming along the nearside because you have to take a wide swing to manoeuvre round the corner. As a professional driver you should allow for this. This is the reason for mirrors being fitted to commercial vehicles.

• Reversing into tight locations on construction sites.

• Driving along narrow road/tracks manoeuvring in small spaces.

• Cars on nearside blind spot. Reversing into tight deliveries.

• When moving off at roundabouts. Cars/cycles/motorcycles tend to come up inside to try to beat you at roundabout.

• Waiting to turn left at lights when motor scooters come up on the nearside.

• Close proximity mirror, by this I take it you mean the mirror positioned above the nearside door that is facing straight down. I rely on the mirrors on the main bracket for most of my manoeuvring of which there are two. One large convex mirror and one wide angle mirror placed above. I find these sufficient for most manoeuvring and find that the mirror you describe as close proximity mirror causes a blind spot when turning at junctions.

• Although I can not think of a specific incident I find close proximity mirrors are invaluable. When moving near traffic stationary or other and built-up areas. My vehicle is fitted with give mirrors at different angles and I use all of these, all the time.

• When reversing onto building sites which do not have much space and have a lot of building materials lying around (ie packs of bricks/plasterboard/building blocks). The close proximity mirror is very useful as it helps me to avoid hitting these obstacles when I have to manoeuvre around them as it gives you a good view of what is down by your nearside.

• Manoeuvring up narrow streets with cars on both sides.

• When manoeuvring in depots or yards when reversing unit round to left. At traffic lights when cyclists come up inside and stop next to cab.

• When making tight left hand turns I have to straddle the white lines to make the turn. It often happens to have a motorbike or cyclist come up on my nearside. If you don't use the close proximity mirror you wouldn't know they were there.

• Moving around sites and having to get between obstructions.

• On delivery to RDC centres found some use bollards on certain sites and found the close proximity mirror invaluable in missing these objects. Mirror is very helpful for positioning on reverse manoeuvres, i.e. work staff walking around vehicle.

• The usual going through tight gap.

• Cars passing on the nearside usually on motorways.

• My annual mileage is low but it is all town work and on a number of times I have avoided colliding with small motorcycles ie scooter etc and cyclists as they tend to force their way alongside you and as you pull off, just appear out of your blind spot, as you turn left or as you try to keep a gap/space around you in heavy traffic.

• I use it quite a lot in pedestrian precincts as there are a lot of bollards and bins and people.
When reversing in confined construction sites.

As a delivery driver delivering fuel to farms and domestic customers we use a close proximity mirror all day to miss walls, gate posts etc and could not work without it!

My work frequently involved manoeuvring HGV in areas littered with obstacles and with person wandering in a haphazard manner. I often have to stop while someone walks past on the passenger side, or when I detect random obstacles on the ground near the front wheel. Also, on tight right turns on roads where a turning vehicle is forced to overhang the pavement, there frequently are bollards or posts on the pavement. Close proximity mirrors help avoid contact. Also, close proximity mirror helps avoid corner to corner contact, narrow roads, go between rows of parked cars weaving in and out of spaces.

When reversing check bollards and lamp posts.

When reversing in forest tracks. To avoid timber. Sticking out of the bank or timber stacks.

Using these mirrors eliminates the blind spot between the other mirrors on the nearside of the truck. They are a valuable contribution to road safety and should not be done away with under any circumstances.

Passing between double parked cars on narrow roads (housing estates).

Reversing into scrap metal yards.

Whilst reversing in tight situations, when cars are parked on T junction on housing estate etc.

Mainly whilst reversing in tight spaces, making sure my nearside front corner doesn't hit anything. Waiting at traffic lights, indicating left whilst straddling two lanes, cars and cyclists have squeezed down the nearside and stopped on my blind spot. Trying to get through a tight gap e.g. someone has broken down in the middle of the road.

Reversing into tight spaces.

I do a lot of deliveries to builders’ merchants and my close proximity mirror is a must for manoeuvring between and around stacks of bricks, tiles, wood etc. I also spend a lot of time in city and town centres and cyclists often creep up on the nearside at traffic lights, roundabouts etc and without the mirror I could quite easily not realise they were there.

My job involves manoeuvring large low-loaders in and out of construction sites and farms where every job can be a potential ‘minefield’. The ‘nearside’ mirror is invaluable on a high cab.

To avoid posts, bollards etc and parked vehicles. When reversing, and driving forward. Although personnel also guide the driver and aid safe manoeuvres (fire service personnel).

When you’re turning left at traffic lights and a car or motorbike sneaks up the side of you.

Motorway joining motorway so that traffic merges.

Mostly cars coming up the inside of my lorry.

In my job I do a lot of reversing into confined spaces. I have avoided low walls and various obstacles by using the close proximity mirror.

Nearly every junction, traffic lights etc in the ‘rush hour’ car cycles come up your inside. Even when indicating to turn left at a tight turn for HGV. Runcorn Bridge cars will not give way to you when wanting to move out of feeder lane (heading north) onto bridge so you can get into correct lane for exit just after bridge. Roundabouts if you want to turn off at ‘3 O’clock’ they try to beat you round because HGVs hold them up as being too slow. Nearly every entry slip road onto busy motorways cars now expect HGVs to give way to them. If the situation does not allow HGV to move into middle lane in
coming traffic will try to force HGV to slow down so they can ‘get on’. That is why there are so many accidents at motorway entry points.

- Always cyclists moving up on the inside at traffic lights. Cars pushing their luck when creeping from a slip road onto a motorway that is almost at a standstill.

- When moving between stationary vehicles and there's a curve in the road. Reversing into a cul-de-sac or loading bay, with vehicles parked either side.

- Mainly in London where cyclists are always creeping on the nearside.

- When cars come off the slip road onto the motorway, then they hang around down the nearside of the wagon. I think the close proximity mirror should be a bit longer and more angle on it so you can see more to the front and behind the nearside of the cab.

- When a vehicle has come up fast on a slip road entrance to dual carriageway and remained at the side of my vehicle. On a pedestrian area. Close to my base there is a roundabout, which on the approach there is 3 lanes, 2nd exit is 3 lanes but up to 1st exit on roundabout there is only room for two vehicles especially if the two vehicles are large ie HGV or buses as I am on the 3rd lane to turn right the close proximity mirror has enabled me to spot on many occasions cars that have come close to me whilst trying to avoid a vehicle on their left.

- Drivers of fire engines use the proximity mirror all the time for safety and getting close to the kerb and to avoid hazards.

- When moving through any built up area, with lots of stop/start driving it is an everyday occurrence for cyclists and motorcyclists to ride up on your nearside and stop when you are stopped. The nearside mirror is then 'blind' to these people but by using the close proximity mirror allows you to give vital room to them.

- Once or twice at traffic lights when turning left a car has tried to squeeze up the passenger side to get away before me and either not thinking I need the space or being totally ignorant has nearly caused an accident.

- When driving any truck without close proximity mirror you will always have a blind spot more so in heavy traffic and when reversing it is so much easier when you can see down the side of the passenger door.

- I do not drive HGV vehicles regularly on the roads. I do regularly shunt vehicles around the yard where I work. I regularly use the close proximity mirror when shunting as other vehicles and people are about. This has on occasions helped me avoid hitting other vehicles, people and objects.

- When driving or reversing refuse lorry into streets with cars parked on both sides of a narrow street. They can be in the way when in very narrow place and cannot pull nearside mirror in because of close proximity mirror.

- When roundabouts are tight and you need to go further left than a car would give you or when turning right and you have to consider overhang. If you pull away from lights you can see what's down below and let them go.

- In urban areas, I use the mirror every time to manoeuvre when reversing on roads. The close proximity mirror is also used every time when reversing or manoeuvring at locations to avoid damage to my vehicle, customers property and to look out for personnel e.g. unloading staff.

- When you do the job I do you have to use the mirrors all the time as I am a refuse driver ie collect wheelie bins.

- When travelling down roads when cars are parked both sides with just enough room for a HGV to get past. When reversing on building sites, to miss hitting objects with the front end, nearside front wheel and steps.
Situations often occur when manoeuvring where accidents have been avoided due to being able to use the close proximity mirror. The number of occasions when I have avoided an accident or damage to my vehicle are too numerous to list.

I have avoided cars when travelling on the motorway when changing from lane 2 to lane 1.

On a farm with gate posts and machinery.

Reversing past pallets.

Moving vehicles in and out of busy vehicle repair workshops.

All situations due to cyclists squeezing up the inside of traffic in busy streets.

When manoeuvring in a tight space ie a low wall, spillages on the floor, bollards, generally things low down to the ground.

Narrow lanes through city and congested roads where drivers tend to 'lane hop' when speeds are very slow. Also passing entry lanes onto motorways to ensure that traffic entering has safely entered, and not still alongside my vehicle.

When turning left at junctions using my close proximity mirrors has saved me from squashing cyclists, motorcyclists and cars on numerous occasions even though correct signals have been given. My personal opinion is that other road users should be made more aware (when training) that it is dangerous to undertake lorries, also that lorries need more turning space due to overhangs, and that vision is restricted when turning left or right and vehicles can disappear from sight.