On The Spot Accident Data Collection

Final Report

Left-hand Drive HGVs and Foreign Truck Drivers in OTS

PPRO 4/012/032

Undertaken on behalf of the
Department for Transport

Prepared by

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Please note: the VSRC is changing name to become the **Transport Safety Research Centre (TSRC)** to reflect the broad range of research conducted.

Approvals

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ots on the spot accident research

EXECUTIVE SUMMARY

Study Objectives and Procedures

This study evaluates and reports on the findings from real world accident data regarding left hand drive (LHD) heavy goods vehicles (HGVs) and foreign HGV drivers. According to the Department for Transport (DfT) there was a 150% increase between 1992 and 2003 in the number of LHD HGVs, and before 2005 it was anticipated that there would be an estimated 10,000 LHD HGVs using British roads each day. With the expansion of the European Union and concerns regarding foreign HGV accidents in the UK, a review of the scientific evidence regarding foreign HGV accident involvement is timely.

The On The Spot (OTS) project, active since 2000, is funded by the Department for Transport (DfT) and Highways Agency (HA). The OTS teams in Nottinghamshire (Vehicle Safety Research Centre, Loughborough University) and Berkshire (Transport Research Laboratory) attend and investigate, in total, 500 real-world collisions per year on a rolling shift pattern, covering all times and days of the week. All collision types including all road users, all injury severities (from non-injury to fatal) and all road classifications are investigated. Both teams work in slightly different road network areas, which collectively are broadly representative of the UK.

The main objectives of this study are:

- a review of the existing literature;
- a brief analysis of the British national data, to put the OTS analysis into context and show the overall number of accidents that involve HGVs;
- a detailed review of the OTS database in order to make comparisons between accident causation in LHD and RHD heavy goods vehicle accidents;
- to increase the number and depth of interviews with foreign HGV drivers, and thereby achieve an improved understanding of the human factors in LHD HGV accident causation;
- make recommendations for enhanced data collection regarding HGV accidents in the current Phase III of OTS, reflecting the issues found.

For the purposes of this study the issue of interest is defined as LHD HGVs with drivers who are less familiar with the language, road network and general traffic conditions. For this reason, the terms 'left hand drive heavy goods vehicle' and 'foreign driver' have been used inter-changeably.

A description of the vehicle blind spot areas for both LHD and RHD HGVs is given to understand more fully the limitations that the geometric make up of HGVs has on the vision and so the decision making capabilities of the drivers, especially when being driven on the 'wrong' side of the road. Fundamentally both RHD and LHD HGVs suffer the same blind spot but there is a significantly larger proportion of area obscured on the passenger's side of an HGV than on the driver's side. This has implications for the vision of LHD HGV drivers as they carry out nearside to offside lane changes in the UK.

In order to be able to communicate with foreign drivers an on-scene protocol has been established, with a set of questions designed to collect background information regarding the driver's view of the accident and their experiences of driving in the UK. A translation service, Language Line, has been enlisted to be called upon at any time, 24 hours a day, 7 days a week. The 4 interviews conducted so far are presented.

Summary of Findings

Literature Review. A literature review is presented examining relevant legislation, the causes of truck accidents, blind spots, increased mental load and vehicle factors. The recommendations of the European Truck Accident Causation study to reduce truck accidents and the severity of the consequences are presented. In summary, the review finds that there are 3 main additional difficulties facing LHD HGV drivers which may increase the likelihood of being involved in an accident; cultural and behavioural factors, poor/restricted view of the road and increased mental load. A VOSA study has found that half of foreign vehicles checked had serious defects but this is not reflected in the accident data as the specialist identification of vehicle defects is beyond the scope of the OTS project.

Case Numbers. Reviewing the national data for Great Britain there were 189,161 injury accidents recorded for 2006, with 0.5% of them involving a foreign registered LHD HGV. There were 10,466 injury accidents involving an HGV of which 9% (952) involved a foreign registered LHD HGV. In OTS, HGV accidents account for 9.6% of the 3,504 accidents available in the OTS dataset, with LHD HGVs forming 19% of the HGV sample. Of all the accidents on the OTS database, 1.8% involve a LHD HGV.

Notification Levels. The VSRC OTS investigation team believes that damage only accidents with a foreign HGV involved are over represented in the dataset, as other

crash participants are especially likely to call the police (allowing for OTS team notification) due to the language barrier to exchanging insurance details.

Road Type and Day of Week. In both the national and OTS datasets it is clear that the majority of LHD HGV accidents occur on the main arterial routes (Motorways, A roads and Trunk roads), in a greater proportion than RHD HGV accidents. The number of HGV accidents decreases at the weekend, for both LHD and RHD HGVs, as road movements decrease. Further work could build upon this to help target enforcement.

Accident Type. In the OTS sample the majority of LHD HGVs are involved in a collision which is an 'overtaking or lane change manoeuvre' which is understandable considering the type of roads these accidents are occurring on (main arterial routes). This is 3.4 times higher than for RHD HGVs which are split between more general driving type scenarios. A similar pattern is observed for the precipitating factor 'poor turn or manoeuvre'.

Contributory Factors. When involved in accidents drivers of LHD HGVs are more likely to have a contributory factor attributed to them, or their vehicles, than other HGV drivers. The contributory factor which features the most in the national data and very highly in the OTS data for HGV drivers is ‘failed to look properly’. For LHD HGVs this factor is closely associated with vehicle blind spots. A large proportion of LHD HGV accidents involve contributory factors which are part of the driver action or experience categories whereas RHD HGV accidents also include injudicious action and road environment factors.

The OTS human interactions system shows that for LHD drivers the interaction codes 'looked but did not see due to vehicle geometry' and 'intentionally entered into path' are the most frequent, followed by 'adopted a conflicting path'. The LHD HGV driver codes cover perception and judgement issues whilst RHD HGV driver interaction codes cover perception, conflict, attention and loss of control categories.

Vehicle Blind Spots. A trend which is a significant feature throughout the LHD HGV accident data for each accident causation system is 'vehicle blind spot' (76% of OTS LHD HGVs) and the 'vehicle entering a lane conflicting with others or swerving'. Due to the geometry of the vehicles, the potential blind spots on the offside of a LHD HGV are worse than that on the offside of a RHD HGV, causing particular problems when changing lane from the nearside to the offside. The high proportion of LHD HGVs that are articulated will exacerbate vehicle blind spot issues due to increased length.

Mental Load and Distraction. Mental load on a foreign driver can be high due to unfamiliar road layout and road user behaviour along with dealing with a vehicle designed for the other side of the road. Although new technologies may be designed to help the driver (such as lane assist) there is a need for further research to better understand the mental work load experienced by foreign drivers and any Human Machine Interface issues that may in fact increase distraction as more new technologies are introduced.

Accident Investigation. These accidents present unique challenges for investigators. The language barrier is a general challenge in the investigation of these accidents but also the in-depth investigation of vehicle and trailer maintenance and driver hours is a difficulty, leading to a possible under representation of maintenance, overloading and driver fatigue issues in both OTS and national data sets, for both LHD and RHD HGVs. Vehicle defects are not highlighted as a significant contributory factor for LHD HGV accidents (or in fact in RHD HGV accidents) in either dataset although they are reported in a recent VOSA checking study. Further data from driver interviews or questionnaires may help inform the investigation of fatigue in the future as the investigation of driver hours by OTS teams through the analysis of the tachograph is not possible in the majority of accidents.

On-Scene Interviews. Although the number of LHD HGV driver on-scene interviews has been unexpectedly low, it is clear from the four interviews already conducted that they play an important part in the investigation of these accidents. Without them important information regarding the driver's point of view of the collision scenario, driving hours, previous experience and preparation for driving in the UK is lost. However, benefits from an extended on-scene interview process must be balanced against an increase in the length of time the investigation teams must spend on scene away from other data collection duties.

On-Going Work. A pilot study using new on-scene questionnaires (translated into several common languages) will be carried out by both OTS teams so that the entire OTS project can collect new data at the same level. The interviewing of foreign drivers on-scene will continue and be fully reported at the end of OTS Phase III in the document, Left-hand Drive HGVs and Foreign Truck Drivers in OTS, Supplement to Main Report, (March 2010), along with the questionnaire pilot study. Recommendations for new database fields are made at the end of this report for further consideration by both OTS teams.

Possible Actions to Increase Awareness. In order to reduce the number of LHD HGV collisions occurring in the UK, an activity distributing information at ports (or during crossings) could increase LHD HGV driver awareness of driving on the left and give an informed knowledge of UK driving laws, speed limits and imperial/metric conversion. In addition, an initiative to improve UK driver training and awareness in this area could be worthwhile, to increase awareness of HGV blind spots and reduce the risk of drivers putting themselves in dangerous areas on the road. A first step could be a modification to the highway code to give advice on overtaking LHD vehicles.

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1. INTRODUCTION

1.1. Background

As the European Union and particularly the commercial trade between the member states continues to grow, so does the concern regarding foreign heavy goods vehicles (HGVs), or specifically Left Hand Drive (LHD) HGVs, coming to the UK and the potential hazards caused on UK roads. This report reviews real world accident data in order to identify common accident scenarios for LHD HGVs and compares these to accidents involving Right Hand Drive (RHD) HGVs. The report will cover various aspects of accident causation and potential differences between LHD and RHD HGVs, including blind spots.

The purpose of the report is not to apportion blame to any group of drivers or vehicles but to highlight problem areas for further consideration by reviewing and comparing common collision scenarios between LHD and RHD HGVs. As is the case in many road traffic accidents all parties involved contribute to the accident through driver experience or behaviour. However this report is heavily biased towards looking at HGVs and their contribution to the accident and although the collision partner may have also played a causal part in the whole accident, this has not been reviewed.

For the purposes of the current study the issue of interest is defined as LHD HGVs with drivers who are less familiar with the language, road network and general traffic conditions. For this reason, the terms 'left hand drive heavy goods vehicle' and 'foreign driver' have been used inter-changeably. Although it is recognised that in reality a left hand drive vehicle could be driven by a resident driver, and that many drivers from outside the UK could be driving vehicles purchased and licensed in the UK, considering only the issue of non-UK drivers in left hand drive vehicles allows a clearer focus on the issues which are likely to have the greatest significance in designing policies to reduce accidents.

After considering the overall picture using British national data this study utilises the information gathered by the On The Spot (OTS) project, which is funded by the Department for Transport (DfT) and Highways Agency (HA), and which collects data on accident causation in the UK.

There are two investigation teams working on the OTS project, the Vehicle Safety Research Centre (VSRC) at Loughborough University, working in the Nottinghamshire region and the Transport Research Laboratory (TRL), working in the Berkshire region. The OTS teams attend and investigate, in total, 500 real-world collisions per year on a rolling shift pattern, covering all times and days of the week. The OTS teams investigate all collision types including all road users, all injury severities (from non-injury to fatal) and all road classifications. Both teams work in slightly different road network areas, which collectively are broadly representative of the UK. The study has been running since 2000 and has investigated over 3,500 real world collisions. More information on the OTS project can be obtained at the website www.ukots.org.

1.2. Aims and Objectives

Accidents involving foreign HGVs have been of special interest to the road safety community in the UK for some time but the growth in trade makes the study of this topic timely. The OTS project has investigated a number of such incidents during the course of its activity in Phase I, Phase II and now Phase III of the project. This provides opportunities to:

- review and report upon data and related materials that have been collected;
- introduce enhanced procedures in the current Phase III to overcome specific obstacles to data collection associated with these cases.

The aim of this report is to evaluate HGV accidents in the OTS dataset in order to compare the common causation factors between collisions involving LHD and RHD HGVs and to gain a better understanding of the collision mechanisms involved. A brief analysis of the British national data (STATS19) is also included to show the overall number of accidents that involve HGVs and set the OTS analysis into context.

Specific study objectives are:

- to conduct a detailed analysis of accidents on the OTS Phase I, Phase II and Phase III databases that involve heavy goods vehicles in order to make comparisons between LHD and RHD HGVs;
- to increase the number and depth of interviews with foreign HGV drivers, and thereby to achieve an improved understanding of the human factors in LHD HGV accident causation. This will be facilitated by using a translation service or foreign language materials in follow-up interviews and questionnaires.

1.3. Blind Spots Explained

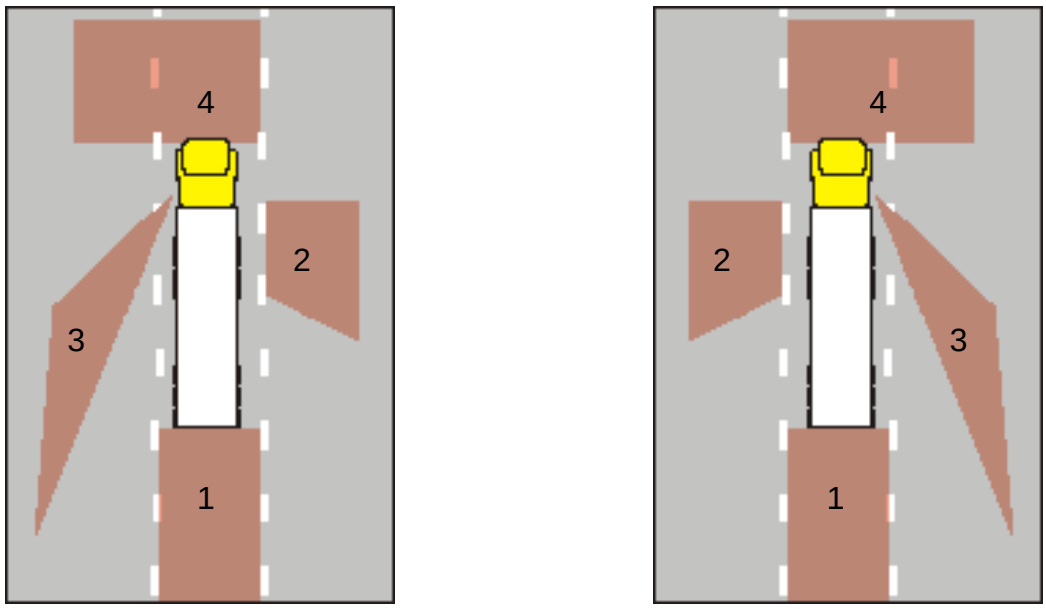
1.3.1. Blind Spot Areas

In order to best understand the problem areas when looking at the vision afforded to HGV drivers the next section of the report outlines what has been classed as a blind spot area for both LHD and RHD HGVs. This may not be an extensive list of blind spots as the study has not been vehicle or model specific and has therefore dealt in general areas.

A vehicle blind spot is an area outside of the vehicle that the driver cannot see due to the construction of the vehicle and the limited coverage of the vehicle's external mirrors.

Inevitably, heavy goods vehicles, due to their size and geometric make up, suffer from vehicle blind spots that are far larger and more obtrusive to the driver than the average car driver, a problem that is exaggerated when left hand drive vehicles travel on the left side of the road in the UK. Fully understanding the size and position of this area is essential in helping to reduce blind spot type collisions involving left hand drive HGVs on the UK's roads.

Examining vehicle blind spot areas in more depth allows us to understand more fully the limitations that the geometric make up of HGVs has on the vision and so the decision making capabilities of the drivers, especially when being driven on the "wrong" side of the road. Figure 1 illustrates the typical blind spot areas to be found on both LHD and RHD HGVs.



(Right hand drive) (Left hand drive)

Figure 1: Common blind spot areas for HGVs

Area 1 is the area found behind the vehicle for a distance greater than 10 metres (3 car lengths). This obscuration usually only effects high sided vehicles and although an inconvenience to the driver it is considered to have little or no influence on the likeliness of an HGV causing a collision in moving traffic, the likelihood can increase if the HGV is reversing or parking.

Area 2 is on the driver's side of the vehicle and is found to commence at a point adjacent to the rear of the cab and finish approximately one third of the way along the trailer for a width of 2.5 to 5 metres. This particular blind spot obscures vehicles travelling parallel to the HGV.

Area 3 represents an area to the passenger's side of the vehicle and this time a far larger area is obscured. Usually triangular in shape it is projected out at an angle of approximately 30 degrees from the driver's position and travels back past the rear of the vehicle. There is a possibility that this area could obscure vehicles in lane 1 but due to its increased angle the potential to obscure vehicles that are a greater distance away from the vehicle is far greater.

Area 4 potentially provides the worst blind spot area, especially for LHD trucks being driven on the left. This area, depending on the height of the cab and driver, can obscure an area the size of the cab in front of the vehicle but also an area extending past the passenger's side of the vehicle. This provides an area where vehicles, especially cars and vulnerable road users (VRUs) can be "lost" by the driver.

1.3.2. Driver Side Vision Comparison

All HGVs whether they are RHD or LHD suffer from the same blind spot areas. However it must be understood that the exact size, location and area of obscuration is make, model and driver specific. For example, those driving the same model truck but of differing heights may experience different areas of obscured vision due to differing mirror and seat positioning. Therefore all blind spot areas must be taken as general areas and locations.

Although both RHD and LHD HGVs suffer the same blind spot areas the effect of these on the driver will be compounded if the vehicle is being driven on the opposite side of the road to which it was designed to do so, due to differences in highway infrastructure and road user behaviour. The reason for this is that there is a significantly larger proportion of area obscured on the passenger's side of the HGV than on the drivers' side. The drivers of LHD HGVs will find it difficult when moving from the nearside to the offside due to areas 4 and 3. Likewise drivers of RHD HGVs will find it difficult to see clearly due to these areas when moving from offside to the nearside. When an HGV moves from the nearside to the offside in the UK, e.g. when overtaking or lane changing, it is more likely that an unseen faster vehicle is approaching on the offside than when moving from the offside to the nearside, when the 'other' vehicle has been seen by the HGV driver and overtaken. It is likely that when moving to the offside a LHD HGV driver will have less vision due to blind spot areas 3 and 4 than a RHD HGV driver.

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2. LITERATURE REVIEW

2.1. Background Statistics

According to Eurostat (2006)[1] the opening up of the single European market and the growth of just-in-time deliveries have driven a rapid growth in road freight volumes across Europe. In addition to this, the UK is one of Europe's biggest economies, with more than half of intra-EU25[2] trade-flows being made by the UK, France, Germany, Spain and Italy[1].

This has contributed to a growth in the number of left hand drive heavy goods vehicles (LHD HGVs) using British roads. According to the Department for Transport (DfT) (2003)[3] there was a 150% increase between 1992 and 2003 in the number of LHD HGVs, and before 2005 it was anticipated that there would be an estimated 10,000 LHD HGVs using British roads each day. On average a LHD HGV, when in the UK, spends two thirds of its time on motorways. Of the LHD HGVs visiting the UK, approximately 20% made at least one trip to the UK each week and stayed on average for two days each trip. The recent expansion of the EU to 27 countries may contribute to further growth.

This has generated concerns in the popular media about the safety of such vehicles.

According to Chief Supt Geraint Anwyl, of the Association of Chief Police Officers (ACPO);

"This is a very serious issue and lives are at risk here. As we've seen accession countries coming into the EU, the offending rate is getting greater and greater." [26]

Trade magazines and websites serving the freight transport industry in the UK have also devoted editorials and articles to the issue;

"Polish HGV accidents have risen more than eight-fold, from 361 in 2001 to 3,132 in 2006. While only one Lithuanian lorry was involved in an incident in 2001, there were 745 recorded in 2006". [4]

Popular daily newspapers in the UK have also suggested that vehicles coming into the UK from elsewhere pose a safety risk.

"Nearly one in ten lorries involved in accidents on British roads is foreign - putting thousands of British lives at risk, damning official figures have revealed." [27]

According to David Shelton, managing director of Motorpoint; [28]

"UK drivers are at real risk from overseas lorries whose drivers may not be able to see vehicles overtaking them, or who simply don't have a good enough understanding of the British driving laws".

However, such reporting of the issue in the mainstream media does not always provide scientific justification for the claims that this is now a significant safety issue in the UK. Some sources exist from which estimates of the scale of the problem can be made.

In 2005 the national data (STATS19) recorded 1,164 injury accidents which were classed as side-swipe collisions. Of these accidents 39% involved LHD or foreign registered HGVs, the majority of these accidents occurred as the HGV changed lanes to the right (to the offside)[29].

According to Cooper et al (2007)[6] in 2005 in British Columbia Canada, LHD HGVs were over 4.5 times more likely to be involved in crashes while turning, overtaking or lane-changing than domestic HGVs. According to data collected by Kent Police[7] there were 333 accidents in the area covered by the force between 1994 and 2001 where the cause was a LHD HGV changing lanes to the right.

However, detailed scientific study of the phenomenon of LHD HGV accidents in the UK is not widely available. In the context of the development over many decades of road safety expertise in the UK, this is a relatively recent problem and research into the extent of the problem, likely causes and appropriate remedial measures has not yet been undertaken on a large scale. According to the European Truck Accident Causation (ETAC) study, even in general terms *"only limited statistics are available regarding accidents involving trucks and even less is known about the cause of these accidents"* [8].

In the specific case of HGVs operating on the opposite side of the road than that for which they were designed, information and data are even scarcer.

2.2. Legislation

Since the issue of relevance here is HGVs which are not primarily registered or operated in the UK it is felt that European, rather than domestic legislation is the appropriate area for consideration. In general, legislation at this level aimed at the safety of HGVs has been limited. The exception to this is the 2003 European directive which requires all new HGVs (vehicles with a weight of more than 3.5 tonnes) to be equipped with blind spot mirrors. The main focus of this directive is accidents involving vulnerable road users caused by the lateral blind spot on the passenger side of HGVs.

However, since replacement of the truck fleet in Europe is relatively slow, it was estimated that the fleet would only be fully replaced by 2022 at the earliest. In the meantime, vehicles without the blind spot mirror would continue to pose a risk, especially to vulnerable road users. It was estimated that introduction of a legal obligation to retrofit mirrors to vehicles in operation since 1998 would save an additional 1,300 lives in Europe up to 2020.[9]

In 2007, the European Parliament and the Council adopted a new directive requiring additional mirrors to be fitted to all commercial vehicles over 3.5 tonnes registered after 1st January 2000. Under the terms of this new directive all affected vehicles must have the mirrors retrofitted no later than 31st March 2009.

There are various other directives which address other elements of the safe operation of HGVs across Europe. These include EC Directive 2002/85 requiring all vehicles over 3.5 tonnes to have in-vehicle speed limitation applying a 90km/h maximum by 1st January 2005 for all new vehicles and 1st January 2006 for existing vehicles.

The restraint use rate of HGV drivers (and also of passengers) is very low in Europe. The installation and use of seat belts in HGVs was recently covered by European legislation: EEC Directive 2003/20/EC amending 91/671/EEC mandates the use of safety belts where fitted by 2006 in all forward facing front and exposed rear seats in new HGVs.

Mandatory regulation at EU level has been limited to date and though technical standards exist they tend to be optional. Other areas that could usefully be targeted by legislation include:

- Stability control: Research has indicated that Electronic Stability devices for trucks could improve safety when negotiating curves by about 40%[10]. Some newer trucks offer electronic stability control. Whilst no European standard yet exists it is believed that work is underway to specify European requirements for rollover stability and a dynamic rollover test for new HGVs.
- Seat belt installation: No mandatory EU-wide installation requirement exists for seat belts in HGVs. Research indicates that to improve restraint use, 3-point belts should be integrated directly into the seat of the driver and passenger.
- Under run protection: Mandatory protection at the front, rear and side has been specified by various European directives. However, there is research to suggest that the protection offered by existing requirements is inadequate and some revision could be considered.[10]
- Cabin structure: Optional regulations exist for HGV cab structure, but there is evidence that increasing the stiffness of the structure could increase survivability for the most severe HGV crashes.
- Visibility (of the HGV): The European standard ECE-Regulation 104 (January 1998) addresses the conspicuity of long and heavy vehicles and their trailers, but it is currently optional.

Also the effectiveness of legislation is limited by enforcement. The European Transport Safety Council (ETSC) believes that thorough checking and sanctioning of traffic rules could save 14,000 lives across Europe each year[11]. In terms of the effectiveness of enforcement in the UK, the picture is somewhat mixed, with ETSC concluding that in some areas (notably speed enforcement and seat belt wearing) efforts remain high. In other areas, drink driving being the most significant, enforcement levels have fallen.

2.3. Previous Research

The safety implications of left hand drive vehicles driving on the left hand side of the road is not a well researched area. There are a number of possible explanations for this, including:

- its relatively recent emergence as an issue of concern;
- the relatively small number of countries where traffic drives on the left;
- the difficulty of establishing from accident databases such as CARE or historically British national data (STATS19) that driving position could have been a factor in an accident, leading to problems identifying the appropriate accidents for analysis;
- the difficulty of establishing from existing data sources the scale of the problem.

Of the studies that do exist, very few focus on the specific problems resulting from the driver's position on the left hand side of the vehicle in traffic on the left side of the road. For this reason, it has been decided to include in this literature review papers which also look at the issue of right hand drive vehicles in right side traffic, and papers which address the issue of foreign drivers in a more general sense. Whilst it has not been established scientifically that these situations are analogous, it is nevertheless logical to assume that many of the same issues will arise in both cases.

2.3.1. The Causes of Truck Accidents

According to the European Truck Accident Causation study (ETAC)[8] the main cause of truck accidents is linked to human error in the majority of cases (85.2%), with other factors (for example, vehicle, infrastructure or weather) playing a minor role. In general the main factors in accidents between a truck and another vehicle are:

- non-adapted speed;
- failure to observe intersection rules;
- and inattention,

although the importance of these factors varies for different accident configurations.

Overall, accidents at intersections were the most common, accounting for 27% of the total accidents. Accidents due to lane departure and accidents after an overtaking manoeuvre – probably the two configurations of most relevance here – were responsible for 19.5% and 11.3% of the accidents respectively.

A blind spot is most commonly a factor in accidents occurring at intersections and involving at least one vulnerable road user. In 47% of such accidents blind spots from the truck driver's view was the main cause, with two thirds of such accidents proving fatal.

The main factor limiting the relevance of this study to the UK case is the limited sampling, as none of the 624 accidents investigated occurred in the UK. However, it is one of the most comprehensive studies of truck accident causation currently available.

Another significant factor in goods vehicle accidents is fatigue. The US National Transportation Safety Board estimates driver fatigue to be a factor in 20 to 40% of truck accidents[12]. In a UK context, a study by RoSPA [13] using data from 2001 estimated fatigue to be a factor in 16 to 23% of motorway accidents and 11% of HGV and PSV accidents.

However, these are very general figures, and it remains the case that little is known about the precise mechanisms which cause truck accidents, especially in the specific case of foreign truck drivers on UK roads. The following sections outline some of the existing research which looks at the general case of "foreign drivers" and attempts to draw realistic conclusions of relevance to the UK situation.

2.3.2. General Issues

There are a number of issues which might be predicted to influence the accident involvement of foreign drivers, regardless of where they are from or which roads (besides those in their country of origin) they are driving on. Yannis et al (2007)[14] provide an extensive list of factors, including:

- poor knowledge of the road network;
- lack of understanding of the local rules;
- insufficient driving skill;
- variance of attitudes, reflected in driving behaviour.

They conclude that,

"Foreign drivers bringing their own rules and practices to an unfamiliar environment appear to be at increased accident and injury involvement and risk".

This finding is confirmed by Leviakangas (1998)[15] who says that;

"In addition to traffic rules defined by legislation or similar standards there are numerous "unwritten" rules and expectations concerning the behaviour of other drivers. When a foreign driver enters this environment, he or she is not always aware of these written and unwritten rules".

Yannis et al[14] also state that;
"different types of foreign drivers present a significantly different accident risk".

As part of the EC SafetyNet project, Vis et al [16] (2007) report on the large variations across Europe in behavioural elements such as:

- driver impairment (whether through alcohol, drugs or fatigue);
- seat belt wearing rates;
- speeding,

and the differences in other factors such as:

- the characteristics of the vehicle fleet in different Member States and;
- the features of the infrastructure drivers have experience of.

It is logical to conclude that drivers from different EU member states are not a homogenous group, and the likelihood of accident involvement could vary significantly between different nationalities. This contention is supported by data from Kent Police[7], which shows that the majority of foreign registered trucks leaving Britain were French, and as expected, they appear most frequently in the accident data. However, in 2002 Spanish vehicles were the 6th most common HGV leaving the UK, but were involved in 21.7% of side-swipe accidents.

As well as the obvious difficulty of driving on the opposite side of the road, there are a number of additional factors which may make the UK a particularly problematic place for non-native drivers to operate safely. RoSPA (2007) highlights:[17]

- more stringent driver testing in the UK;
- the imperial system, leading to problems understanding distances and speed limits;
- the unique treatment of HGVs compared to other classes of road user, meaning that the posted limit may be higher than the limit which applies to HGVs.

In addition to these general factors, a number of specific areas of concern have been highlighted in the literature. These include blind spots, mental workload and vehicle

maintenance, the latter being arguably the issue which has generated the most comment in the popular media.

These issues are discussed in turn in the following sections.

2.3.3. Blind Spots

According to RoSPA (2007)[17] the larger blind spot that results from using a left hand drive vehicle on British roads is the most obvious safety concern. This problem is most pronounced when other road users pass on the far side of the vehicle, and for right turning vehicles.

However, whilst it appears logical that a reduction in the what drivers can see will have an effect on safety, according to Sivak et al (2006);[18]

"the incremental safety consequences of specific opaque areas in the direct field of drivers' vision have not yet been quantified".

Their results indicate that whilst lateral visibility out of the vehicle cabin does have an effect on safety, and affects involvement in lane-change crashes, more research needs to be done to evaluate the sensitivity of the effect to speed and road type, and to identify which severity of crash is most affected. It should be noted that this study was carried out using a sample of data from North Carolina in the United States. However, there seems to be little research currently available that assesses the sensitivity of crash involvement to visual obstructions for the specific issue of goods vehicles in the UK. Should such a study be possible it would help to quantify the magnitude of the problem, and thus enable appropriate counter measures to be developed and their likely effectiveness assessed.

Tait and Cook (1998)[19] conclude that ineffective or insufficient driver vision from the cab of large vehicles constitutes a "significant problem". Furthermore, the DfT[20] estimates that if measures to address the blind spots to the side of heavy goods vehicles are 25% effective, 10.5 lives could be saved each year. A further 8 lives could be saved by addressing the blind spot at the front of the vehicle.

According to Tait and Southall (1999)[21], the most cost effective measures to improve the driver's field of vision involve a combination of additional, modified or repositioned mirrors. They make a number of recommendations for additional and modified mirrors.

During a trial conducted by VOSA in 2007, 40,000 'Fresnel lenses' were distributed to LHD vehicles entering the UK at Dover. The lenses are small sheets of flexible plastic with a moulded lens which adheres to glass and help to alleviate the problem of the LHD truck blind spot. It was estimated that there was a 59% decrease in side-swipe incidents as a result of the lenses[29].

However, there are confounding factors that must be considered when assessing the likely effectiveness of implementing such measures. The variation in drivers' height, seating position and cab design will influence the field of vision the driver has from the seating position. In a survey of vision available from a variety of different goods vehicles[21] by the now Ergonomics and Safety Research Institute (ESRI) at Loughborough University, it was found that the likelihood of seeing a pedestrian standing close to the front of the vehicle varied widely across vehicle makes and models. However, in the poorest performing vehicles it was estimated that the seat position would have to be higher than the 99th percentile sitting eye height for the pedestrian to be visible. In other words, few if any drivers would be tall enough to see a pedestrian from their seated driving position.
Also the additional mental load placed on the driver should it become necessary to check additional mirrors can be a confounding factor. This could be a significant factor in determining the impact of such measures, especially if, as some literature suggests, the mental demands on foreign drivers are already significantly higher than those on domestic drivers.

The work of Tait and Southall[21] predates some of the legislation, which attempts to tackle the problem of goods vehicle blind spots, as outlined in section 2.2. However, it is clear that the precise relationship between reduced lateral vision from the cab and side-swipe accidents is still not well understood, and more research in this field could help to inform future policy.

2.3.4. Increased Mental Load

Yannis et al (2006)[14] highlight the potential of increased mental load as a contributory factor in accidents involving foreign drivers, since certain road characteristics are found to significantly differentiate the risk between different nationalities. Inhabited areas and junctions are two such characteristics. Yannis et al conclude that,

"This may be attributed to the fact that urban areas and junctions require a more demanding driver behaviour, namely a combination of decisions under more complex traffic conditions and more traffic rules".

Using a simulator, Jeon et al (2004)[22] found that drivers who were unfamiliar driving RHD vehicles, when placed in RHD vehicles, were observed conducting more lane position adjustments, less visual searching when manoeuvring across lanes, and overall showed twice the level of mental workload than the drivers familiar with RHD vehicles. Whilst these results cannot be considered to be directly transferable (since the drivers in this study were unfamiliar with the vehicle, whereas in the scenario of interest here, it is the road network that the driver is assumed to be unfamiliar with), it is nevertheless additional support for the hypothesis that mental load could be an important factor in the accident involvement of foreign goods vehicle drivers.

2.3.5. Vehicle Factors

According to RoSPA (2007)[17] the UK has the most stringent vehicle maintenance standards in Europe. Vehicles which would be deemed unsafe by UK standards may be able to use the UK road network. This view appears to be supported by figures published by the Vehicle and Operator Services Agency (VOSA)[23] which found that half of the foreign lorries checked in 2006 had serious vehicle defects which could have affected their safety. In addition, one third of vehicles from Spain, Portugal and the Republic of Ireland were found to be overloaded.

"Trucks from across the continent must be subject to the same rigorous UK inspection standards in terms of driver's hours, professional driving qualifications and the condition of their vehicles".

However, with technical failure of the vehicle being responsible for only 5.3% of the accidents investigated in the ETAC study, it may be that the scope for reducing accidents and injuries through measures aimed at vehicle maintenance standards may be limited.

Cooper et al (2006)[6] conclude that the important element with respect to imported vehicles (in their study) is driver performance, rather than vehicle safety;

"driver unfamiliarity coupled with operational or visibility problems associated with manoeuvring such vehicles in a right-side driving environment probably predisposes them to a higher than expected collision causation rate".

2.4. Conclusions

There is evidence in the existing literature that foreign drivers face a number of additional difficulties which may increase their likelihood of being involved in an accident. These include:

- cultural and behavioural factors;
- poor/restricted view of the road;
- increased mental load.

These factors have not been well researched, especially in the specific context of the UK. More work to better understand the precise relationship between the restrictions in lateral vision and accident involvement would enable policy to be targeted more effectively. It would also facilitate a more accurate estimation of the cost-effectiveness of policy recommendations.

The study conducted by VOSA in 2006 found that half of foreign HGVs checked had serious vehicle defects which may compromise vehicle safety. In addition to this one third of vehicles from Spain, Portugal and the Republic of Ireland were found to be overloaded in that study.

The ETAC study makes a number of recommendations to reduce truck accidents and the severity of the consequences. These are aimed at all stake-holders, including vehicle manufacturers, infrastructure providers, governments and drivers. They include:

- implementation of active and passive safety systems;
- improved signage at intersections;
- improved driver training – for truck drivers, but also for other road users, to better anticipate truck behaviour;
- increased enforcement for vehicle maintenance;
- provision of safety incentives to operators;
- objective and fact-based reporting of truck accidents by the media;
- more focus on a healthy lifestyle for drivers.

However, these recommendations should be considered in the context of the slightly unique position of the UK, and adapted in order to have maximum impact.

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3. METHODOLOGY

3.1. Data Analysis

The main focus of this study is to perform a review of the nature and circumstances of accidents involving LHD HGVs by comparing typical scenarios with those involving RHD HGVs. This was achieved by briefly analysing the British national data (STATS19) and then the in-depth OTS accident data. For the purposes of this study the issue of interest is defined as LHD HGVs with drivers who are less familiar with the language, road network and general traffic conditions. For this reason, the terms 'left hand drive heavy goods vehicle' and 'foreign driver' have been used inter-changeably.

Cases were reviewed from all 3 phases of OTS (data collected from 2000 to 2008), up to data release 3e. The examination of 3,504 accidents identified data for 361 HGVs. All HGV cases were reviewed to identify causation factors and trends across a range of collision scenarios.

Before any in-depth analysis could be conducted, a data enhancement process had to be carried out by experienced investigators. The OTS database has evolved significantly over the three phases and certain data was found to be absent in early cases. A key example of this is that not all vehicle records stated whether HGVs were LHD or RHD. Each of the cases were reviewed to allow an expert judgement based on statements within the case and photographic evidence.

After initial examination of the cases, the sample could be split into LHD and RHD HGVs, allowing specific collision scenarios and common occurrences to be identified.

The data was further analysed to compare and contrast scenario types between LHD and RHD HGVs. Basic collision conditions were compared, before moving onto the more complex data available relating to the causes of collisions. OTS utilises a variety of systems for evaluating causation of which three are explored by the present report: Accident Causation System; Contributory Factors 2005 and Interactions. These systems are described more fully as results are presented.

3.2. Interviewing Foreign Drivers On-Scene

An interview protocol including a translation element formed a new initiative conducted by the VSRC to enhance data collection for OTS cases involving foreign HGV drivers. Historically road user information for foreign drivers has been scarce, often due to the difficulties experienced by investigators when attempting to communicate with drivers who speak little or no English.

In order to rectify this problem, a translation service was engaged, which could be contacted on-scene, 24 hours a day. A contract was established with 'Language Line', which enabled the VSRC investigation team to fully interview foreign drivers, where appropriate, at the scene of their collisions. This gave drivers the opportunity to fully explain what happened from their own perspective, giving investigators a better understanding of the full dynamic of each collision and the behaviour of all participants.

Once the contract was in place, interview questions and procedures were established in order to maximise the consistent gathering of detailed information within the limited time constraints, which govern all on-scene data collection. In particular, questions were included to establish whether drivers were given any training or advice on driving in the UK before entering this country.

4. NATIONAL DATA (STATS19) ANALYSIS

4.1. Introduction

A brief analysis of the national road accident injury data for Great Britain (commonly called 'STATS19' due to the name of the form that the Police complete) has been undertaken to examine the overall number of accidents involving HGVs and to set the OTS analysis into context.

Since 2005 the STATS19 dataset has included records regarding causation factor, using the Contributory Factors 2005 System. Further information on this system can be found in section 5.3.2. An analysis of the factors commonly attributed to HGV drivers is presented here, which complements the more in-depth analysis available from OTS.

4.2. Definition of Foreign Registered Vehicles in the National Data

It is important to understand the data that is available in the British national data regarding foreign registered vehicles and whether a vehicle is left or right hand drive. The relevant section from STATS20 (Instructions for the Completion of Road Accident Reports)[30] explaining the possible relevant codes is reproduced below.

FOREIGN REGISTERED VEHICLE
CODES
0. Not a foreign registered vehicle
1. Foreign registered vehicle - left hand drive
2. Foreign registered vehicle - right hand drive
3. Foreign registered vehicle - two wheeler

NOTES
A. Codes 1 - 3 should be used for all vehicles bearing non-UK registration plates, including vehicles from the Republic of Ireland, the Isle of Man and the Channel Islands.
B. Foreign non-motor vehicles (e.g. bicycles) should be coded 0.
C. Left hand drive UK registered vehicles should be coded 0.
D. Vehicles which are not traced (e.g. Hit and Run) should be coded 0.

It is possible to identify foreign registered vehicles that are left hand drive but not all left hand drive vehicles, as those vehicles registered in the UK are coded as ‘0’ and not identifiable. Therefore the comparisons made using national data are between,

- Foreign registered HGVs – LHD
- Other HGVs
  - Not foreign registered (includes LHD UK registered)
  - Foreign registered RHD

4.3. HGV Occupant Casualties

Examining the national data for 2006 (most recent year available) there are 2,172 accidents that involved injury to an occupant of an HGV. A breakdown of these HGV occupant casualties is given in Table 1.

	HGV Driver Casualties			HGV Passenger Casualties			
HGV Type	Fatal	Serious	Slight	Fatal	Serious	Slight	Total
Foreign registered HGV - LHD	5	14	39	2	2	4	66
Other HGV - Not foreign registered (includes LHD UK registered) - Foreign registered RHD	31	280	1,763	1	48	341	2,464
Total	36	294	1,802	3	50	345	2,530

Table 1: HGV casualties – Great Britain 2006

As expected the number of occupant casualties is lower for LHD foreign registered HGVs at 3% of the figure for other HGVs. Although the case numbers are small, the proportion of injured LHD foreign registered HGV occupant casualties that are reported as killed or seriously injured (KSI) is very high at 35%, compared to 15% for other HGV occupant casualties. As a reference point, for car occupant casualties (cars and taxis) the KSI rate is 8%.

When HGV occupants are injured they are more likely to be killed or seriously injured than car occupants. When considering the size of the vehicles this seems counter intuitive, larger vehicles should protect better, but it is due to the HGVs protecting better against slight injuries until the crash severity or circumstance is such that serious injuries and fatalities occur, so the KSI calculation is skewed. For example, interaction with a car is not likely to give a large change in velocity for the HGV driver but interaction with another large vehicle may lead to direct intrusion of the cabin resulting in more serious injuries.

Comparing the two groups of HGVs, an element of under-reporting of slight injuries is likely for LHD foreign registered HGV occupants or it is possible that they are involved in higher severity collisions. Unfortunately there is no measure of crash severity in the national dataset.

4.4. Accidents with HGVs Involved – Casualty Severity

Due to the size of HGVs in relation to most collision partners it is appropriate to consider the number of accidents with at least one HGV involved and the resultant casualties in the entire accident. Table 2 gives the number of accidents by the overall accident severity for different combinations of HGV involvement.

Key:

Foreign registered HGV - LHD	A
Other HGV - Not foreign registered (includes LHD UK registered) - Foreign registered RHD	B

	Number of Accidents			
Accidents with:	Fatal	Serious	Slight	Total
Any HGV involved (A or B)	386	1,445	8,635	10,466
A involved	30	77	845	952
B involved	367	1,381	7,849	9,597
Both A and B	11	13	59	83
Just A (no B)	19	64	786	869
Just B (no A)	356	1,368	7,790	9,514

Table 2: Accidents with HGV involvement – Great Britain 2006

It is clear from Table 2 that HGVs are involved in many more injury accidents than there are HGV occupant casualties (Table 1). Of the 10,466 injury accidents involving an HGV, only 2,172 (21%) involved injury to an occupant of an HGV.

Overall, 9% of all reported HGV accidents involved a foreign registered LHD HGV, which is 0.5% of the total 189,161 injury accidents recorded for 2006.

Of the injury accidents with a LHD foreign registered HGV involved, 11.2% record a casualty as killed or seriously injured (KSI). For injury accidents with an ‘other HGV’ involved the corresponding figure is higher at 18.3%.

Table 3 considers all the casualties in accidents where HGVs are involved, split by LHD foreign registered HGVs and other HGVs.

	Number of Casualties			
Accidents with:	Fatal	Serious	Slight	Total
Any HGV involved (A or B)	419	1,700	12,420	14,539
A involved	43	95	1096	1,234
B involved	394	1,621	11,420	13,435
Both A and B	18	16	96	130
Just A (no B)	25	79	1,000	1,104
Just B (no A)	376	1,605	11,324	13,305

Table 3: Casualties in Accidents with HGV Involvement – Great Britain 2006

From the 10,466 injury accidents that HGVs are involved in (Table 2), there are 14,539 casualties (Table 3). As the tables show for completeness, the involvement of types of vehicles can be considered in many ways (just A, no B etc) but considering simply accidents with a LHD foreign registered HGV involved in some way gives 8.5% of all the casualties involved in HGV accidents. The corresponding figure for other HGVs is 92.4% (these figures will not sum to 100% due to accidents that involve both types of HGVs).

4.5. Contributory Factors for HGV Drivers

Previous tables give the size of the casualty population when LHD foreign registered HGVs are 'involved' in accidents, but there is no indication of any blame or responsibility for the accident necessarily being attached to the HGV or HGVs involved in the accident.

Utilising the contributory factor data in the national data, Table 4 shows the proportion of HGV drivers who have a contributory factor recorded for them.

Only accidents were a police officer attended the scene are included in this section of analysis. This follows the practice followed in the contributory factor analysis included in Road Casualties Great Britain. The contributory factor system in STATS19 allows the police officer to indicate a factor as being 'very likely' or 'possible'. No distinction is made here between the two categories.

Driver of:	No Contributory Factor	At least one Contributory Factor	% with Factor
Foreign registered HGV - LHD	206	722	78%
Other HGV - Not foreign registered (includes LHD UK registered) - Foreign registered RHD	4,296	4,914	53%

Table 4: Proportion of all HGV drivers who have at least one contributory factor attributed to them in accidents (officer attended scene) – Great Britain 2006

From Table 4 it is clear that when LHD foreign registered HGV drivers are involved in some way in an accident they are more likely to have a contributory factor attributed to them than other HGV drivers, 78% compared to 53%.

Selecting drivers with at least one contributory factor associated with them allows a comparison between the drivers of LHD foreign registered HGVs and other HGVs. Figure 2 gives the proportion of drivers with at least one contributory factor associated with them who have a certain factor attributed to them. So, for example, 48% of LHD foreign registered HGV drivers, with at least one factor associated with them, are recorded as 'failing to look properly'.

Car drivers have been included as a comparison. Only the top 25 most common factors are illustrated for clarity and only accidents with police officer attendance are included.

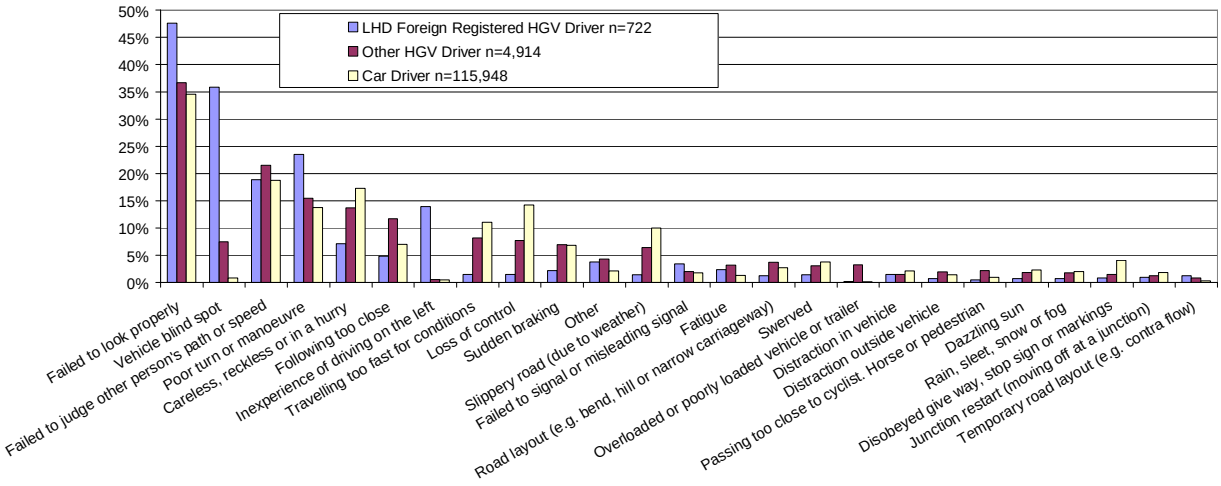

Figure 2: Proportion of drivers with at least one contributory factor attributed to them most frequent factors – Great Britain 2006

It is clear that ‘vehicle blind spot’ and ‘inexperience of driving on the left’ feature distinctively for LHD foreign registered HGV drivers and a higher proportion of them have ‘failed to look properly’ or made a 'poor turn or manoeuvre' attributed to them than other HGV drivers. It is likely that it is these factors that are influencing the higher proportion of all LHD foreign registered HGV drivers who have at least one contributory factor attributed to them in Table 4.

Whilst the difference for ‘inexperience of driving on the left’ is expected (although strictly the case selection criteria here are based on vehicle rather than driver, an ‘other HGV’ could be driven by a foreign driver) the difference for ‘vehicle blind spot’ is particularly pronounced. The proportion of LHD foreign registered HGV drivers with ‘fatigue’ attributed to them is smaller at 2.4% than the corresponding figure for other HGV drivers at 3.1%.

The contributory factor system includes 6 factors addressing vehicle defects. These are considered in Figure 3 as the literature review highlights strong preconceptions regarding the poor maintenance and safety of foreign vehicles.

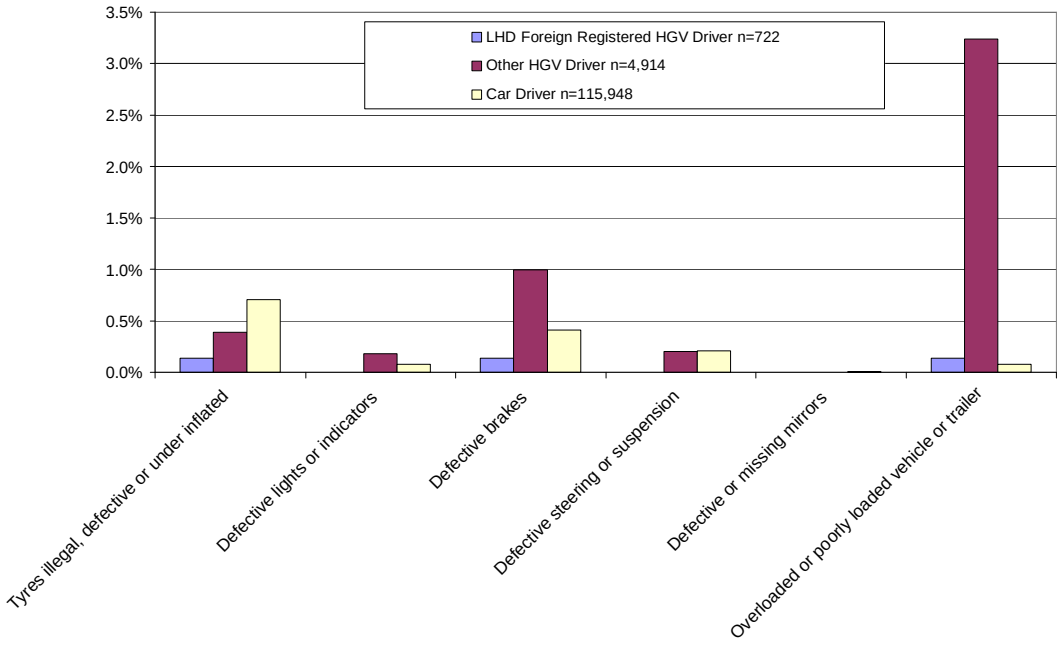

Figure 3: Proportion of drivers with at least one contributory factor attributed to them by 'vehicle defect' factors – Great Britain 2006

Although the proportion of HGV drivers that have a vehicle defect contributory factor attributed to them is small there is a marked difference between LHD foreign registered HGV vehicles and other HGVs. In each of the six categories the percentage for LHD foreign registered HGV vehicles is less than for other HGVs. There is a very large difference for the 'overloaded or poorly loaded vehicle or trailer' factor. This may be because of checks at sea crossings (or the train for the Channel Tunnel) or for HGVs travelling to sea crossings the knowledge that overloading will cause problems later on when being checked.

4.6. Accidents with HGVs Involved – Road Class

The following analysis considers the road classification of the accident site for injury accidents involving HGVs.

Figure 4 compares the road classification distribution for accident involvement between the two types of HGV defined in this analysis. Unfortunately it is not possible to differentiate between trunk roads, which is possible with the OTS dataset.

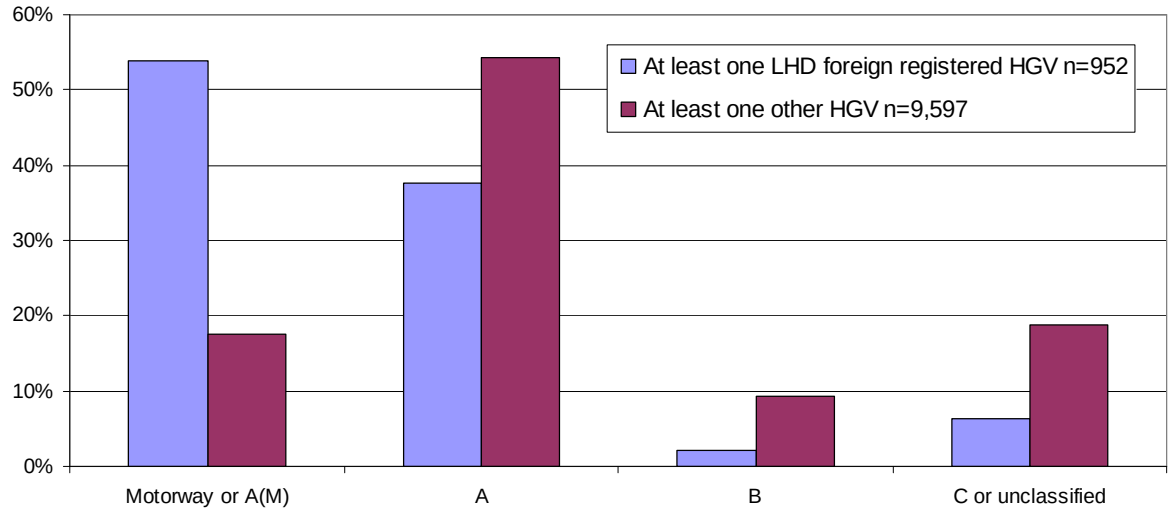

Figure 4: Road classification vs. HGV type – Great Britain 2006

It is clear that injury accidents which involve at least one LHD foreign registered HGV occur proportionally more often on motorways and less often on A roads then those accidents involving at least one other HGV. Generally LHD foreign registered HGVs are involved in proportionally more accidents on motorways and A roads than B, C or unclassified roads with 92% on motorways and A roads. In comparison, this figure is 72% for other HGVs.

Figure 5 selects only HGVs with at least one contributory factor attributed to them and only accidents with police officer attendance.

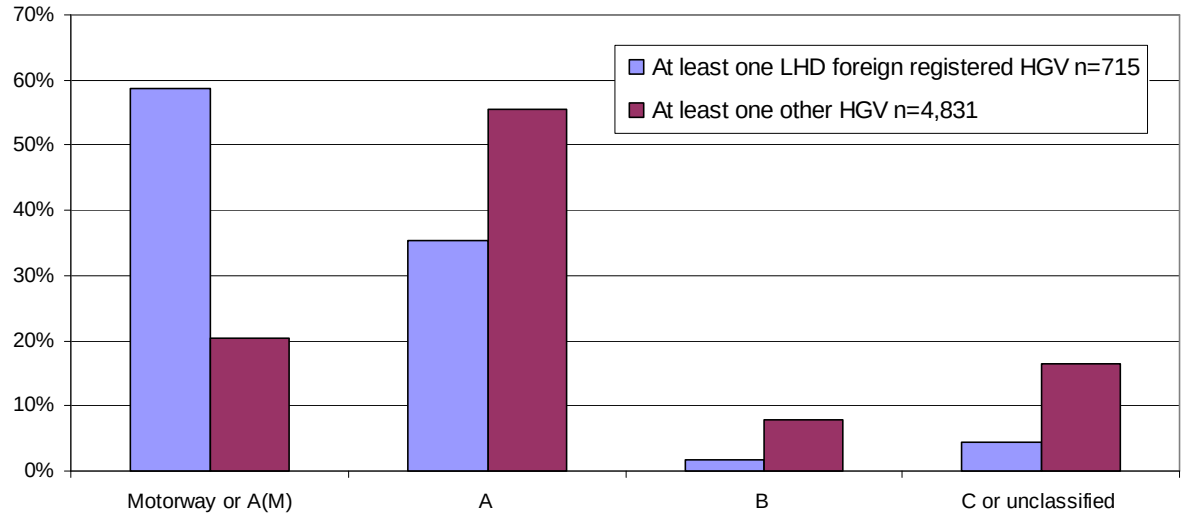

Figure 5: Road classification vs. HGV type (at least one causation factor attributed to HGV)– Great Britain 2006

The pattern is very much the same as Figure 4 although for LHD foreign registered HGVs the figure for the proportion for accidents occurring on motorways is even stronger and overall 94% occur on motorways and A roads. In comparison, this figure is 76% for other HGVs.

4.7. Accidents with HGVs Involved – Day of Week

The following analysis considers the day of the week for injury accidents involving HGVs. Figure 6 compares the day of the week distribution for accident involvement between the two types of HGV defined in this analysis.

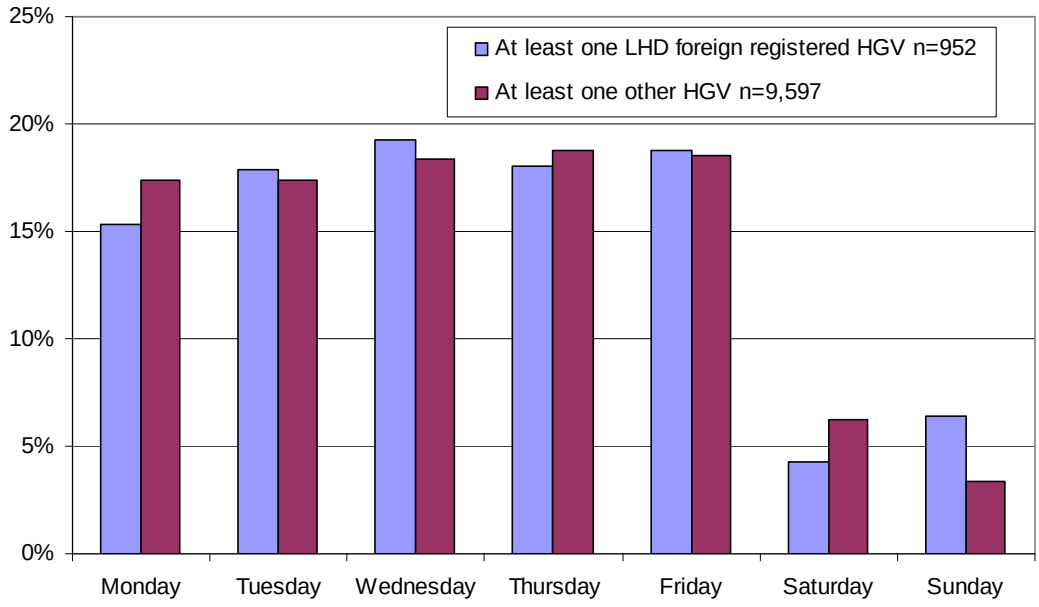

Figure 6: Day of week vs. HGV type – Great Britain 2006

For both types of HGV the distribution of accidents between Monday to Friday is similar with a slight increase from Monday to Friday. The drop in the number of accidents for both types is clear for Saturday and Sunday, with a greater proportion of accidents involving LHD foreign registered HGVs occurring on a Sunday than a Saturday but much less than each day from Monday to Friday. The opposite trend for the weekend can be seen for other HGVs.

Figure 7 selects only HGVs with at least one contributory factor attributed to them and only accidents with police officer attendance.

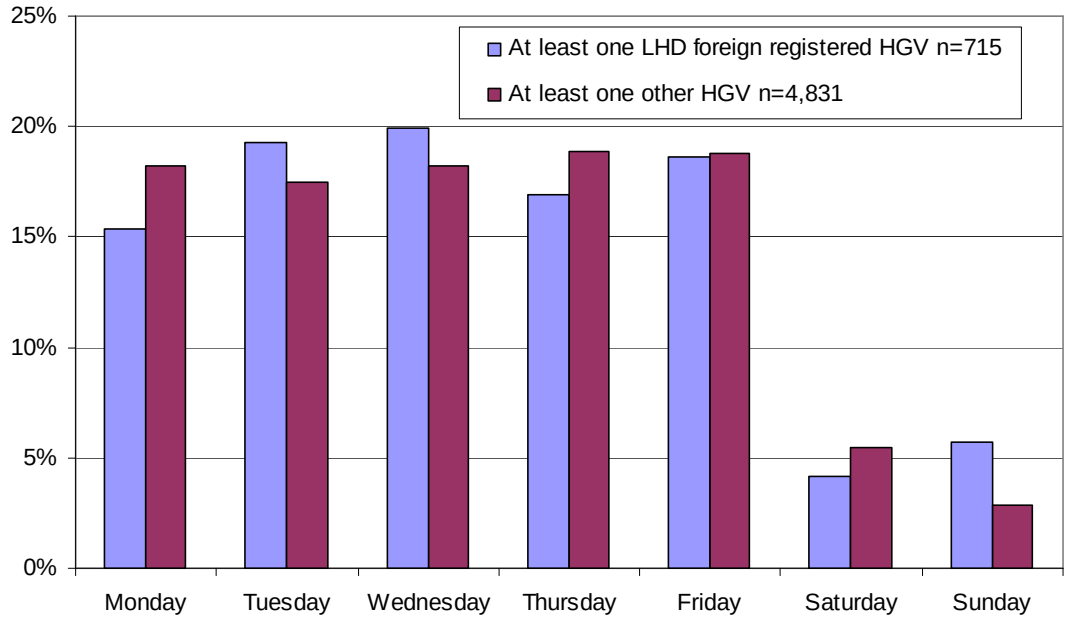

Figure 7: Day of week vs. HGV type (at least one causation factor attributed to HGV) – Great Britain 2006

The pattern is very much the same as Figure 7 with a much lower proportion of accidents occurring at the weekend for both types of HGV.

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5. RESULTS OTS ANALYSIS

5.1. Description of Sample

Due to the OTS HGV sample size shown in Table 5 it was decided to use all the HGVs involved and not limit this number by individual accidents. Therefore if an accident involved two HGVs both were included in order to increase understanding of the causation factors each vehicle has contributed to the accident. This improves the understanding of HGV accidents and enables a full comparison between LHD and RHD HGVs. Table 5 shows the total number of HGVs and the numbers of OTS cases or accidents the HGVs were part of.

Seat orientation of vehicle	Number of HGVs	Number of accidents
Left hand drive	65	64
Right hand drive	250	232
Unknown	46	42
Total	361	338

Table 5: Number of HGVs in OTS collisions

5.2. General Statistics

It was not possible to establish the side of drive or seat orientation for the vehicle in 46 cases. In some of these unknown cases the vehicle did not stop and was not traced, in others the seat orientation was simply not recorded and could not be confirmed by photographs or other evidence (because the data requirements have evolved over the course of the OTS project and early cases contain less information).

It was decided that as drive orientation is a core variable for this analysis, cases without this data should be excluded. This reduced the sample size to 315 HGVs in 296 cases. Within that sub-sample of HGVs, 20% are LHD and 80% are RHD.

The overall accident severity for accidents involving an HGV is shown in Table 6, by the type of HGV, LHD or RHD. This injury severity may not have been the injury outcome for the driver of the HGV but is the highest recorded injury in that accident.

Seat orientation of vehicle	Severity of all accidents				
	Fatal	Serious	Slight	Non-Injury	Unknown
Left hand drive	0	4	20	40	0
Right hand drive	13	32	92	93	2
Unknown	0	4	14	23	1
Total (n=338)	13	40	126	156	3

Table 6: Severity of collisions involving HGVs

It can be seen that the majority of LHD HGVs in this sample are involved in collisions with a severity of slight injury or non-injury with only 4 collisions with an injury severity of serious and no collisions with a fatal injury severity. In comparison to this a fifth of the RHD HGV collisions result in a killed or seriously injured severity outcome.

The proportion of collisions involving LHD and RHD HGVs according to the road classification where the collision occurs is shown in Figure 8. The complete dataset of known LHD and RHD HGVs is used for Figure 8 as this information is recorded for each vehicle involved in an accident as collision partners may have been on different roads on the approach to an accident locus.

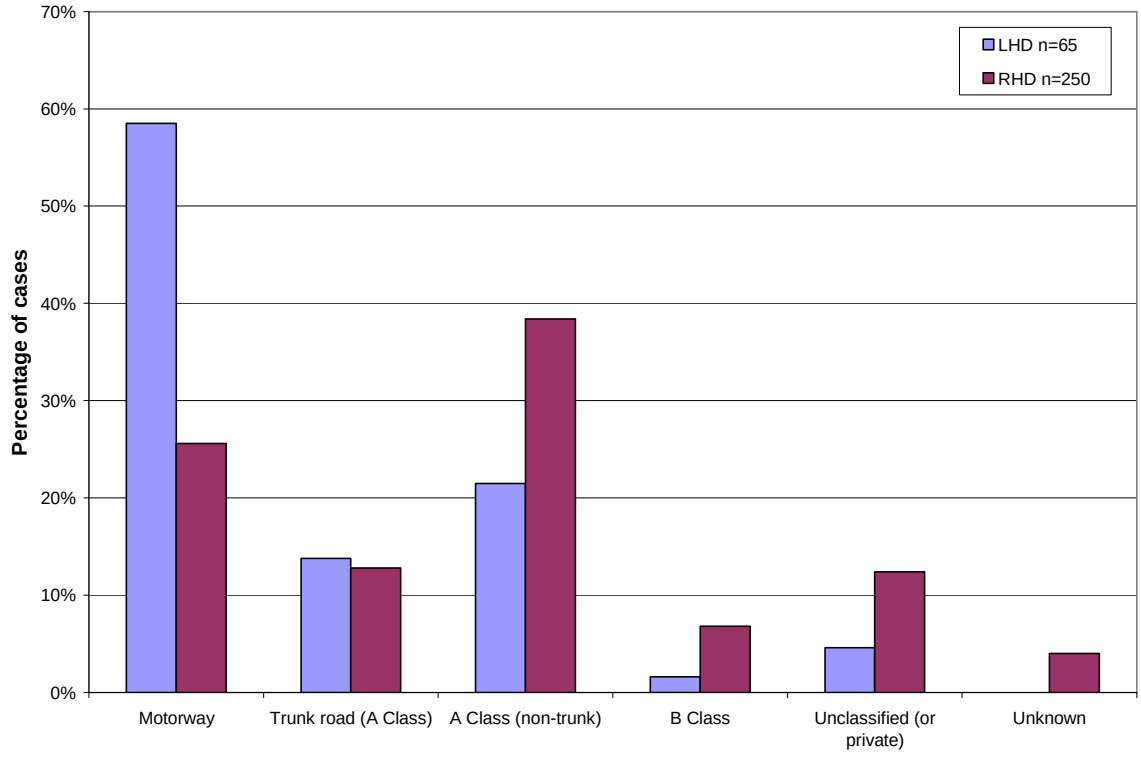

Figure 8: Road classification vs. HGV type

The greater proportion of LHD HGV collisions occur on motorways (59%), followed by A class (non-trunk) roads (22%). Those two carriageway classes also feature in most RHD HGV collisions, but in the reverse order (A class non-trunk 39%, motorways 26%). This observation would be expected as the vast majority of miles driven by HGVs are on the main arterial routes.

In order to further break down the general accident grouping of LHD and RHD HGVs the data has been selected according to the speed limit of the carriageway where the accident occurred. The distribution of accidents by the posted speed limits on the UK roads are displayed in Figure 9. However this is the posted speed limit for the roads and not legal speed limit for HGVs which on national speed limit roads is lower than the posted limit. This can be misleading for foreign or LHD HGVs on UK roads if not familiar with UK driving laws.

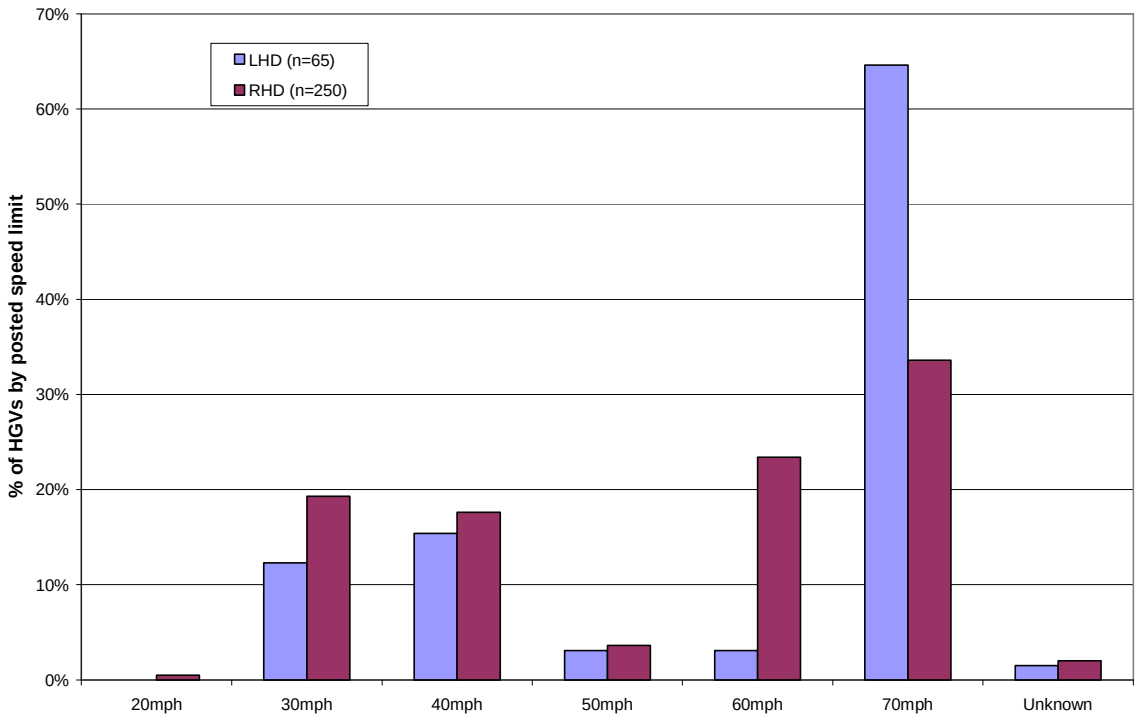

Figure 9: HGV type by posted speed limit

Figure 9 shows that the majority of LHD HGVs are involved in collisions on roads with a 70mph speed limit, followed by 40mph and then 30mph roads. Most collisions involving RHD HGVs take place on 70mph roads but then 60mph roads feature as the second most common location, a large difference compared to the LHD HGV group.

The charts in Figure 10 give the distribution of HGV construction type within the two groups: LHD and RHD HGVs.

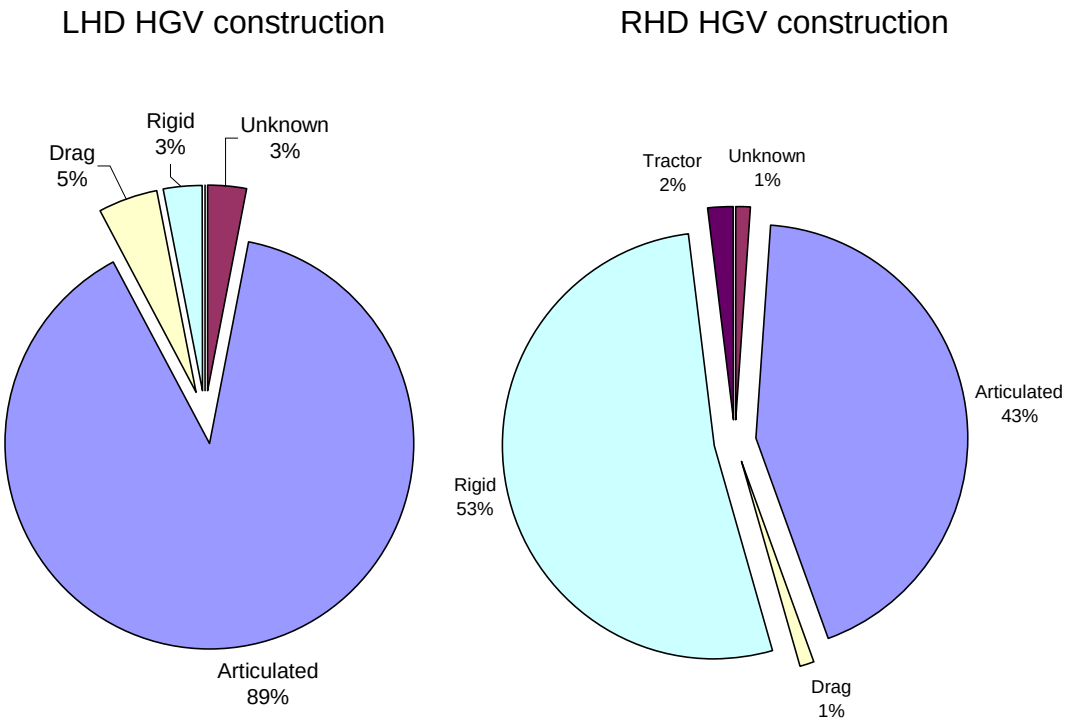

Figure 10: HGV construction for LHD and RHD HGVs

Figure 10 shows the majority of the LHD HGVs (89% of the sample) are articulated HGVs (tractor and trailer combination) compared to RHD HGVs, which is split between articulated HGVs, 43%, and rigid construction, 53%.

Broadly speaking the two data sets of LHD and RHD HGVs used in this report are similar in regards to the day of the week they occurred on. Figure 11 gives the distribution of the LHD and RHD HGV samples across the week, with the complete OTS data sample also shown to give a basis for comparison.

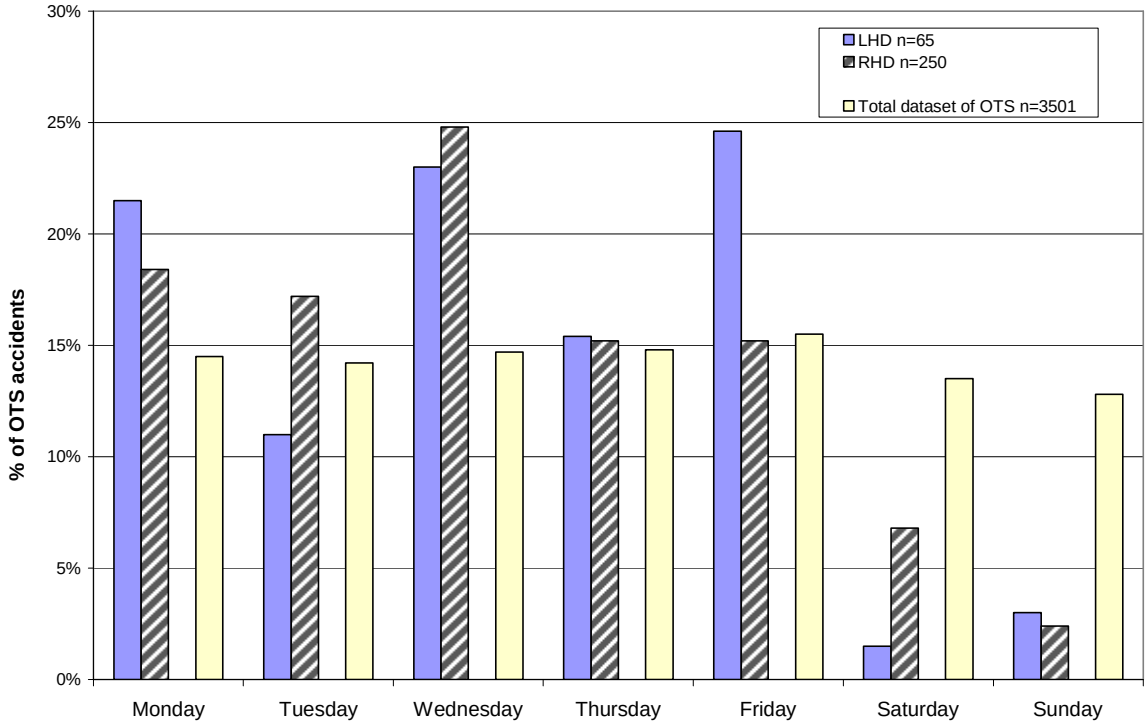

Figure 11: Day of the week vs. LHD and RHD HGVs

The main difference between LHD and RHD HGVs is on Friday and Saturday, nearly 25% of LHD collisions occur on Friday compared to 15% for RHD HGVs. In contrast to this only 1.5% and 6.8% of collisions occur on Saturdays for LHD and RHD HGVs respectively. For both groups the proportion of accidents is generally smaller at the weekend than the working week. The main OTS sample stays relatively consistent Monday to Friday and does drop slightly at the weekend but not as much as the HGV sample, showing that this is a feature of HGV accidents.

During the review process of both the LHD and RHD HGVs samples a judgement was made as to whether the HGV had performed the principal or most significant contributing factor in the collision. This was established by an experienced investigator based on all the causation factors and the strength of confidence given to each factor by the investigation team. This resulted in a subset of cases for both LHD and RHD HGVs where the principal causation factors had been attributed to the HGV and thus enabled the analysis to focus on certain collision scenarios with a high level of confidence.

Firstly all the cases are included to give an overview of the typical collision scenarios involving HGVs whether they have performed the most significant causal factor or

not. This is then complemented with a brief overview of the general scenarios using only the HGVs which had performed the significant causal factor.

By selecting the collisions where the HGV had performed what was deemed to be the most significant causal factor the sample size for LHD and RHD HGVs was further reduced, Table 7.

Seat orientation of vehicle	Number of cases
Left hand drive	55
Right hand drive	138
Unknown	17
Total	210

Table 7: Sample size of HGVs performing the most significant causal factor

Every accident is assigned an alpha-numeric classification code to best describe the type of collision (see Appendix 12.1 for Collision Code Sheet). This discriminates, for example, between rear-end collisions, merging collisions, and loss of control on bends. The letter represents the collision type, and the number provides information on location within specific road layouts. Analysis of the HGV data was conducted using the letter element of this code.

Figure 12 shows the distribution of collision types occurring in the whole data sample for both LHD and RHD HGVs including the vehicles which may not have contributed the most significant causal factor.

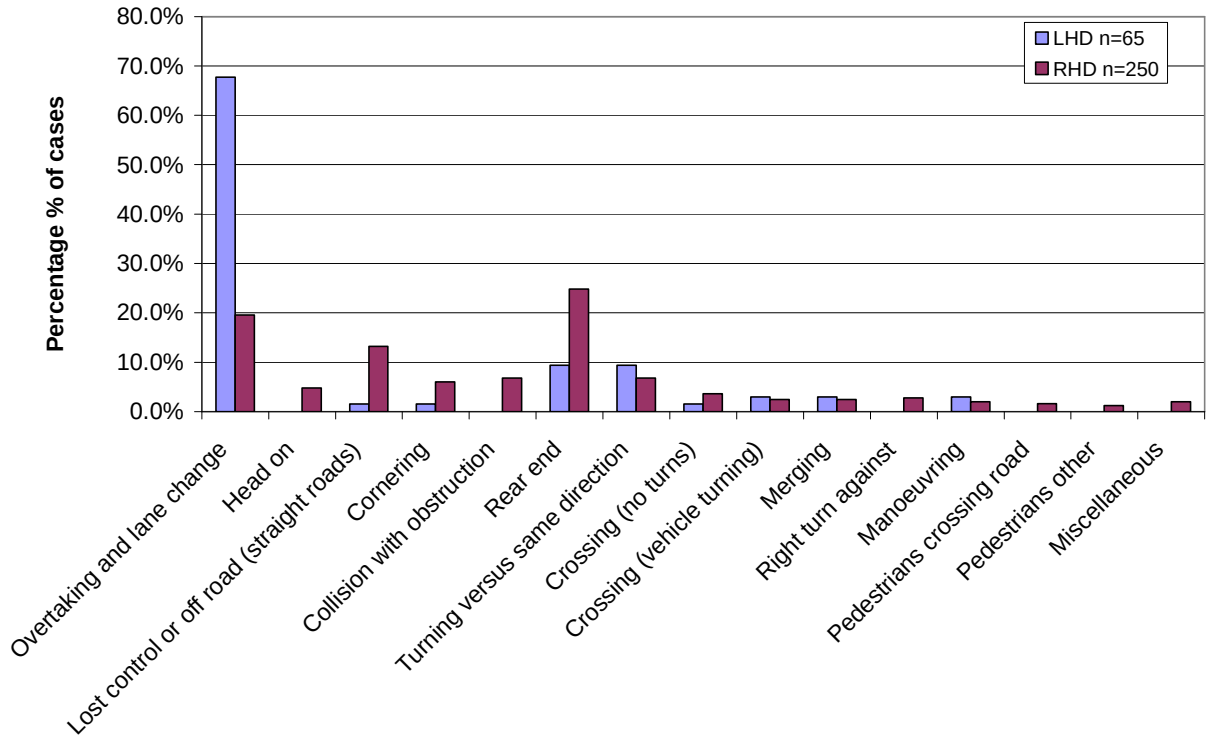

Figure 12: Collision classification code vs. HGV type

The three most frequent collision types in the OTS sample for LHD HGVs are given in Table 8.

Category	Overtaking or lane changing	Rear end	Turning vs. same direction
N° of LHD	44 (66.7%)	6 (9.4%)	6 (9.4%)

Table 8: LHD collision classification codes

This shows that the most common collision type for LHD HGVs in this dataset is 'overtaking or lane changing' with a majority of 66.7% of LHD cases.

The most frequent collision types for the RHD HGVs are in Table 9, with 'overtaking or lane changing' and 'rear end' collisions again being the most frequent, but with quite different proportions to LHD HGVs.

Category	Rear end	Overtaking or lane changing	Loss of control going off road
N° of RHD	62 (24.8%)	49 (19.6%)	33 (13.2%)

Table 9: RHD collision classification codes

For the RHD HGVs group, ‘loss of control’ is the third most common collision type, representing 13% of the sample. In the LHD HGVs group only 1.5% of the sampled collisions are best described by this category.

The alpha numeric code of the collision classification code is for the whole collision and not vehicle specific. It was therefore decided to use the judgement of the experienced investigator as to which collision participant had performed the most significant causal factor. Where this factor was decided to be connected to the HGV it was included in the following chart (Figure 13).

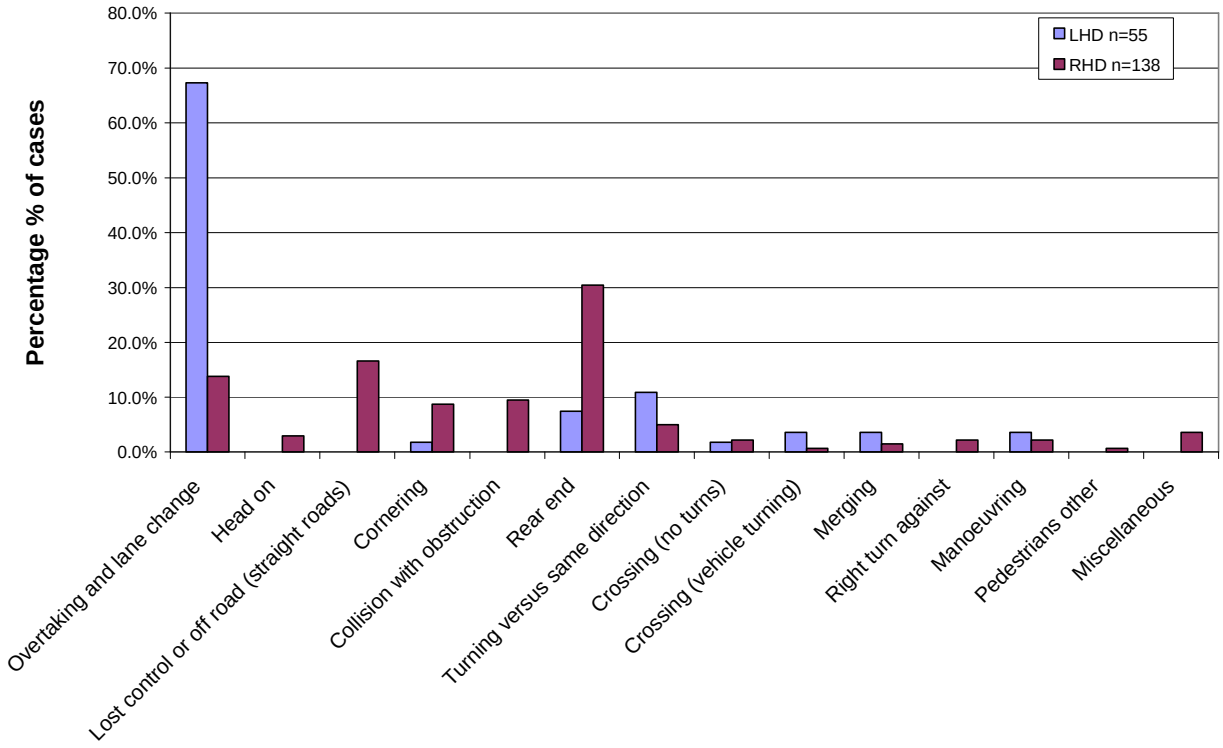

Figure 13: Collision classification code for HGV with significant factor vs. HGV type

The three most frequent collision types in the subset of only HGVs which have performed the most significant causal factor for the collision are shown in Table 10 for LHD HGVs and Table 11 for RHD HGVs.

Category	Overtaking or lane changing	Turning vs. same direction	Rear end
N° of LHD	37 (67.3%)	6 (10.9%)	4 (7.4%)

Table 10: LHD HGVs (with most significant causal factor) collision classification codes

Table 10 shows that the most common collision type for LHD HGVs in this subset of the data is 'overtaking or lane changing' with a majority of 67.3% of LHD cases, this is very similar to the complete dataset (Table 9). The number of LHD HGVs which performed 'turning vs. same direction' stayed the same in both the main dataset and the refined subset, however the percentage slightly increased.

The most frequent collision types for the RHD HGVs are shown in Table 11.

Category	Rear end	Loss of control going off road	Overtaking or lane changing
N° of RHD	42 (30.4%)	23 (16.6%)	19 (13.8%)

Table 11: RHD HGVs (with most significant causal factor) collision classification codes

For RHD HGVs 'overtaking or lane changing' and 'rear end' collisions are again in the top three most frequent, but with quite different proportions. The numbers and percentages have changed, with the percentage of cases being classed as 'loss of control going off road' increased.

In order to understand the type of accident scenarios both LHD and RHD HGVs are involved in the driver types have been split according to the driving action prior to the collision. The term move to the offside or nearside includes controlled lane changes and swerving actions.

N° of	Move to offside	Move to nearside	Rear end	Other
LHD (n=55)	47 (85.5%)	2 (3.6%)	4 (7.3%)	2 (3.6%)
RHD (n=138)	9 (6.5%)	27 (19.5%)	39 (28.3%)	63 (45.6%)

Table 12: Driver action, movement prior to collision

The results in Table 12 show that the majority of LHD HGVs move to the offside in the OTS sample, with 85.5% performing this manoeuvre, compared to only 6.5% of RHD HGVs performing the same action to the offside. It is interesting to note that a larger proportion of RHD HGVs are performing a manoeuvre to the nearside than offside, which may be due to the influence of blind spots.

The results in Figure 14 give the overall injury severity of the collisions involving LHD and RHD HGVs. Please note this is the overall accident severity and therefore includes all collision participants. As this severity is per accident the total number of LHD HGV cases is 64 accidents and RHD HGVs is 232 accidents.

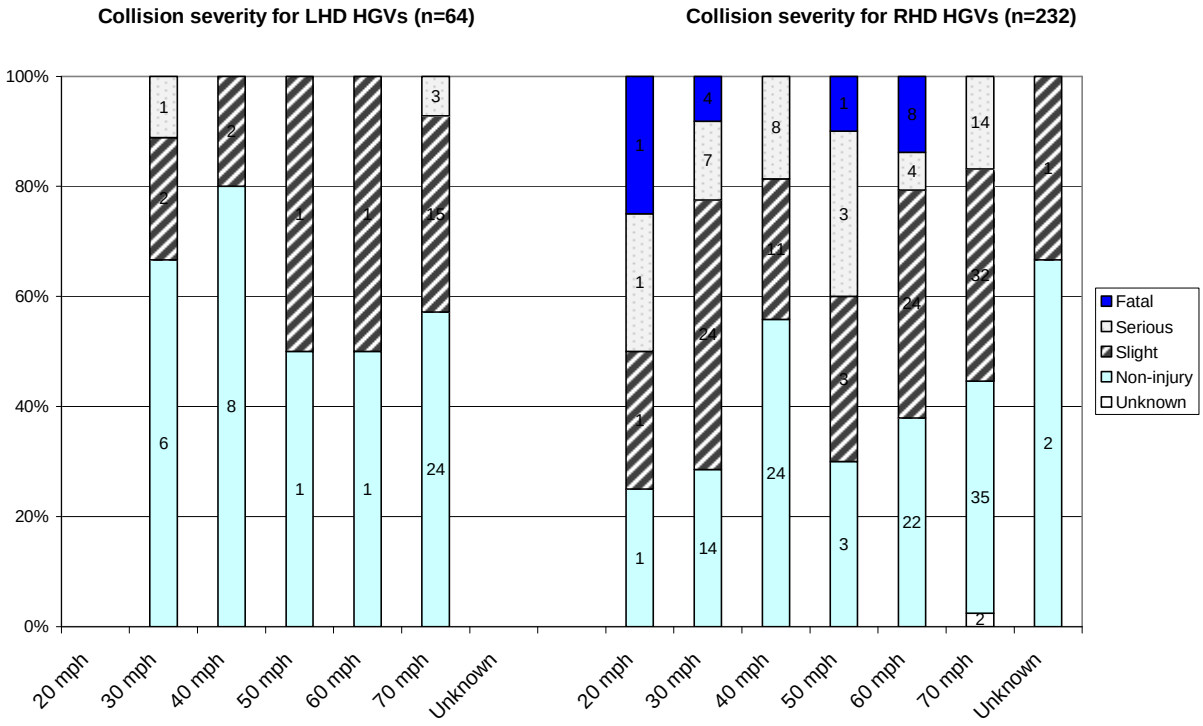

Figure 14. Accident severity vs. speed limit of road

Figure 14 shows that within the sample LHD HGVs are rarely involved in collisions of a severity outcome higher than 'slight'. Less than 8% of the LHD HGV collisions on 70mph roads are rated as serious compared to 14% of RHD HGV collisions. On 30mph roads, 11% of LHD HGV collisions have a severity rating higher than slight, however the sample is of limited size (slight n=2 and serious n=1). This compares to 25% of RHD HGV collisions resulting in at least one road user being killed or seriously injured (fatal n=4 and serious n=7).

The majority of collisions involving HGVs in this sample tend to be non injury for the driver of the HGV. Although there are some HGV driver injuries recorded, most are classified as slight. Results can be compared in Figure 15 and Figure 16 which depicts the accident injury severity for the HGV driver only, for LHD (n=65) and RHD (n=250) HGVs.

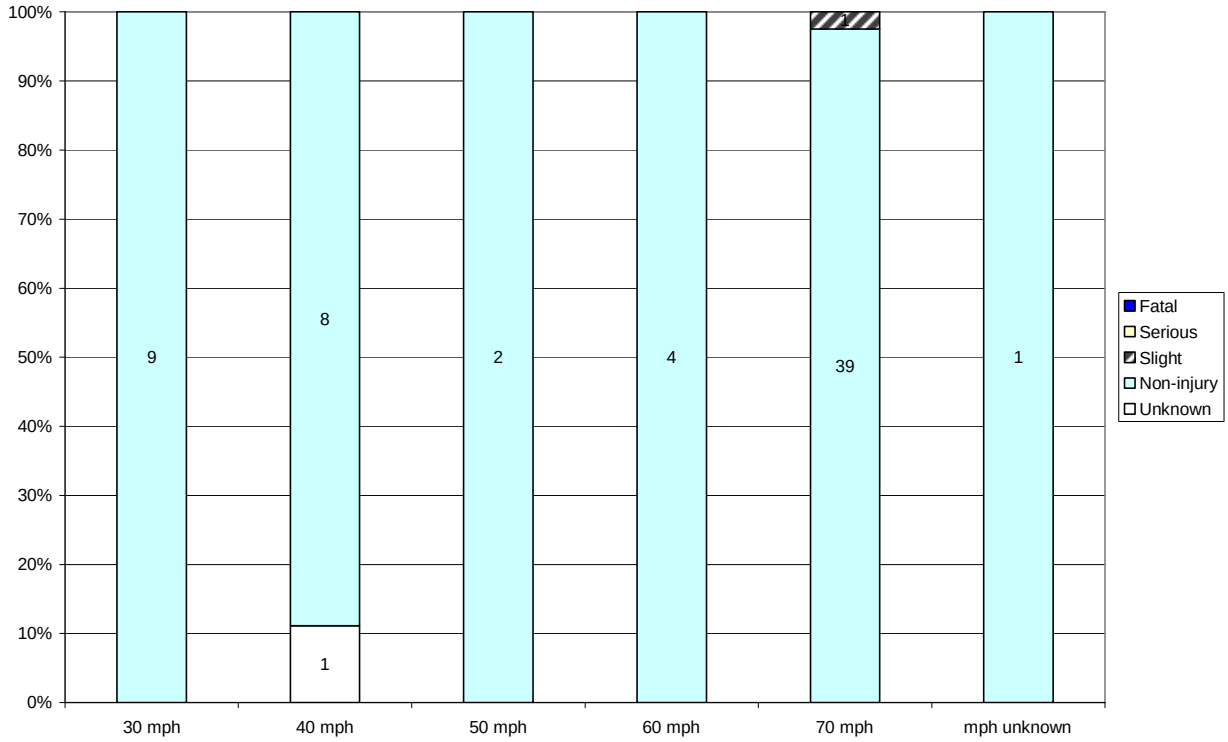

Figure 15: LHD HGV (n=65) driver severity vs. speed limit of the road

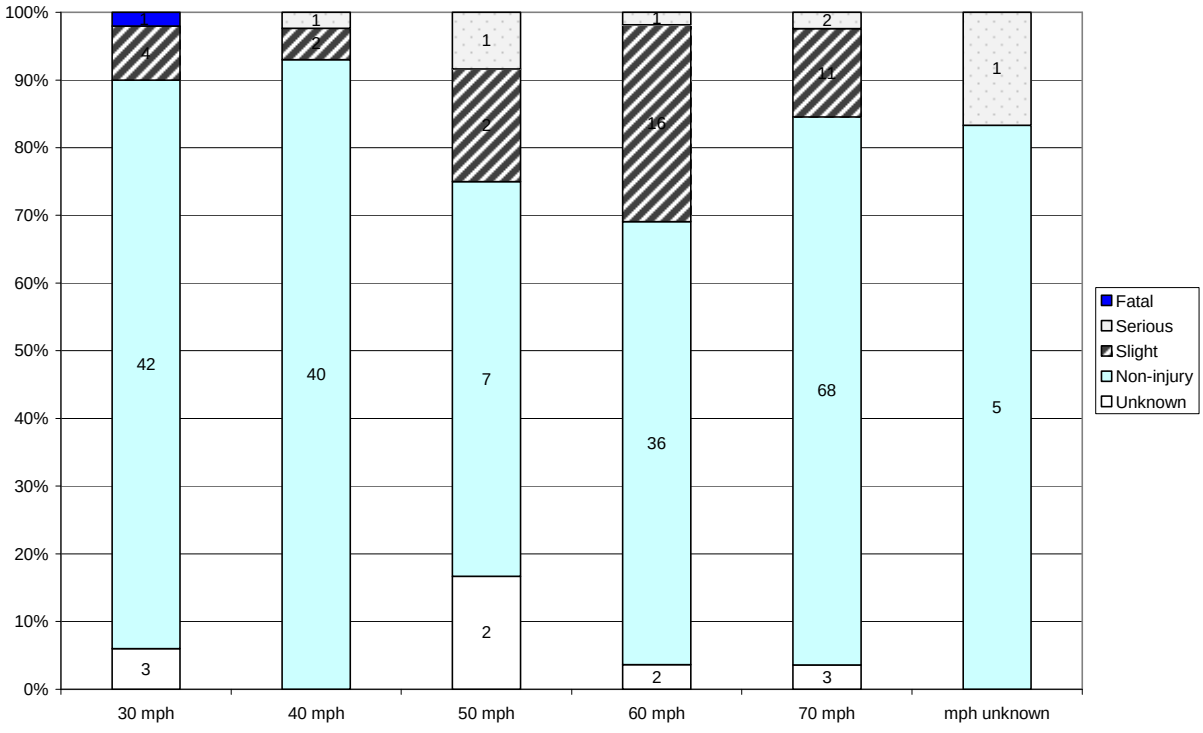

Figure 16: RHD HGV (n=250) driver severity vs. speed limit of the road

Only one LHD HGV driver is recorded as suffering a slight injury, with the vast majority, 97%, of LHD HGV drivers in this sample being recorded as non-injury (Figure 15). In contrast to this just over 17% of RHD HGVs drivers in this sample are

recorded as having an injury severity of slight or higher, with 7% being killed or seriously injured (Figure 16).

5.3. Collision Causes

OTS utilizes a variety of systems for evaluating the causes of accidents of which three are explored by the present report:

- Accident Causation system;
- Contributory Factors 2005;
- Human Interactions.

The systems are introduced and results are presented for each below, with emphasis on accident causation. In order to best understand the collision causation mechanisms the results shown focus on the HGVs which had performed the most significant causal factor as determined by the experienced collision investigators.

5.3.1. The Accident Causation System

This section presents a comparison made between LHD and RHD HGVs by considering the OTS Accident Causation System. The factors in this system are split into two categories, the 'precipitating factor' and the 'contributory factors' (see Appendix 11.2 for the Accident Causation System code sheet). For the purpose of this report only the precipitating factors have been presented to show the distribution of the directly precipitative factors. The analysis on the more specific causal factors have been analysed using the Contributory Factors 2005 System later in the report.

Only one precipitating factor can be selected for each case from a list of 15. The selected factor is the principle causation factor which the investigation team believe directly precipitated the occurrence of the collision. This system was devised by TRL in 1995 and adopted by 18 police forces in 1997 as a pilot study. It was used until 2005, when a revised coding system by Southampton University was adopted nationally. This system has remained as part of the OTS coding system which is coded independently from any police investigation by the OTS investigation team.

The analysis of precipitating factors used accidents where the precipitating factor had been linked to the HGV and not any other collision participant.

Figure 17 gives the distribution of precipitating factors for LHD HGVs based on the sample of 55 HGVs which are responsible for the precipitating factor in the accident. Figure 18 does the same for RHD HGVs with a sample size of 138 HGVs.

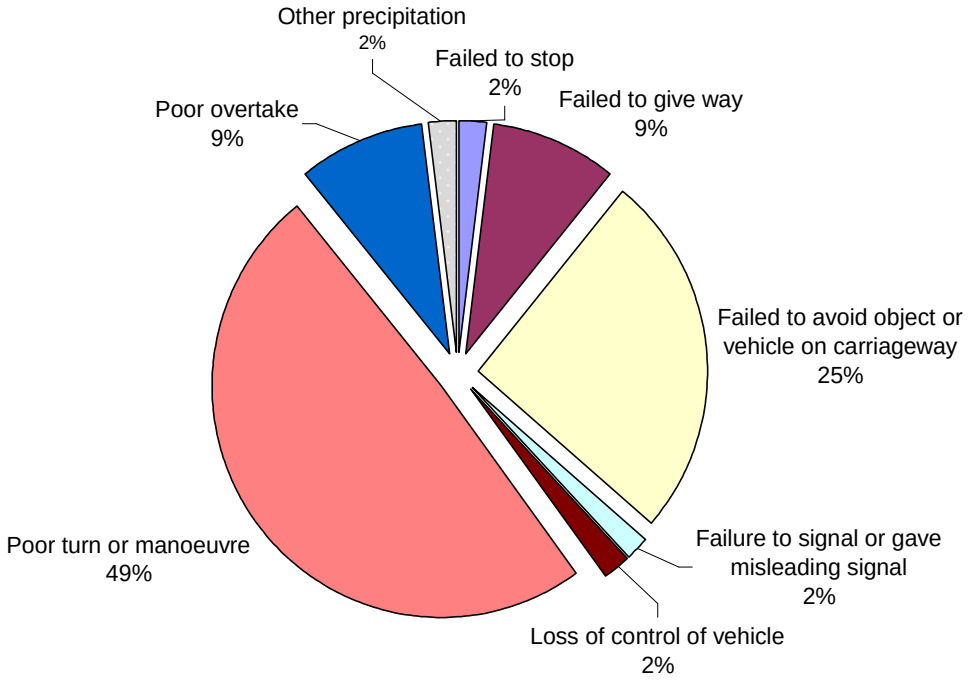

Figure 17: Precipitating factors for LHD (n=55) HGVs

Figure 17 clearly shows the largest proportion, 49%, of LHD HGV collisions are coded as a 'poor turn or manoeuvre' (n=27) and the next most frequent precipitating factor is 'failed to avoid object or vehicle' at 25% (n=14).

Figure 18 gives the distribution of the precipitating factors for the138 RHD HGVs in the sample, where the precipitating factor in the accident is attributed to them.

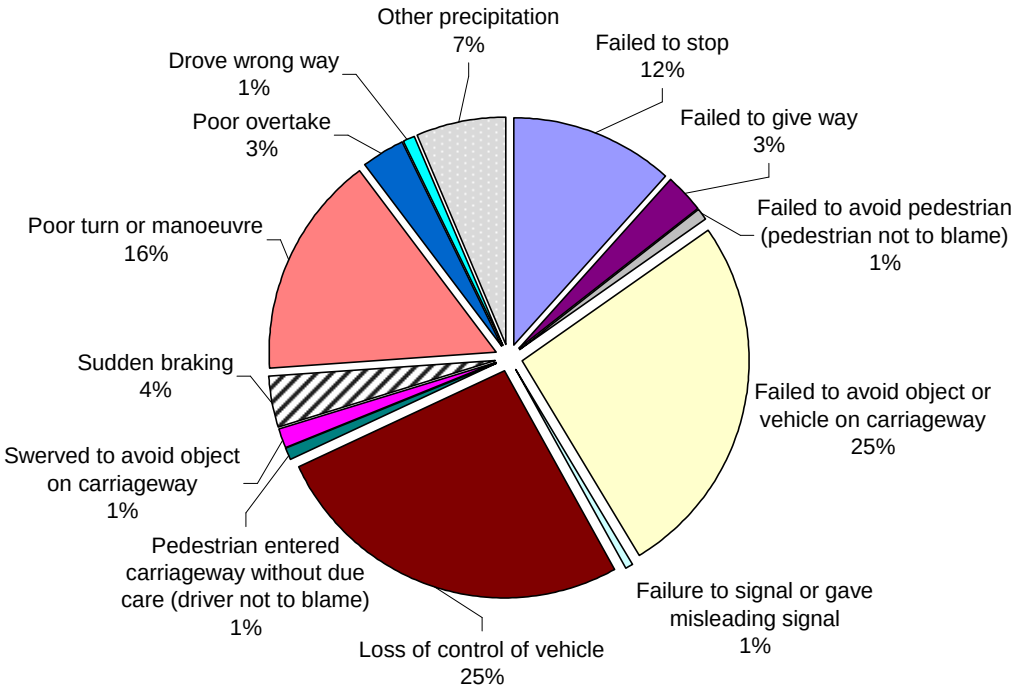

Figure 18: Precipitating factors for RHD (n=138) HGVs

The two largest sub groups in Figure **18** are 'failed to avoid object or vehicle' (25% n=36) and 'loss of control' (25% n=36), the third most frequent factor is 'poor turn or manoeuvre' (16% n=22).

5.3.2. The Contributory Factors 2005 System

The contributory factors 2005 system uses 3 digit numeric codes. This system was developed following a review of 'precipitating and contributory factors' conducted at Southampton University[25]. These codes have been adopted nationally by police forces since 2005 and completed for all police reported collisions, with data on injury accidents reported in STATS19. For the OTS project these codes are used and completed in isolation from the police investigation in order for the OTS investigation to remain independent.

The codes are determined by experienced OTS investigators after all the evidence from each collision has been gathered. The Contributory Factors 2005 code can be assigned with a confidence level of ‘very likely’ or ‘possibly’ (see Appendix 11.3 for Contributory Factors 2005 system code sheet). There can be a maximum of 6 codes assigned to each collision therefore a single vehicle could have multiple codes assigned to it. For this reason in the results presented below in the charts the total number of codes is a higher figure than the number of vehicles reviewed.

In order to compare the contributory 2005 factors for LHD and RHD HGVs it is important to understand the proportion of HGVs which have been attributed with a factor so they can be included in the analysis. The results in Table 13 are the proportion of LHD and RHD HGV drivers which have at least one contributory factor (2005 system) attributed to them out of the whole HGV sample.

Driver of HGV:	No Contributory Factor	At least One Contributory Factor	% with Factor
LHD n=65	8	57	88%
RHD n=250	96	154	62%

Table 13: Proportion of all HGV drivers who have at least one contributory factor attributed to them in accidents

It is clear that when LHD HGV drivers are involved in some way in an accident they are more likely to have a contributory factor attributed to them than RHD HGV drivers, 88% compared to 62%.

The distribution of contributory factor codes presented in Figure 19 and Figure 20 gives the proportion of HGV drivers that had a particular factor attributed to them. Only drivers that had performed the most significant causal factor (LHD n=55 and RHD n=138) are included. Figure 19 shows the all the utilised factors by the OTS investigation team for the LHD HGV accidents. For clarity Figure 20 shows the top 27 factors used by the investigation teams.

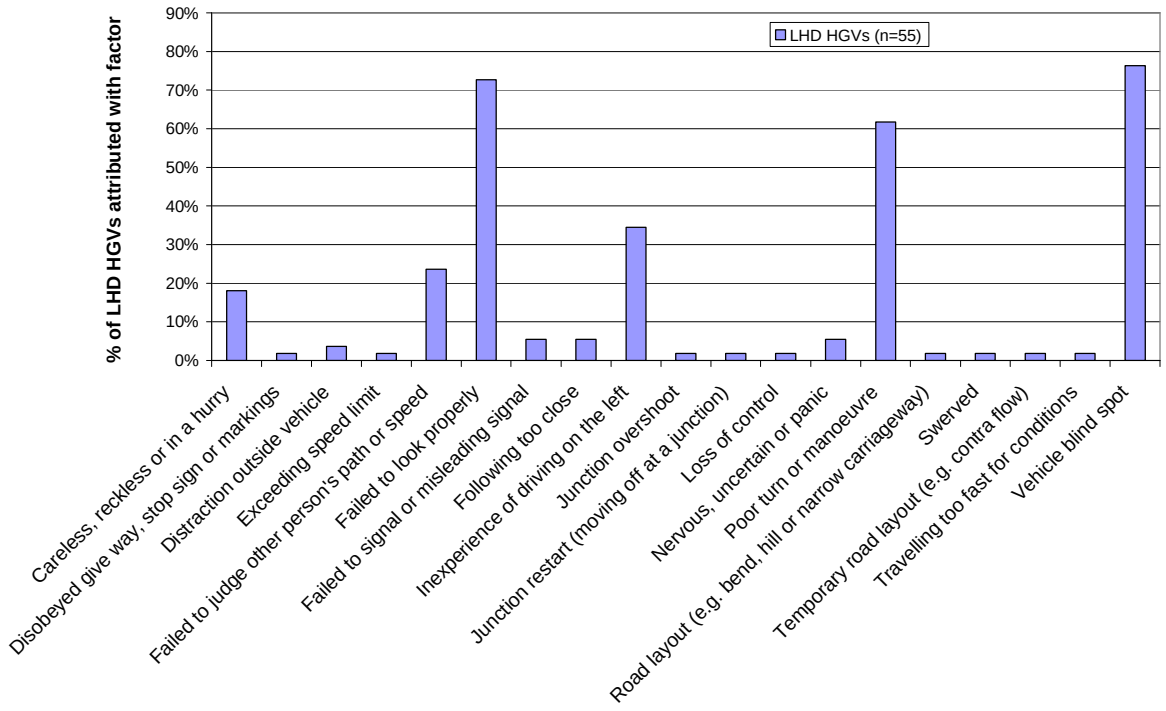

Figure 19: Contributory factors for LHD HGVs

The three highest proportions are outlined in Table 14, with the two most frequent demonstrating that the vision the driver is afforded is an issue when driving a LHD HGV on the UK network. Also included is a fourth factor of interest to the topic in hand 'inexperience of driving on the left'.

Contributory factors (2005 system)	Vehicle blind spot	Failed to look properly	Poor turn or manoeuvre	Inexperience of driving on the left
Number of LHD	42 (76%)	40 (72%)	34 (61%)	19 (35%)

Table 14: LHD HGVs contributory factors 2005

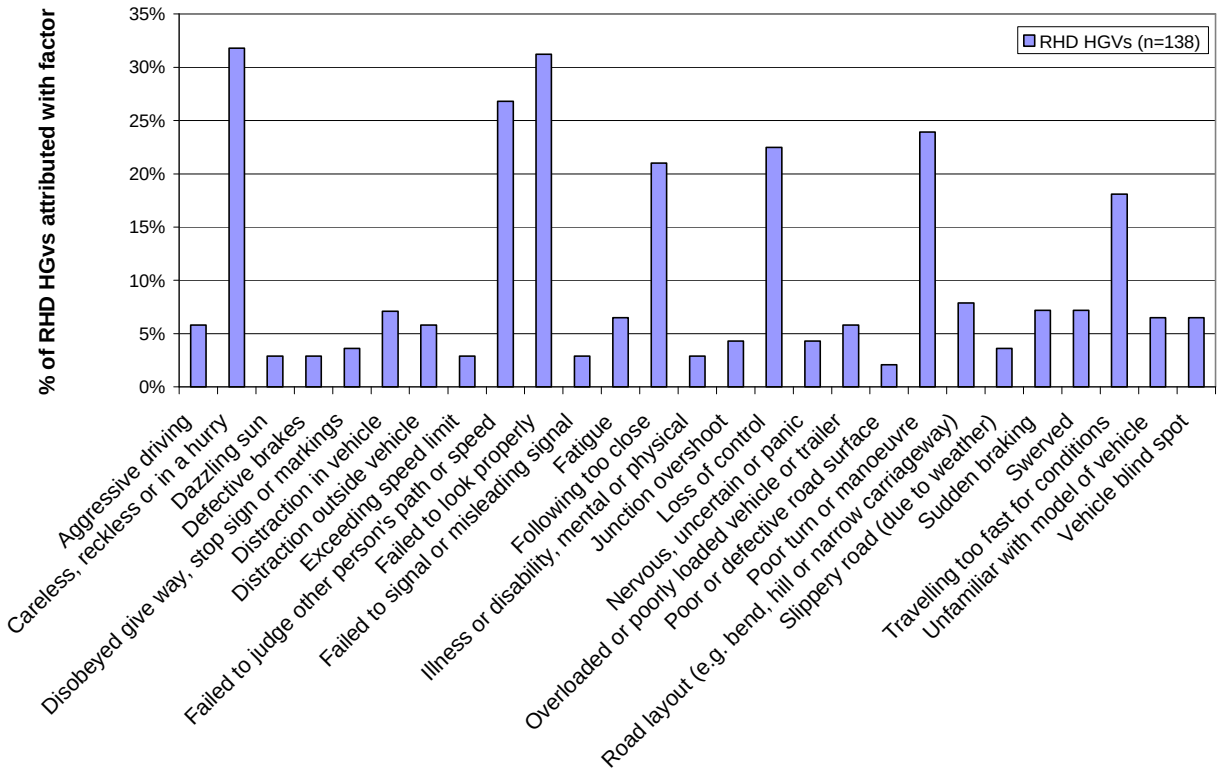

Figure 20: Contributory factors for RHD HGVs

The three highest proportions for RHD HGVs are outlined in Table 15.

Contributory factors (2005 system)	Careless, reckless or in a hurry	Failed to look properly	Failed to judge other person's path or speed
Number of RHD	44 (32%)	43 (31%)	34 (25%)

Table 15: RHD HGVs contributory factors 2005

Although driver vision is still an issue other driver behaviour traits are more frequent for RHD HGVs.

5.3.2.1. Further Analysis of Contributory Factors 2005

To examine accident causation in conjunction with collision scenarios the data has been filtered according to the most frequent collision classification code (presented in Table 8 for LHD HGVs and Table 9 for RHD HGVs earlier in the report). The results in Figure 21 and Figure 22 give the percentages of LHD and RHD HGVs which are attributed particular contributory factors (y axis), by the most frequent collision classification codes (x axis). The results in Figure 21 and Figure 22 show all the contributory factors used by the investigators for LHD and RHD HGVs.

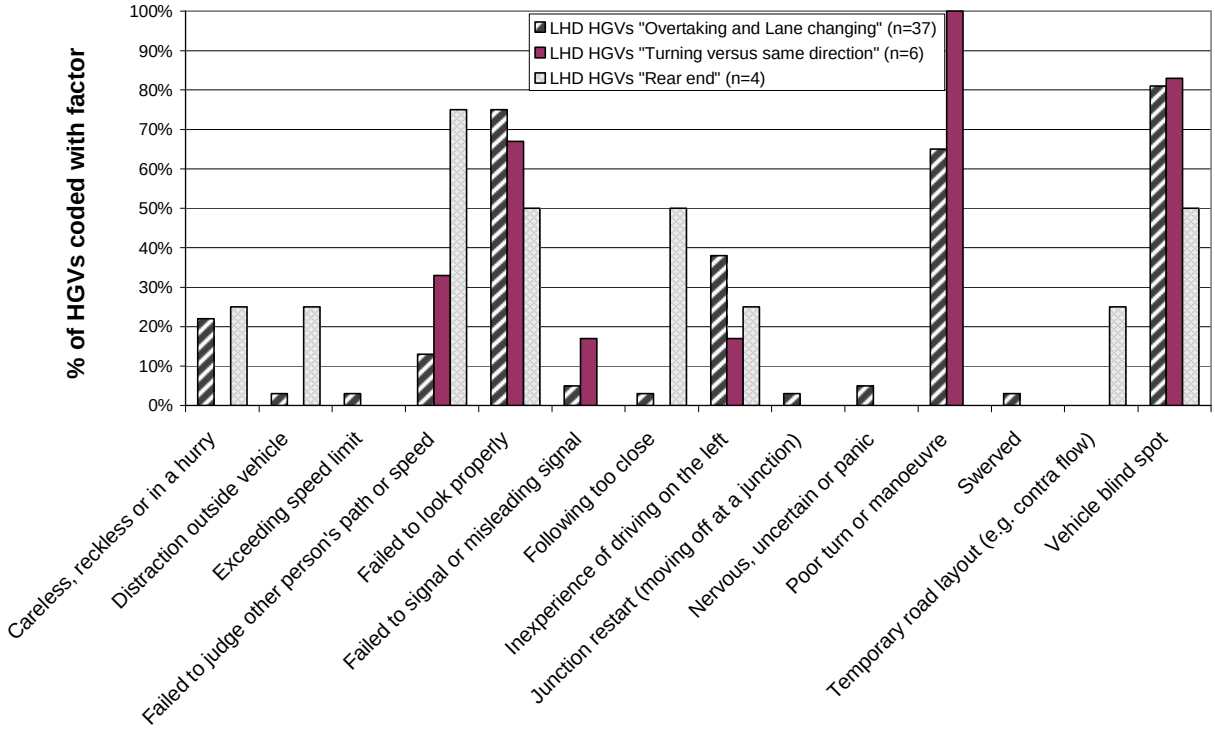

Figure 21: LHD HGVs contributory factor codes 2005 vs. most frequent collision classification codes

It can be seen in the chart that 100% of the LHD HGVs involved in a 'turning versus the same direction' type collision (n=6) are coded as performing a 'poor turn or manoeuvre' but ‘failing to look properly’ and ‘vehicle blind spot’ also feature.

In all three collision classification types, 'overtaking and lane changing' (n=37), 'turning versus same direction' (n=6) and 'rear end' (n=4) collisions the Contributory Factors 2005 code 'vehicle blind spot' features strongly with 81%, 82% and 50% of HGVs coded with that factor respectively.

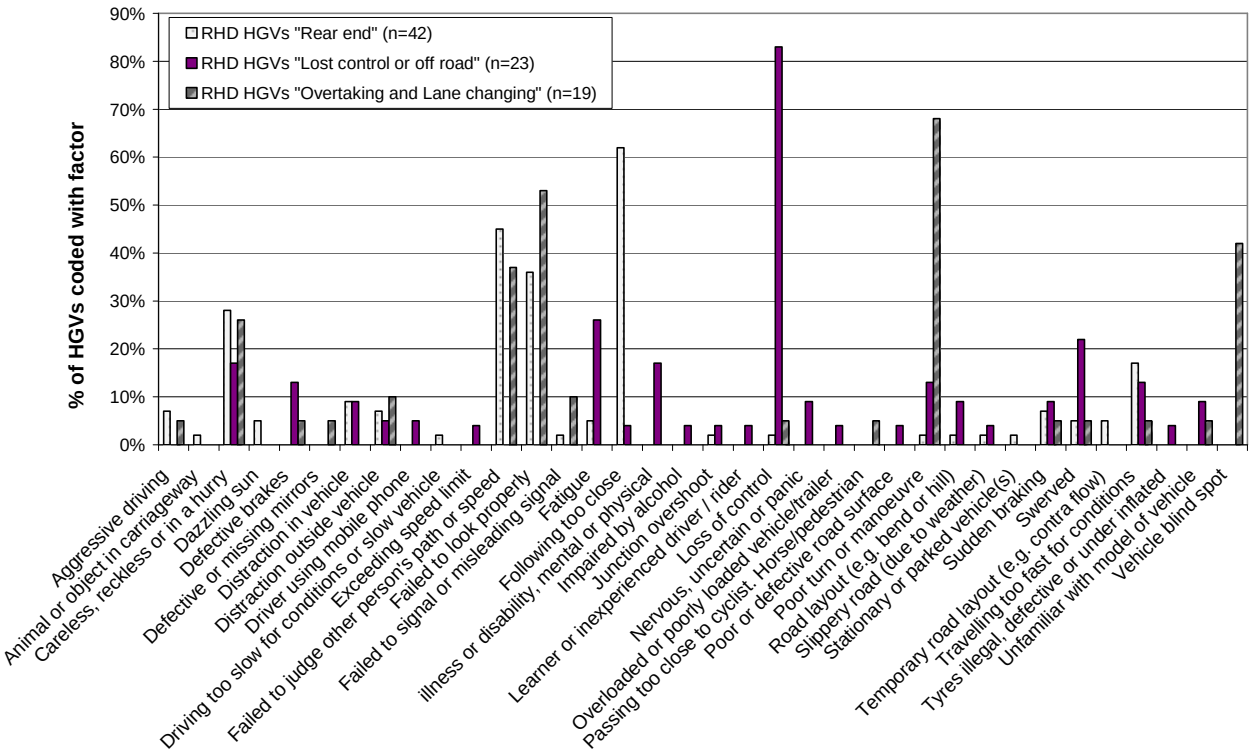

Figure 22: RHD HGVs contributory factor codes 2005 vs. most frequent collision classification codes

The results for RHD HGVs in Figure 22 show that for 'overtaking and lane changing' type collisions (for which there are 19 RHD HGVs) the contributory factor 'poor turn or manoeuvre' is coded for 68% of drivers. This is similar to LHD HGVs.

Although the factor 'vehicle blind spot' does not feature in 'rear end' or 'lost control or off road' type collision it is coded in just over 40% of 'overtaking or lane changing' type collisions for RHD HGV drivers.

The majority of the LHD HGV collisions involve contributory factors which are part of the driver action or experience categories compared to the RHD HGV collisions which also include injudicious action and road environment factors.

5.3.3. The Human Interactions System

Each active road user involved in a collision is assigned an OTS Interaction Code; this code is used to show how this road user has interacted with other road users, vehicles or elements of the road environment (highway). There are 7 categories of interaction: legal, perception, judgement, external factor, conflict, attention and impairment. These categories are then sub-divided into specific interaction codes, giving further information in a 3 digit code. This system was developed at the start of the OTS project and has been used throughout the project for all active road users[24]

(see Appendix 11.4 for Human Interactions System code sheet). Each active road user, or in this case driver, will be attributed at least one interaction code but multiple codes can be attributed to the same driver.

Figure 23 and Figure 24 show an overview of the interaction codes involved in HGV collisions in the OTS database. The charts show the most common interaction codes for the LHD and RHD HGVs which have performed the most significant causal factor. As each driver can be assigned several codes in order to best describe the causal factors only the most frequent codes have been displayed. For clarity Figure 23 gives all the utilised interaction codes for LHD HGVs in the OTS sample. For clarity Figure 24 gives the top 19 interactions codes used for RHD HGVs as a comparison to LHD HGVs.

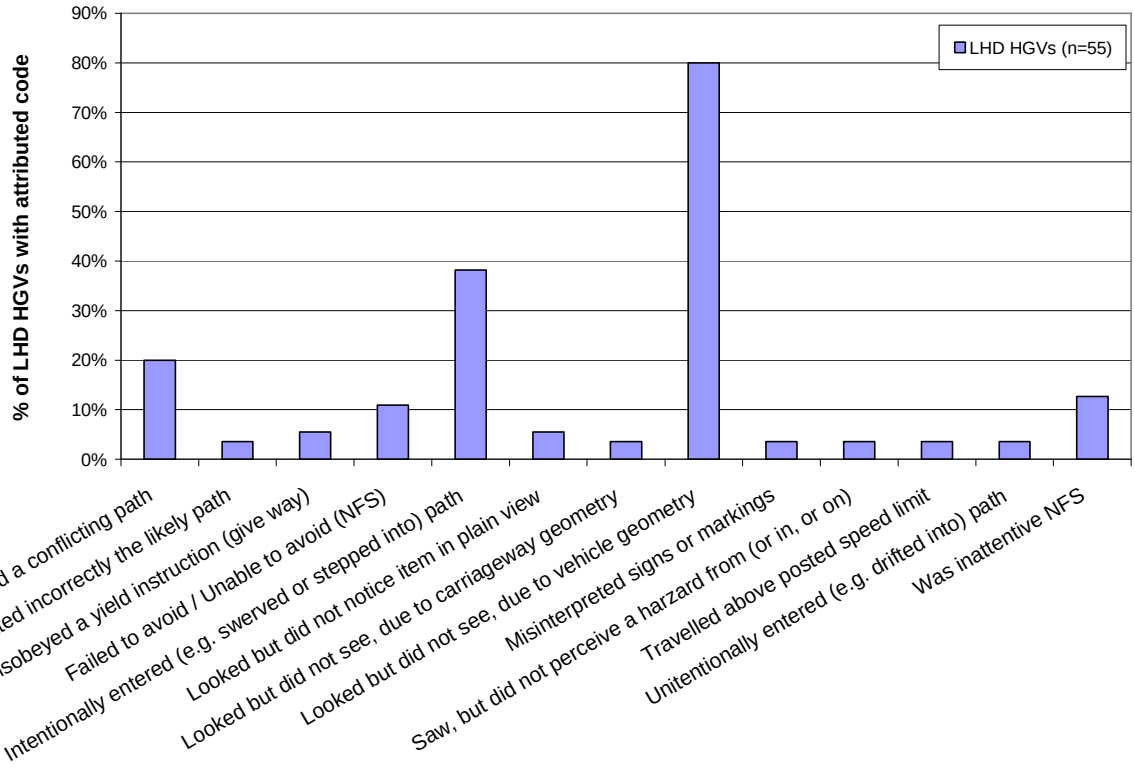

Figure 23: Most frequent interaction codes for LHD HGVs

Figure 23 displays that the two actions which especially indicate driver actions for LHD HGVs are the code 'looked but did not see, due to vehicle geometry (e.g. blind spot, windows)' and the code 'intentionally entered into path of (e.g. swerved)'.

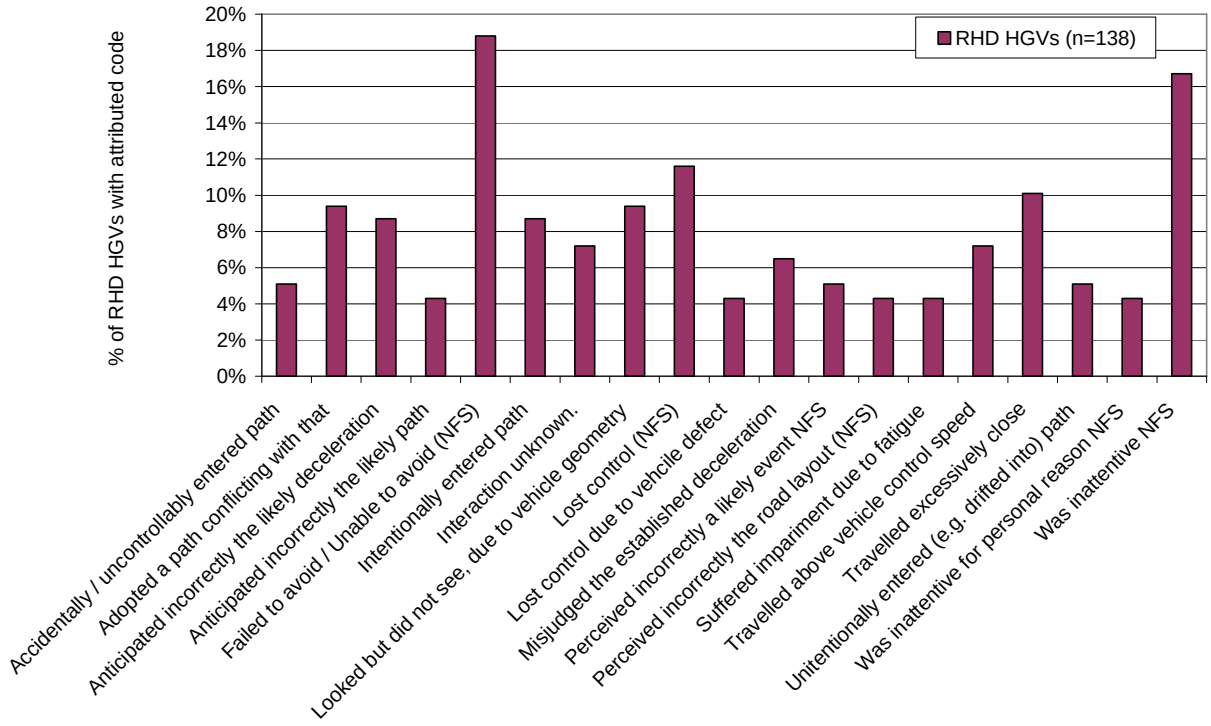

Figure 24: Interaction codes for RHD HGVs

Figure 24 displays that the two actions which especially indicate driver actions for RHD HGVs are the code 'failed to avoid / unable to avoid (NFS)' and 'was inattentive NFS'.

5.3.3.1. Further Analysis Using Interaction Codes

In order to compare and contrast the interaction codes for LHD and RHD HGVs it was decided to examine the interaction codes after selecting by the three most frequent contributory factors (2005 system) for LHD HGVs (shown in Table 14). The same factors are then used to select the RHD HGVs as a comparison. For both LHD and RHD HGVs only the vehicles which had been deemed to have performed the most significant causal factor were selected (LHD n=55, RHD n=138).

The results in Figure 25 and Figure 26 show the interaction codes for LHD and RHD HGVs split into the three subgroups of contributory factors as outlined in Table 16. ‘Inexperience of driving on the left’ is also included as it is of particular interest.

Contributory factors 2005 code	Vehicle blind spot	Failed to look properly	Poor turn or manoeuvre	Inexperience of driving on the left
Number of LHD	42	40	34	19

Table 16: LHD HGVs contributory factors 2005

The results displayed in Figure 25 show all the selected interaction codes utilised by the investigators for LHD HGVs, whilst for clarity Figure 26 shows the top 37 interactions codes selected by contributory factor for RHD HGVs.

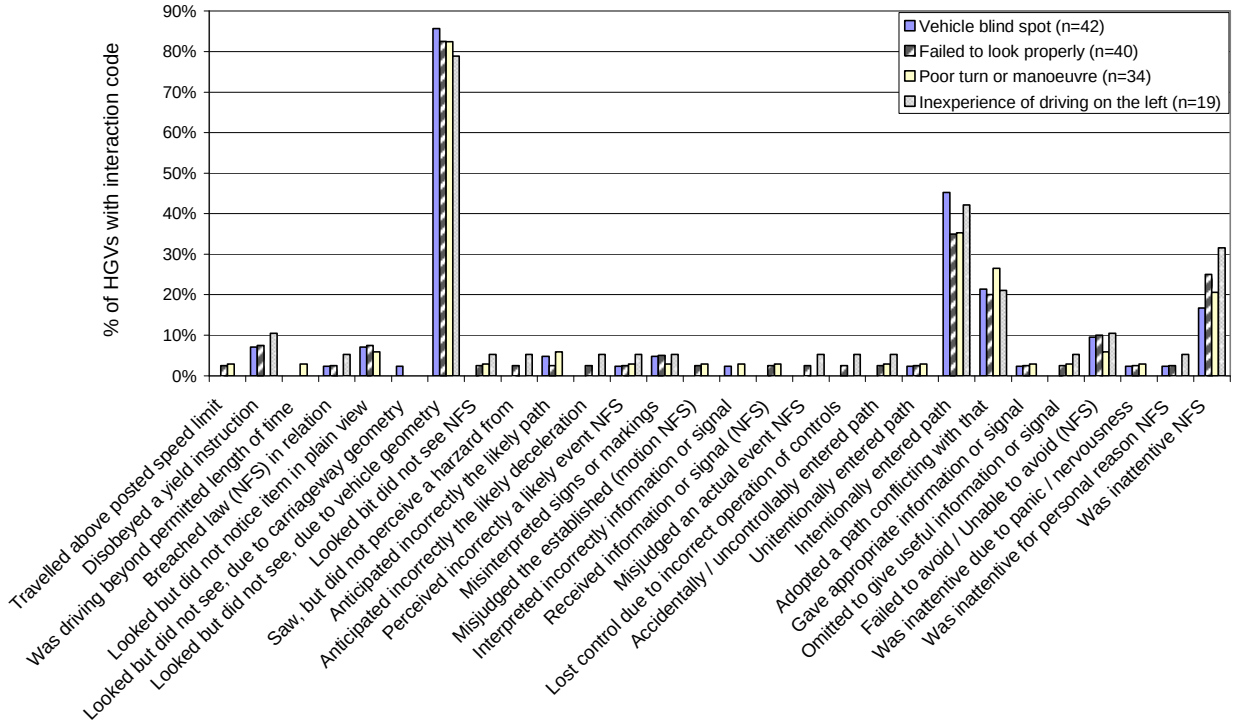

Figure 25: LHD HGVs interaction codes selected by contributory factors

It is apparent from Figure 25 that the interaction code 'looked but did not see, due to vehicle geometry' is the most significant interaction code in the data series. Interaction codes aimed at the vehicle's positioning on the carriageway and driver behaviour are coded frequently, for instance 'intentionally entered path' and 'adopted a conflicting path'.

Figure 26 shows the proportion of RHD HGVs which have been attributed interaction codes, also selected using the most frequent contributory factors for LHD HGVs as outlined in Table 16. The fourth contributory factor of 'inexperience of driving on the left' has not been displayed as there is only one vehicle with this factor in the RHD HGV sample.

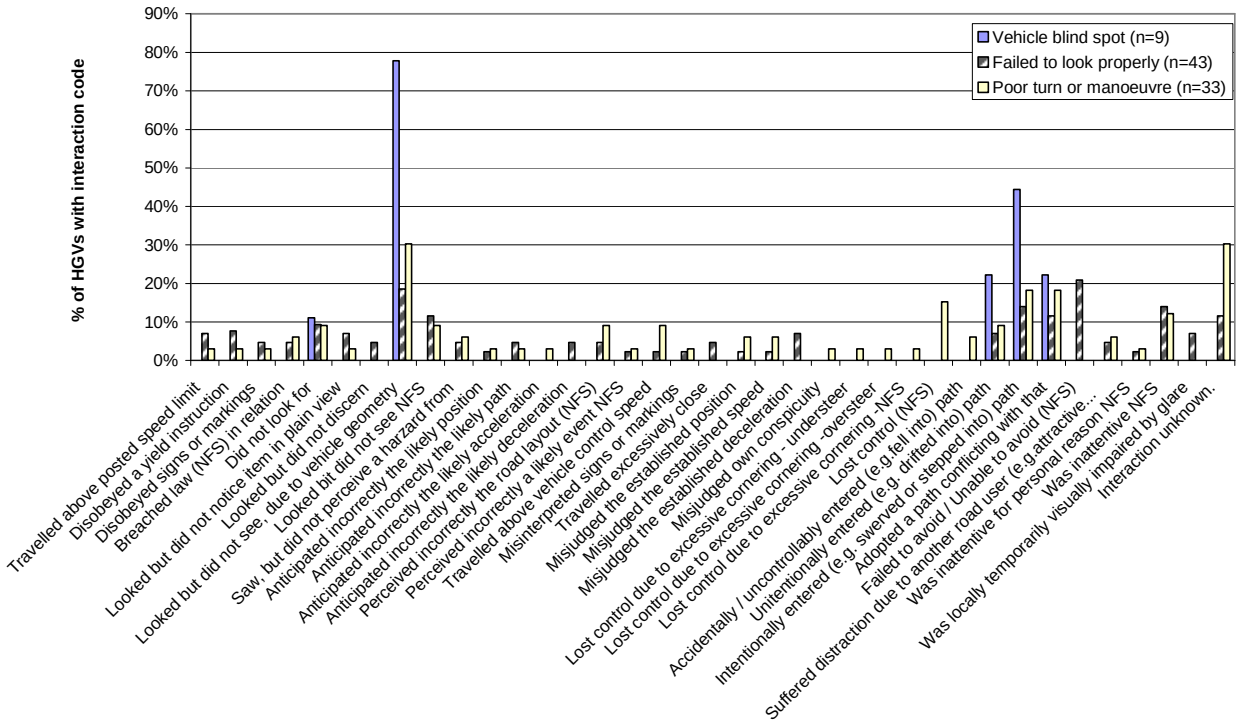

Figure 26: RHD HGVs interaction codes selected by contributory factors

In comparison Figure 26 shows the proportion of interaction codes for RHD HGVs using the selected contributory factors. The distribution of the interaction codes is similar for the LHD and RHD HGVs. There is a higher proportion of interaction codes for RHD HGVs amongst the 'perception' and 'judgement' categories with codes such as 'anticipated incorrectly the likely deceleration' and 'travelled excessively close to'.

6. INTERVIEWING FOREIGN DRIVERS

6.1. Interview Procedure

An aim of this study is to increase the number and depth of interviews with foreign drivers to increase the level of understanding regarding this type of accident within OTS. This is achieved by conducting on scene interviews using a service known as 'Language Line' a translation service for foreign drivers, according to the new protocol outlined in the Methodology (section 3.2).

As each semi-structured interview progressed, the answers given provoked additional questions and lines of enquiry. Each interview is recorded in note form at the time of the interview on scene and written up later. Due to the nature of on-scene investigation the questions cannot be too complex or personal, therefore the aim of the questions is to establish background information and driver experiences rather than specific information regarding that accident, which may be traumatic for the participant at the time.

In order to demonstrate the level of detail returned by the interview methodology, the responses of the four drivers interviewed to date are presented in this report as case examples. The accident scenario and causation have also been included as background information.

One of the four participants was a foreign driver in a RHD HGV. The driver had been living in the UK for the past 5 years and was employed as an HGV driver, however the driver spoke very little English so the translation service was required. The interview is therefore included in this report.

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6.2. Interviews using Language Line

6.2.1. Case 1: Driver from Bulgaria

Evening, February

A red and white left hand drive Volvo HGV (path 1 vehicle 1) drove onto a roundabout from lane 1 of a slip road and into lane 2 of the roundabout. A silver Peugeot 206 (path 1 vehicle 2) travelling along lane 2 of the slip road into lane 2 of the roundabout was in collision with the HGV as it pulled across into lane 2. This resulted in a side swipe collision causing damage to the nearside of the car.

Collision classification letter:	Turning versus same direction
Precipitating factor:	Failed to avoid object or vehicle on carriageway
Contributory factors 2005:	Junction restart (possibly)
	Failed to look properly (likely)
	Failed to judge other persons path (possibly)
	Inexperience of driving on the left (possibly)
Human interaction system:	Looked but did not see due to vehicle geometry

Driver's Interview Comments:

Please give a description of what happened and why the collision occurred?

The driver was from Bulgaria. The driver stated that he approached the roundabout in lane 1 and he was intending to turn right to go and make a delivery. The driver said he pulled onto the roundabout and started to turn right, he said that as he did this he must have changed from lane 1 into lane 2. He didn't see another vehicle. The HGV driver stated that he thought the other vehicle came along the side of him and cut him up. He didn't see the other vehicle until he felt the impact.

Did the driver see the other vehicle before the collision? Why didn't they see it?

The HGV driver said he did not see the other vehicle at all until after the impact. The driver said he was bent to the left as that's how the approach to the island makes the vehicle bend.

How long have they been driving for today?

The driver had only been driving for 1.5 hours, he had the co-driver in the passenger seat and they were sharing the driving in order to reduce the down time of the vehicle.

Is this the driver's first time to the area? Do they know where they are going?

It was his first time to this area of the UK. He mainly operated in the South of the UK prior to this visit. During this visit he had been in the North and the Midlands before heading back. The driver said he had 'SatNav' in his cab but also maps just in case they got lost.

How often do they drive in the UK per year?

- 0--3 times
- 4--8 times
- 8--12 times
- 12 times or more Yes

He drives regularly in the UK, he has been driving since 1970 and is 55 years of age, and he classes himself as a seasoned driver both abroad and in the UK. On average 2 to 3 times a month.

How long have they been driving for in the UK for this journey to the UK? (short/long trip)

The driver had been to Leeds and Birmingham and was making his last drop in Nottingham before going back to Bulgaria. He had been here for just over 1 day and was only planning on being in the UK for 2 days.

Did the driver receive any training or tuition on driving on the left prior to driving in the UK?

Yes, he had received instruction prior to driving in the UK for driving on the left. This had been provided by his haulage company which also included his first few trips to the UK being accompanied by an experienced driver who was used to driving on the left. He has been driving in the UK for a number of years and he has also accompanied numerous drivers to the UK who didn't have the experience.

Have they been involved in an HGV collision before in their own country or in the UK? Have they had any similar collisions before?

The driver said he has never been in a collision before and this is his first crash ever in any country and he had been a Bulgarian Police officer before becoming a lorry driver.

The driver also added that he was aware that there is a blind spot on his vehicle due to it being left hand drive, however he thought that he had checked behind him on the approach to the roundabout and it was clear therefore he did not expect anything to be the blind spot.

His company's tuition for drivers coming to the UK is standard and all drivers must pass it before coming to the UK.

6.2.2. Case 2: Driver from France

Afernoon, March

A foreign LHD HGV (path 1 vehicle 1) failed to stop behind a silver Vauxhall Astra (path 1 vehicle 2) as the car slowed to turn right into a side road. The driver of the HGV said the driver of the car did not indicate and so he reacted late, not knowing the vehicle intended to turn.

Collision classification letter:	Rear end
Precipitating factor:	Failed to stop
Contributory factors 2005:	Travelling too fast for conditions (possibly)
	Failed to look properly (likely)
	Failed to judge other persons path (likely)
	Following too close (likely)
Human interaction system:	Looked but did not notice item in plain view
	Anticipated incorrectly likely position of other vehicle

Driver's Interview Comments:

Please give a description of what happened and why the collision occurred?

The driver was from France. The driver stated that he was following the vehicle in front when she suddenly stopped and tried to turn right. He said that she didn't indicate at all just suddenly stopped and he had no where to go.

Did the driver see the other vehicle before the collision? Why didn't they see it?

The driver said he had been following the vehicle for some time so yes he knew it was there he just didn't expect her to stop in the middle of the road trying to turn right without indicating. He didn't see her partly pull into a right turn lane or see the right turn lane itself.

How long have they been driving for today?

The driver stated he had all his allotted breaks and had been driving for 3 hours and 6 minutes, he checked on his chart.

Is this the driver's first time to the area? Do they know where they are going?

No the driver was very familiar with the area having driven in the area a few times before and he knew where he was going.

How often do they drive in the UK per year?

- 0--3 times
- 4--8 times
- 8--12 times
- 12 times or more Yes

Yes, the driver says he comes to the UK most weeks and at least 4 times a month as some weeks he may make two short trips.

How long have they been driving for in the UK for this journey to the UK? (short/long trip)

He usually comes for a week at time to the UK, and he had been 4 days and was going back the next day. (This would mean he was in the UK Monday to Friday)

Did the driver receive any training or tuition on driving on the left prior to driving in the UK?

Yes, his company made him have a substantial amount of training before driving in the UK. It was 4 months of training driving around the UK being mentored for his driving style and understanding of the UK roads. This also had a 3 week training course on driving on the left.

Have they been involved in an HGV collision before in their own country or in the UK? Have they had any similar collisions before?

He has been involved in one other collision in the UK which was about a year previous. It was on the Motorway and he had changed lanes not seeing a car overtaking him.

He didn't see how this accident was his fault as the lady in front didn't indicate and even though there was a right turn lane she didn't pull all the way into it so he clipped the rear of her car.

6.2.3. Case 3: Driver from Romania

Evening, February

A foreign LHD HGV (path 1 vehicle 1) entered a roundabout and failed to see a red Volvo S40 (path 2 vehicle 1) which was already on the roundabout but in the blind spot of the HGV. The two vehicles collided on the roundabout in a side swipe type collision.

Collision classification letter:	Merging
Precipitating factor:	Failed to giveway
Contributory factors 2005:	Disobeyed give way or stop sign (likely)
	Failed to look properly (likely)
	Failed to judge other persons path (likely)
Human interaction system:	Looked but did not see due to vehicle geometry
	Looked but did not see (NFS)

Driver's Interview Comments:

Please give a description of what happened and why the collision occurred?

Driver was from Romania. Driver stated that he was entering the junction (roundabout) and did not see another vehicle. He then felt something so pulled to the side of the road and a car had hit the side of him. He said that he didn't see the car at all and thought he may have been going too fast.

(The investigation found no evidence that the car was going above the speed limit and the impact damage was minimal suggesting a low energy impact)

Did the driver see the other vehicle before the collision? Why didn't they see it?

The driver said he didn't see the other vehicle at all prior to the accident, thought the junction was clear.

How long have they been driving for today?

The driver had been driving for about 2.5 hours and was approximately half way to his destination.

Is this the drivers first time to the area? Do they know where they are going?

This was the driver's first trip to the area and he didn't know the area or the area he was going to. He had a map and some directions and was following those. This was only his second trip to the UK.

How often do they drive in the UK per year?

- 0--3 times Yes (but could be more in future)
- 4--8 times
- 8--12 times
- 12 times or more

This was only his second trip to the UK, his first trip was only 2 weeks prior to the accident. He wasn't sure how many times he would be coming over the coming year, perhaps twice a month.

How long have they been driving for in the UK for this journey to the UK? (short/long trip)

The driver said he had been in the UK for 3 days and was going back in 2 days time after making 3 more drops and 1 more pick up of goods.

Did the driver receive any training or tuition on driving on the left prior to driving in the UK?

The driver said he had received some training in Romania before coming to the UK, not specifying any further information.

Have they been involved in an HGV collision before in their own country or in the UK? Have they had any similar collisions before?

The driver stated that he has been driving for 15 years and has not been involved in an accident before in the UK or his own country.

The driver thought this was down to his blind spot in his vehicle.

6.2.4. Case 4: Driver Originally from Hungary

The final on scene interview was actually a foreign driver in a RHD HGV. He had been working and living in the UK for 5 years after coming over from Hungary and spoke very little English.

Late Morning, August

A Citroen Berlingo (path 1 vehicle 1) moved off through red traffic signals in lane 2 following other vehicles also in lane 2. A LHD HGV (path 1 vehicle 2) moved off from the same traffic signals in lane 1. As the two lanes merged into one after the traffic signals the HGV and the Citroen were involved in a side swipe collision.

*Foreign driver of right hand drive HGV

Collision classification letter:	Overtaking or lane changing
Precipitating factor:	Poor overtake
Contributory factors 2005:	Failed to judge other persons path (possibly)
Human interaction system:	Failed to avoid / unable to avoid (NFS)

Driver's Interview Comments:

Please give a description of what happened and why the collision occurred?

Driver stated he was stationary at a red traffic light in the left lane and he saw the car in the right lane a few cars back, he thinks about 5 cars back. When the lights turned green he started off and the right lane merged into his, 4 cars had overtaken him before the lanes merged. The other car tried to squeeze past him between his truck and the bollard. There was nowhere the truck could go so he hit the rear side of the car.

Did the driver see the other vehicle before the collision? Why didn't they see it?

The driver said he saw the car when the lights were red and assumed he would have waited behind the truck when the lanes merged.

How long have they been driving for today?

Driver said he had started at 04:30am so he had being driving for 7 hours, he had stopped for breakfast for an hour at 9am. So had only being driving for 1.5 hours since his last break.

Is this the drivers first time to the area? Do they know where they are going?

He said he is familiar with the area and the route he was travelling as he drives this way 2-3 times per week. He has been on this route for some time, he thinks nearly 2 years.

How often do they drive in the UK per year?

- 0--3 times
- 4--8 times
- 8--12 times
- 12 times or more Yes

He has lived in the UK for 5 years and has been working as an HGV driver for the entire time.

How long have they been driving for in the UK for this journey to the UK? (short/long trip)

He is working full time as an HGV driver in the UK and has been for 5 years. But he has been an HGV driver for 35 years in total, 30 years back in Hungary, but he didn't drive to the UK at all then.

Did the driver receive any training or tuition on driving on the left prior to driving in the UK?

When he first came to the UK he had to pass a short training course before a company would employ him, this was 2 days a week for 3 weeks. Partly lecture and partly driving around in an HGV being assessed. He passed the course and has driven in the UK since.

Have they been involved in an HGV collision before in their own country or in the UK?

The driver wasn't involved in a single accident back in Hungary but has had 2 minor accidents in the UK in the past 5 years, he said that one was reversing into a driveway he hit a wall and the second was in general traffic.

Interview Progress and Conclusions

6.2.5. On-Scene Interviews

This aspect of the study has been hampered by an unexpectedly low number of LHD HGV accidents occurring during the response time of the OTS team. During the time frame allowed for this study 4 on-scene interviews were possible using the translation service.

These interviews have involved drivers from France, Romania, Bulgaria and Hungary, yielding a useful amount of detail and have identified some interesting points. For example, all drivers stated that they received training before coming to the UK on how to drive on the left and the French driver elaborated, saying that he was mentored by a co-driver for his first few trips, to ensure he was driving at an acceptable standard.

These interviews have assisted the development of this investigative procedure, but further interviews are required to enable informed conclusions to be drawn from the data.

The extended interview process does increase the length of time the investigation teams must spend on scene whilst keeping involved drivers at the roadside. The interviews conducted to date have taken between 25 minutes and 40 minutes to complete.

Also, this procedure detains the interviewing member of the investigation team, meaning others must collect all the physical evidence at the scene. Therefore this activity is resource consuming in both time and manpower.

6.2.6. Interview Results so Far

A summary of the answers given during the on-scene pilot study are given in Table 17. The information highlights the similarities in the answers between the 4 foreign drivers interviewed. The 4 drivers were from France, Romania, Bulgaria and Hungary and the drivers had varying experiences of driving in the UK but all had years of experience driving HGVs in their countries.

	Case 1	Case 2	Case 3	Case 4
Driving manoeuvre	Side swipe	Shunt accident	Merging	Merging
Familiarity with area	Unfamiliar	Familiar	Unfamiliar	Familiar
Driving time that day	1.5 hrs	3 hrs	2.5 hrs	7 hrs, 1.5 hrs since break
Frequency coming to the UK	3 times per month	4 times per month	Only 2nd trip	Now lives in UK
Duration of stay in UK	2 Days	5 Days	5 Days	Lived in UK for 5 years
Previous training	Company supplied extensive training	4 months company training	Some limited company training	3 week course in the UK
Previous collisions	No previous collisions	1 previous in UK, side swipe on Motorway	No previous collisions	2 since being in the UK, non in own country
Blind spots	Thought checked the blind spot	Didn't see rear of the car sticking out	Car in blind spot	Car's fault, couldn't see the car.

Table 17: Summary of answers from the on-scene interview pilot study

6.2.7. Interview Conclusions

With the sample of just 4 interviews it is impossible to draw valid conclusions on the experiences for the all foreign driver population, however interesting common trends and similarities can be identified, as outlined in the interview results.

Three of the four drivers were familiar with driving in the UK and made frequent trips to the UK, staying for between 2 and 5 days each time.

Two of the drivers were familiar with the area where the accident occurred, none of the drivers had exceeded their driving hours or had been driving for an excessive time, with 3 hours being the longest driving stint.

Two of the accidents were merging accidents with a third classed as a side swipe when the HGV was changing lanes and the final accident was a shunt accident where the LHD HGV drove into the rear of the vehicle in front.

The HGV drivers all stated they received training prior to being allowed to come to the UK. Two of the drivers stated how their company had formal training which was supported by accompanied drives to the UK for a number of visits.

The driver who was now resident in the UK stated how he had to pass a 3 week training course which was 2 days a week before he was able to get employment with the company.

The interview protocol implemented on-scene worked well and the accident participant welcomed the service of being able to talk to research staff. This enabled the research staff to explain the meaning of their work and what the information will be used for.

6.2.8. The Next Step

It is the belief of the investigation team at the VSRC that the translation service and on-scene interviews do play an important part in on-scene investigation, they provide additional information which would have been lost prior to this study. They not only aid the investigation team in finding out the driver's point of view, experience and ideas on the collision scenario but also enable the OTS team to explain to the driver the purpose of their work and reassure the driver it isn't a police investigation and is for independent research purposes.

It has been agreed to continue the on scene activity after the completion of this report until the end of the current OTS phase III (September 2009). The VSRC is going to continue using the translator service ‘Language Line’ to continue to get more depth regarding the foreign drivers and an on-scene short questionnaire has been developed to be used along side this at both centres (VSRC and TRL). This will increase the number of accidents investigated where additional information can be collected regarding foreign drivers.

The findings from this extended pilot study will then be presented in a short report outlining the common responses and experiences from the data sample and brief comparisons and conclusions drawn. The findings will be reported in the document Left-hand Drive HGVs and Foreign Truck Drivers in OTS, Supplement to Main Report (March 2010), Dnaton, Kirk and Hill.

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7. DISCUSSION

7.1. Introduction

It is clear from comments presented in the literature review that the examination of foreign HGV safety is a balance between the (often strong) perception of the problems, and their size, and the scientific evidence. This discussion section brings together the results of the analyses presented in this report and also considers them in the context of the literature review and the methodologies involved in the collection of real world accident data regarding HGVs. Issues regarding the collection of data for these vehicles are discussed and have been fed into the recommendations made in this report for future OTS data collection (section 9.2).

7.2. Number of Cases

Within the limits of vehicle definition and that only injury accidents are collected, the national STATS19 data allows an examination of the overall size of the 'foreign HGV' situation on British roads. During 2006 there were 952 injury accidents which involved a foreign registered LHD HGV compared to 9,597 for other HGVs (not foreign registered and foreign registered RHD HGVs). Overall 9% of all reported HGV accidents involved a foreign registered LHD HGV, which is 0.5% of the total 189,161 injury accidents recorded for 2006. HGVs from the Republic of Ireland (foreign registered – right hand drive) have been included in the other HGV category in the STATS19 analysis as this enables compatibility with the LHD / RHD comparison of the OTS analysis.

In OTS the HGV accidents account for 9.6% of the 3,504 accidents available in the OTS dataset, with the 64 LHD HGVs being 19% of the HGV sample, 232 RHD HGV accidents 69% and 42 Unknown HGV accidents 12%. Of all the accidents on the OTS database 1.8% involve a LHD HGV. Data from the very start of OTS collection are used and this is where the majority of the unknown cases of drive side stem from, although, even with the most recent and best collection procedures, if the HGV leaves the seen before the team arrive the information can be lost.

7.3. Accident Notification Levels

The proportion of OTS accidents that involve a LHD HGV is over three times higher than in the national data (1.8% compared to 0.5%). Partially this can be explained by

the injury selection criteria, as OTS collects damage only and injury accidents whereas only injury accidents are included in the national data. Also an over reporting (or rather over representation compared to RHD HGV accidents) of damage only LHD HGV accidents is evident in OTS.

Looking at the split between LHD and RHD HGV accidents between the two databases shows that 9% of the nationally reported HGV accidents involve a LHD HGV compared with 21% for OTS. This is a further indication of the higher level of notifications for LHD HGVs, compared to RHD HGVs, to the OTS teams.

It is believed by the OTS investigation team at the VSRC that when an accident occurs with a foreign HGV involved, other participants in the accident are more likely to call the police (allowing for OTS team notification) compared to an accident with a British registered HGV. This is primarily because the potential language barrier doesn't allow an easy exchange of details for insurance purposes. There is also likely to be more disparity between LHD and RHD for damage only accidents than injury accidents because when an injury occurs the choice of notifying the emergency services is reduced by the need for medical assistance and legal requirements for police notification.

7.4. Injury Severity

Figures from national data and OTS show that HGV driver severity for both LHD and RHD HGVs is usually lower than overall accident severity, which is understandable given that HGVs are usually much larger than their crash opponents. Nationally only 21% of injury accidents involving an HGV result in an injury for an HGV occupant. In 2006 there were 10,466 injury accidents involving an HGV of which LHD foreign registered HGVs involved somewhere contributed 8.5% of the total casualty count.

In the OTS sample 13.6% of HGV accidents result in an injury for an HGV occupant, with 53% of HGV accidents reported as injury accidents. In the LHD HGV sample 38% of accidents have a casualty recorded with 17% of these injury accidents being classed as serious and no fatal injuries being recorded in the sample. This compares to 59% of RHD HGVs being involved in an injury accident and 33% of these injury accidents having at least one road user being killed or seriously injured (KSI). This disparity between the two HGV groups could indicate that LHD HGVs are involved in accidents of less severe crash severity (so there are less casualties) or, as discussed in 7.3, the notification rates are higher for LHD HGV damage only accidents.

The national data confirms expectations that the number of HGV occupants injured is lower for LHD HGVs than are seen for RHD HGVs. However the proportion of LHD HGV occupant casualties reported as killed or seriously injured, when an injury is sustained, is 35%, which is 2.3 times greater than RHD HGVs. For all HGV occupants there is a higher risk of them being killed or seriously injured, when an injury is recorded, compared to car occupants. When considering the size of the vehicles this seems counter intuitive, larger vehicles should protect better, but it is due to the HGVs protecting better against slight injuries until the crash severity or circumstance is such that serious injuries and fatalities occur. This is mainly dependant on the collision partner or accident circumstances, for example a collision with a car may not be a harmful event for the HGV occupant compared to a collision with another HGV which could cause severe vehicle intrusion.

In contrast to this the national data suggests an element of under-reporting of slight injuries for LHD foreign registered HGV occupants or there is a possibility that they are simply involved in higher severity collisions. Unfortunately there is currently no measure of crash severity in the national dataset.

7.5. Accident Location and Day of Week

It has not been the aim or intention in this study to pin point exactly the location and full circumstances of HGV accidents but the analysis of road type (and speed limit) and day of week is useful to inform the examination of common accident scenarios and causation factors (especially fatigue). Also this brief examination allows a first look at where enforcement can be carried out. Further work could build upon this to help target enforcement.

Figures from both the national data and OTS show that the majority of LHD HGV accidents occur on the fastest roads. In the national data 92% of LHD HGV accidents occur on Motorways or A roads compared to 72% for RHD HGV accidents and in the OTS data 95% of LHD HGV accidents occur on Motorways, A roads and Trunk roads, compared to 78% of RHD HGVs. With the transportation of freight, large distances are involved so the main arterial routes will see a larger proportion of the distance travelled by HGVs. Therefore just considering exposure by miles travelled will dictate that these roads feature highly in the accident databases. Also, of course, there is an element of accident causation to consider as well. On these types of roads changing lanes frequently, joining and leaving the main carriageway are typical

manoeuvres and if blind spots are a feature in HGV accidents then it is not unexpected to find the majority of accidents on these roads.

It is also important to note though that nearly 20% of LHD HGV collisions in OTS also occur on roads with a speed limit of 30mph compared to nearly 12% of RHD HGVs. A possible cause for this is an increase in manoeuvres being conducted at lower speeds and inclusion of roundabouts in the road network which are not common road infrastructure in some mainland European countries.

Both the national and OTS data show that the frequency of accidents increase between Monday to Friday and then drop on Saturday and Sunday. The drop at the weekend follows expectations as there is expected to be a fall in the number of HGVs using the road network at weekends.

The OTS data however shows a rise in accident frequency on Wednesdays for both LHD and RHD HGVs and again on Fridays for LHD HGVs. The rise on Friday could be due to making deliveries before having to go back to Europe or making drops before businesses / distribution centres close at the weekend. As for the increase of HGV collisions on Wednesdays this would take further investigation to best understand this phenomenon.

7.6. Accident Types

In the OTS LHD HGV sample the majority, 67%, of HGVs are involved in a collision which was an 'overtaking or lane change manoeuvre' which is understandable considering the type of roads these accidents are occurring on (main arterial routes). This is 3.4 times higher than for RHD HGVs which are split between general driving type scenarios such as 'loss of control', 'shunt accidents', 'cornering' and also 'overtaking manoeuvres'. When selected according to the most significant contributory factor the accident types don’t change, but the proportions involved do, with LHD HGVs 4.9 times more likely to be involved in an 'overtaking or lane changing' accident compared to RHD HGVs.

When addressing the issue of HGV accidents and especially LHD HGV accidents the issue of blind spots is an important one to consider with the HGV changing lanes to the offside and colliding with a vehicle the driver ‘didn't see’. The complementing issue for RHD HGVs is overtaking a vehicle and changing lanes into the nearside or merging lanes. The OTS sample shows that in 85% of the LHD HGV accidents the

suspected scenario of changing lanes to the offside is the driving action which caused the collision compared to only 20% for the complementing action to the nearside for RHD HGVs. This suggests that it is not only blind spot issue but also a driver experience issue of interacting with the road and traffic environment. For example the RHD HGV would have overtaken a vehicle before changing lanes back, therefore the driver should be aware of the vehicle to the nearside. In contrast to this the LHD HGV is changing lanes to perform an overtake and is aware of the vehicle in front but did not see the vehicle to the offside. Additionally, collisions may be more likely because frequency and relative speeds will be greater for vehicles travelling to the offside of an HGV.

The vast majority of LHD HGVs in the OTS sample are articulated HGVs, a long vehicle made up of a tractor cab and separate trailer unit. This increases the size of blind spots and also hinders the manoeuvrability of the vehicle somewhat. In contrast, the RHD HGV sample is largely split between articulated (43%) and rigid (53%) vehicle construction. Rigid is a fixed unit of tractor and trailer and is generally smaller in size compared to an articulated HGV. This difference makes sense as the LHD HGVs are generally covering larger distances, therefore it is cost beneficial to send larger goods carrying vehicles.

A large proportion of LHD HGVs, 49%, are involved in a collision where the precipitating factor is 'poor turn or manoeuvre', a category that would also include changing lanes or negotiating junctions. This is much higher than the figure for RHD HGVs with only 16% involved in an accident with this precipitating factor.

7.7. Overview of Causation Factors

It is not the aim of the report to apportion blame on any type of road user or vehicle type, it is to look at the accident causation issues recorded. The coding system of contributory factors (2005 system) in OTS shows that 88% of LHD HGV drivers have at least one contributory factor attributed to them compared to 62% of RHD HGV drivers. The figures are lower in the national data but the difference between the two HGV groups is similar at 78% and 53% respectively. A reason for the higher figures in OTS could be due to differences between the people reporting and coding the data in the two data sets. Sometimes police officers are not present at the scene (there is a variable for place reported in the national dataset) so contributory factors may not be recorded in the national data and with the possibility of police officers having to

prove their codes in a court of law they might be slightly more hesitant then OTS investigators. Although both these factors are small, together they may account for the 10% difference.

Although the 2005 contributory factors system is fundamentally the same in both datasets the OTS project benefits from experienced investigators who study hundreds of accidents per year and the inclusion of damage only accidents. The national data is collected by police officers who may only deal with a few accidents per year. OTS is also able to build upon the contributory factors with the investigation of participant interactions.

It is interesting though with a dataset as large as the national data to look at the factors in HGV accidents to examine if the trends are similar to the OTS data set. The contributory factor which features the most in the national data for HGVs is ‘failed to look properly’ with 48% of LHD HGV drivers and 36% of RHD HGV drivers (who had at least one factor attributed to them) being attributed with this factor. Other interesting factors for the LHD foreign registered HGVs in the national data include; 'vehicle blind spot' and 'inexperience of driving on the left' with 36% and 14% of the sample respectively compared to only 7% and less than 1% for RHD HGVs.

In the OTS LHD HGV sample, 76% of the HGVs are deemed to have 'vehicle blind spot' as a contributory factor where this was only recorded in 7% of RHD HGV accidents. The second most frequent is ‘failed to look properly’ with 72% and 31% for LHD and RHD HGVs respectively. 'Inexperience of driving on the left' features for 35% of LHD HGV drivers and doesn’t feature in the OTS RHD HGV sample.

Part of the large difference for the factor 'vehicle blind spot' between the two groups of HGVs could possibly be due to preconceived thoughts by police officers or OTS investigators that a LHD HGV would suffer from a blind spot whereas a RHD HGV wouldn't suffer from this problem. It is a large difference though and it is likely that this is a significant issue for LHD HGVs when on UK roads due to the road network and driving style.

In the OTS sample LHD HGV drivers are 2.5 times more likely to be coded as performing a 'poor turn or manoeuvre' compared to RHD HGV drivers and 2.4 times more likely to be deemed to have 'failed to look properly'. It is clear that for LHD HGV drivers the factors 'vehicle blind spot' and 'failed to look properly' will be closely associated.

7.8. Further Work on Causation Codes in OTS

The most frequent collision classification codes for LHD HGVs were used to further group the LHD and RHD sample and the contributory factors were investigated. The distributions of contributory factors are very similar to the overview discussed above, further reinforcing the effects of the 'vehicle blind spot' and the driver 'failing to look properly'. However, when this selection methodology is applied to the RHD HGV sample it shows that 42% of drivers (8 out of 19) involved in 'overtaking and lane changing' type accidents are attributed the 'vehicle blind spot' factor, much higher than the overall figure of 7% for RHD HGV drivers.

A large proportion of LHD HGV accidents involve contributory factors which are part of the driver action or experience categories whereas RHD HGV accidents also include injudicious action and road environment factors.

The national data shows that 'fatigue' is coded for 3.1% of RHD HGV drivers compared to only 2.4% of LHD HGV drivers. This figure differs to the results in OTS where 6.5% of RHD HGV drivers are attributed with this factor and 'fatigue' doesn't feature in the LHD HGV sample at all. A possible reason for this is due to the level of severity of the LHD HGV accidents, mainly being slight injury or non-injury, so the tachograph was not interrogated to establish driver hours. Further data from driver interviews or questionnaires will help inform the investigation of fatigue in the future.

The literature review highlights a VOSA report that half of foreign HGVs checked in 2006 had serious vehicle defects. In the national data it was observed that less than 0.5% of LHD foreign registered HGVs are coded as having a vehicle defect as a contributory factor. Across the 6 factors analysed, vehicle defects are more of an issue for other HGVs, with 3.5% found to have been 'overloaded or poorly loaded' compared to only 0.1% of LHD HGVs. The small amount reported for LHD HGVs may be as a result of load checking at points of entry or exit to and from the UK, for safety on ferries or in the Channel Tunnel. For HGVs travelling to leave the UK it may not be worth the risk that they turned back at sea crossings. In the OTS analysis no vehicle defect contributory factors are attributed to LHD HGVs at all. The most common vehicle defect factor for RHD HGVs is 'overloaded or poorly loaded' but only 8 out of 250 are attributed with this factor.

The findings in this report of low instances of vehicle maintenance being a contributory factor concur with the ETAC study which reports that the scope for

reducing accidents and injuries through measures aimed at vehicle maintenance standards may be limited. Also a study from Cooper et al (2006)[6] concludes that the important element with respect to imported vehicles (in their study) is driver performance, rather than vehicle safety. Additionally, it must be noted that OTS (and national) data do not follow specialist vehicle examinations as carried out by VOSA.

7.9. Human Interactions Codes

The OTS human interactions system, which looks specifically at the driver's actions and influences, can be used to further examine drivers when they are split into contributory factor groupings. Firstly it was observed that generally for LHD drivers the interaction codes 'looked but did not see due to vehicle geometry' (80%) and 'intentionally entered into path' (39%) are the most frequent, followed by 'adopted a conflicting path' (20%). This further shows that LHD HGVs not only have an issue with the vision surrounding the vehicle, and as a result are encroaching on other road user's space, they are struggling on reading the road environment and road infrastructure.

The RHD HGV drivers in the OTS sample have a broad spectrum of interaction codes with 'inattentive', 'failing to avoid' and 'losing control' being the three most frequent. Generally the RHD HGV driver interaction codes cover the perception, conflict, attention and loss of control categories, suggesting that there is more of a driver error and distraction problem compared to the perception and judgement issues attributed to LHD HGV drivers.

When the drivers are further grouped according to the most frequent contributory factors the interaction code distributions for both LHD and RHD drivers are similar to the overall distributions however the proportion of drivers for the most frequent interaction codes were a lot greater, enforcing the issues previously discussed.

The literature review reports how mental load on a foreign driver can be high due to unfamiliar road layout and road user behaviour, along with dealing with a vehicle designed for the other side of the road. Specific examples are the difference in imperial and metric road signs, signs and instructions that are not given in the driver's native language and having different speed limits for HGVs compared to the posted speed limit. Mental load is very hard to judge in itself through real world investigation as the result is more obvious than the reason, but the high instance of the 'failed to

look' contributory factor could be attributed to mental load as well as vehicle geometry. Although the figures are also high for RHD HGVs.

In combination with the points above, foreign drivers also have to combat learnt patterns of behaviour. An example of learnt behaviour is how pedestrians from the UK instinctively look right when crossing mainland European roads. Foreign HGV drivers can find themselves in a situation of tackling an unfamiliar road layout and also combating a learnt pattern of behaviour, instinctively looking the 'wrong way'.

7.10. New Technologies and Legislation

Manufacturers and policy makers have tried to reduce the number of HGV accidents by introducing new vehicle technologies into the fleet or by regulation and legislation.

If new technologies such as lane assist and monitoring systems such as radar sensing become implemented and more common place there may be a reduction in side swipe and lane changing accidents. However this software will still be reliant on the driver reacting in time and taking an appropriate avoiding action. This technology will not reduce confusion for the driver regarding a strange road environment or road network and with mental loads already suggested as being high the driver interface of any new technologies must be carefully considered.

There is legislation for all new HGVs built since 2003 to be fitted with blind spot mirrors and the new directive from the European Parliament and Council that additional mirrors need to be fitted to all commercial vehicles over 3.5 tonnes registered after 1st January 2000 and this must be completed by March 2009. However it is estimated that the European HGV fleet will only be fully replaced by 2022. This legislation should see a reduction in the number of accidents occurring however it is not necessarily addressing the human side of this problem. If the mirrors are positioned incorrectly for the height and seat positioning of the driver they can be ineffective.

Navigation tasks, especially in a foreign country, also place a mental load on the driver which may be reduced as satellite navigation aids are updated to include full and accurate UK map data, including key information for HGV drivers such as roads that are and are not suitable for HGVs. Questions, however, remain concerning Human Machine Interface issues, including the potential for increased driver distraction and/or mental work load while interacting with such systems. As the

standard of information systems and number of effective in-cab monitors and camera systems increase, to aid reversing manoeuvres or to reduce frontal blind spots for HGVs, so might the mental demand and possible distraction levels on the driver. Nevertheless, if such demands are high and the driver is in a foreign country where the road network is different the driver may still may be involved in similar types of accidents as before the new technology or mirrors were fitted.

These areas of driver aids and new legislation can be monitored to see how the accident rate of HGVs fluctuates and projects such as OTS can continue to investigate the causation factors involved. Recommendations for future on-scene data collection are made in section 9.2.

7.11. On-Scene Interviews

The four interviews conducted so far have shown that the interview protocol implemented on-scene works well, collecting additional information which would have been lost prior to this study. They aid the investigation team in finding out the driver's point of view on the collision scenario, driving hours, previous experience and preparation for driving in the UK. The translated interviews also enable the OTS team members to explain to the driver the purpose of their work and reassure the driver it is not a police investigation and is for independent research purposes. The advantages of the translated interviews have to be balanced against the cost and the time taken to carry them out, both in terms of time at scene and the extra personnel time needed to cover the normal on-scene duties of the interviewer.

7.12. Challenges for Real World Investigation of Foreign HGV Accidents

As discussed in the literature review of this report the popular media have raised a number of issues regarding LHD HGVs on UK roads and their safety and the VOSA have found alarming levels of serious defects when checking foreign HGVs. The main issues which have not been able to be reviewed in any great depth using OTS data are vehicle and trailer maintenance and driver hours.

Due to the nature of the OTS HGV accidents with a large proportion of them being non-injury accidents, information such as driver hours is often not recorded as this information can only be collected for accidents where the injury severity is killed or seriously injured (life threatening or life altering) as the information is then retrieved

by the police investigation team. This leads to a possible under representation in the OTS data for both LHD and RHD HGVs of fatigue factors.

It is not practical for the OTS project to carry out a full vehicle inspection on vehicles in regards to road worthiness to the same level as VOSA due to time constraints and the nature of the work. For this reason maintenance and overloading issues may be under represented in the OTS data analysis. Similarly this will be the case for the majority of STATS19 reported cases, although the fatal and potentially fatal cases will be investigated for maintenance and overloading issues, the lesser severity accidents may be missing this information.

Of course the language barrier is a general challenge in the investigation of these accidents and although the translated interview protocols do go some way to relieving this difficulty not being able to communicate straight away with all accident participants will always introduce an extra difficulty on scene.

Due to police procedural changes and the implementation of the Highways Agency road traffic officers on the UK Motorway networks it has been suggested that the number of LHD HGVs non-injury accidents being attended by Nottinghamshire Police has reduced over the past year. As a result the OTS team at the VSRC has also seen a reduction in the number of LHD HGVs being reported to the team by the police. This will be monitored in the future and any opportunities to receive more notifications evaluated.

7.13. Possible Actions to Increase Awareness

In order to reduce the number of LHD HGV collisions occurring in the UK a number of strategies could be implemented to increase driver awareness.

Information for driving in the UK could be given out at ports (or during crossings) to aid driver awareness and driver experience. This information could include the permitted speed limits for HGVs on UK roads, advice on vehicle blind spots and typical scenarios such as changing lanes to the offside, guidelines and suggestions on driving hours and taking regular driver breaks and an imperial to metric conversion chart to aid with speed limits, distances and heights of low obstacles.

In addition, advice and further instruction could be given to UK drivers to make them more aware of foreign vehicles and more considerate of the potential difficulties for

the drivers of foreign vehicles. A possible area where this could be done is by expanding rule 164 of the Highway Code (overtaking large vehicles).

This report has highlighted the issues for foreign or LHD HGVs in the UK and it would be interesting to undertake a study looking at accidents occurring involving RHD UK HGVs in mainland Europe and evaluate the collision scenarios and potential human behaviour factors in comparison to the findings of this report.

8. CONCLUSIONS

This section concludes the main research findings of this report and experiences from the on-scene interview pilot.

1. During 2006 in Great Britain there were 952 injury accidents which involved a foreign registered LHD HGV and 9,597 involving other HGVs. Of all the injury accidents (189,161) in 2006, 0.5% involved a foreign registered LHD HGV.

2. In OTS, HGV accidents account for 9.6% of the 3,504 accidents available in the OTS dataset, with LHD HGVs forming 19% of the HGV sample. Of all the accidents on the OTS database, 1.8% involve a LHD HGV.

3. The VSRC OTS investigation team believes that damage only accidents with a foreign HGV involved are over represented in the dataset, as other crash participants are especially likely to call the police (allowing for OTS team notification).

4. Both the national and OTS datasets show that the majority of LHD HGV accidents occur on the main arterial routes (Motorways, A roads and Trunk roads), in a greater proportion than RHD HGV accidents. The number of HGV accidents decreases at the weekend, for both LHD and RHD HGVs. Further work could build upon this to help target enforcement.

5. Figures from national data and OTS show that HGV driver injury severity for both LHD and RHD HGVs is usually lower than overall accident severity. In the national data for 2006, injury accidents involving a foreign registered LHD HGV account for 9.8% of the 10,466 reported HGV injury accidents and 8.5% of casualties from all accidents involving an HGV.

6. In the OTS sample the majority of LHD HGVs are involved in a collision which is an 'overtaking or lane change manoeuvre' which is understandable considering the type of roads these accidents are occurring on (main arterial routes). This is 3.4 times higher than for RHD HGVs which are split between more general driving type scenarios. A similar pattern is observed for the precipitating factor 'poor turn or manoeuvre'.

7. When involved in accidents drivers of LHD HGVs are more likely to have a contributory factor attributed to them, or their vehicles, than other HGV drivers.

8. LHD HGV accidents present unique challenges for investigators. The language barrier is a general challenge in the investigation of these accidents but also the in-depth investigation of vehicle and trailer maintenance and driver hours is a difficulty, leading to a possible under representation of maintenance, overloading and driver fatigue issues in both OTS and national data sets, for both LHD and RHD HGVs.

9. Vehicle defects are not highlighted as a significant contributory factor for LHD HGVs accidents (or in fact in RHD HGV accidents) in either dataset (note conclusion 8).

10. A trend which is a significant feature throughout the LHD HGV accident data for each accident causation system is 'vehicle blind spot' (76% of OTS LHD HGVs) and 'vehicle entering a lane conflicting with others or swerving'. Due to the geometry of the vehicles, the potential blind spots on the offside of a LHD HGV are worse than that on the offside of a RHD HGV, causing particular problems when changing lane from the nearside to the offside. The high proportion of LHD HGVs that are articulated will exacerbate vehicle blind spot issues due to increased length.

11. The contributory factor which features the most in the national data and very highly in the OTS data for HGV drivers is ‘failed to look properly’. For LHD HGVs this factor is closely associated with vehicle blind spots.

12. A large proportion of LHD HGV accidents involve contributory factors which are part of the driver action or experience categories whereas RHD HGV accidents also include injudicious action and road environment factors.

13. The OTS human interactions system shows that for LHD drivers the interaction codes 'looked but did not see due to vehicle geometry' and 'intentionally entered into path' are the most frequent interaction codes, followed by 'adopted a conflicting path'. The LHD HGV driver codes cover perception and judgement issues whilst RHD HGV driver interaction codes cover the perception, conflict, attention and loss of control categories.

14. Mental load on a foreign driver can be high due to unfamiliar road layout and road user behaviour along with dealing with a vehicle designed for the other side of the road. Although new technologies may be designed to help the driver (such

as lane assist) there is a need for further research to better understand the mental work load experienced by foreign drivers and any Human Machine Interface issues that may in fact increase distraction as more new technologies are introduced.

15. The national data shows that 'fatigue' is coded for 3.1% of RHD HGV drivers compared to only 2.4% of LHD HGV drivers. This figure differs from the results in OTS where 6.5% of RHD HGV drivers are attributed with this factor and 'fatigue' doesn't feature in the LHD HGV sample at all. Further data from driver interviews or questionnaires may help inform the investigation of fatigue in the future.

16. Although the number of LHD HGV driver on-scene interviews has been unexpectedly low, it is clear from the four interviews already conducted that they play an important part in the investigation of these accidents. Without them important information regarding the driver's point of view of the collision scenario, driving hours, previous experience and preparation for driving in the UK is lost. However, benefits from an extended on-scene interview process must be balanced against an increase in the length of time the investigation teams must spend on scene away from other data collection duties.

17. Information issued to LHD HGV drivers regarding driving in the UK (for example, UK driving law, speed limits and imperial/metric conversion) distributed at ports (or during crossings) along with initiatives to increase UK driver awareness of LHD vehicles (for example, more detail in the Highway Code) are practical initiatives that would address some of the issues highlighted in this report.

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9. ON-GOING WORK AND FUTURE RECOMMENDATIONS

This section presents an outline to the remainder of the on-scene interview and questionnaire study and also procedural recommendations for the recording of the data relevant to HGV accidents in the OTS database.

9.1. On-Going Work - On-Scene Interviews and Questionnaires

Due to the low rate of on-scene interviews a revised plan has been agreed with the DfT project officer whereby the data analysis, database review and existing interview findings (4 interviews) are concluded in this main report, but, at a later stage, this main report will be supplemented by further work to collect interview data from foreign drivers.

A pilot study using new on-scene questionnaires will enable the VSRC to involve TRL, so the entire OTS project can collect new data at the same level. This will maximise the number and quality of interviews in all subsequent LHD HGV collisions over the remainder of OTS Phase III. This new small scale questionnaire will be translated into several common languages. Information recorded at both centres will be reported by the VSRC at the end of OTS Phase III (September 2009) together with recommendations for ongoing investigations or future work in this area. During the pilot study the VSRC will continue to use the services of 'Language Line' in addition to the on-scene questionnaire to maximise the level of detail available.

9.2. Recommendations for New Database Fields

A number of new database fields are suggested below for further consideration. While some of the information proposed in the fields below may well currently be evaluated during current OTS investigations, the suggestion here is that the following fields should be established for systematic inclusion within the OTS database.

An important factor in making recommendations for additional data collection is good, ongoing, joint working practices between the two OTS investigation teams. Therefore, judgements on additional data must be made on a feasibility basis. It will be important to establish that data collection for the following recommended fields is

viable for both teams with regards to available time on scene, investigator ability and granted permissions.

Recommended Field 1: Is a Fresnel mirror fitted? *(Vehicle; Rearwards Visibility)*

Definition of Field: A Fresnel mirror is a clear, thin, flat plastic lens that is press fitted to a truck's passenger door window or mirror. This simple device improves the driver's vision, close to and around the truck's passenger door. In this field we are determining if the vehicle has been fitted with such a device. They can normally be found on the offside door window or mirror on left-hand drive vehicles and on the nearside door window or mirror on right-hand drive vehicles.

Collection Method: Fitment determined during vehicle examination.

Feasibility of Collection: A very straightforward and easy piece of data to collect by both centres.

Recommended Field 2: Vehicle fitted with digital tachograph? *(Human; Human Core: Drivers Hours)*

Definition of Field: As of 1st July 2006 all new large commercial vehicles must be fitted with a digital tachograph. Unless an enforcement card is present, it will not be possible to extract the driver's hours from the system. A note should be made to explain this issue where driver's hours are unconfirmed.

Collection Method: During vehicle examination the presence of a digital tachograph will be easily ascertained.

Feasibility of Collection: Simple identification of the digital tachograph during vehicle examination. However without an enforcement card, suitable training and the co-operation of the driver it will be very difficult for an OTS team to extract any information from this new system.

Recommended Field 3: Driver familiar with the area? *(Human; Human Core)*

Definition of Field: Is the driver of the vehicle familiar with the area?

Collection Method: It may be possible to ascertain this by interviewing the driver at the scene and/or through the driver questionnaire.

Feasibility of Collection: It should be possible for the OTS teams to determine this information except when interviews/questionnaires are refused or inappropriate.

Recommended Field 4: If vehicle fitted with 'SatNav' was it in use at the time of the collision? (Vehicle; Internal Accessories OR *New Questionnaire; Driver*)

Definition of Field: Particularly looking at this when a driver has entered a weight limit or driven under a low bridge as a result of following their SatNav. The field should include an option for whether the unit is equipped with dedicated HGV software. This field should include the standard OTS causation selection field.

Collection Method: Speaking to the driver at scene, questionnaires and the opinion of the investigator from the scene and vehicle examination.

Feasibility of Collection: It should be possible for an OTS team to collect this information, however interview/questionnaire data cannot be considered objective and may not provide an accurate representation of what happened.

Recommended Field 5: Is the vehicle fitted with a 'kerb line' blind spot mirror? *(Vehicle; Rearward Visibility)*

Definition of Field: A small mirror, usually positioned at the top centre of the passenger door and looking towards the ground.

Collection Method: At time of vehicle examination.

Feasibility of Collection: Can easily be collected by an OTS team at the time of the vehicle examination.

Recommended Field 6: Is the vehicle fitted with a centre blind spot mirror? *(Vehicle; Rearward Visibility)*

Definition of Field: A mirror positioned either at the centre top of the windscreen, or at the lower nearside A pillar. These mirrors allow the driver to see below the windscreen and to the offside and so show any vehicles in the driver's blind spot, especially when changing lanes.

Collection Method: At time of vehicle examination.

Feasibility of Collection: Easily collected by an OTS team at the time of the vehicle examination.

Recommended Field 7: Is the vehicle fitted with any other device for addressing blind spots (e.g. cameras or radar)? *(Vehicle; Rearward Visibility)*

Definition of Field: Any further device that allows the driver to either see into blind spots (e.g. extra cameras) or be alerted to the presence of other road users or obstacles (e.g. radar). The device/s should be described in the vehicle comments field.

Collection Method: At time of vehicle examination.

Feasibility of Collection: Easily collected by an OTS team at the time of the vehicle examination.

Recommended Field 8: In the investigators opinion, are the HGV's mirrors correctly positioned? *(Vehicle; Rearward Visibility)*

Definition of Field: The incorrect alignment of an HGV's mirrors could lead to a vehicle blind spot even if the correct mirrors are fitted to the vehicle.

Collection Method: By vehicle examination and driver analysis at the scene, the investigator may be able to conclude if the mirror positioning is reasonable. However, this will be determined by the investigator's knowledge of both anthropometry and vehicle types.

Feasibility of Collection: Subjective and dependent upon experience. However an OTS team should be able to provide a 'best guess' conclusion on this subject.

Recommended Field 9: Is the vehicle fitted with a reversing camera? *(Vehicle; Rearward Visibility)*

Definition of Field: A lorry may be fitted with a small reversing camera on the rear so that the driver's view when reversing is increased.

Collection Method: At time of vehicle examination.

Feasibility of Collection: Easily collected by an OTS team at the time of the vehicle examination.

Recommended Field 10: Is the driver an agency driver? *(New Questionnaire; Driver)*

Definition of Field: If the driver of the vehicle is an agency driver it may be that they have another job and/or have worked for a different agency before commencing this driving week. If this is the case, the driver may have had insufficient rest days which may lead to fatigue.

Collection Method: Questionnaire and scene interviews.

Feasibility of Collection: Dependent on the honesty of the driver.

Recommended Field 11: Total daily driving hours. *(Human; Human Core)*

Definition of Field: Although it is already recorded whether the driver is within or in excess of their hours, it would be useful to know the length of time that the driver had been driving that day. This may highlight likely fatigue if they are towards the end of their shift.

Collection Method: Tachograph examination at the time of vehicle examination or information from driver, scene or questionnaire.

Feasibility of Collection: With suitable training an OTS team should be able to examine a tachograph with accuracy. However the examination would be dependent on the co-operation of the driver or police powers to seize the tachograph.

Recommended Field 12: Driving hours reported by the driver or tachograph? *(Human; Human Core)*

Definition of Field: Are the driving hours reported by the driver or tachograph.

Collection Method: Consideration at time of data collation.

Feasibility of Collection: Recorded by OTS investigator at the time of data collation.

Recommended Field 13: Total weekly driving hours. *(Human; Human Core)*

Definition of Field: Looking into the accumulative number of driving hours that the driver has worked during their specified working week. Again this may highlight possible fatigue related problems.

Collection Method: Tachograph examination at the time of vehicle examination or information from driver, scene or questionnaire.

Feasibility of Collection: If the vehicle is fitted with a digital tachograph and the driver gives permission for an OTS team to do so, it would be possible to download the information stored on the system at the time of the vehicle examination (although further training and equipment would be required for the OTS team to perform this task). However if the vehicle is still using the old style tachograph it may be more difficult to obtain this information as it would require total co-operation from the driver to provide the team with their used tachographs, unless police powers could be used to examine them. If a driver knows that they are over hours, they may be less likely to cooperate.

Recommended Field 14: Total weekly driving hours reported by the driver or tachograph? *(Human; Human Core)*

Definition of Field: Are the total weekly driving hours reported by the driver or tachograph.

Collection Method: Consideration at time of data collation.

Feasibility of Collection: Recorded by an OTS team at the time of data collation.

Recommended Field 15: Is the driver double manning? *(Human; Human Core)*

Definition of Field: At the time of the accident was a double manning arrangement in place (was there a co-driver in the vehicle sharing the driving).

Collection Method: Information from driver at scene (currently not considered in questionnaire).

Feasibility of Collection: Would need to be considered in interview or questionnaire at the time of the vehicle examination.

Recommended Field 16: Does the driver know the speed limit that applies for their HGV? *(Human; Behaviour)*

Definition of Field: For the road where the collision occurred is the driver aware of the permitted speed limit for their HGV.

Collection Method: Information from driver at scene (currently not considered in questionnaire).

Feasibility of Collection: Would need to be considered by interview or questionnaire at the time of the vehicle examination.

Recommended Field 17: Is the driver aware that in the UK the posted speed limit may not be the permitted speed limit for their HGV? *(Human; Behaviour)*

Definition of Field: Does the driver have awareness of UK driving law in relation to posted speed limits and the speed limits which apply to their HGV, as the two speeds may differ depending on the classification of the road.

Collection Method: Information from driver at scene (currently not considered in questionnaire).

Feasibility of Collection: Would need to be considered by interview or questionnaire at the time of the vehicle examination.

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10. REFERENCES

1) “Key Figures on Europe. Statistical Pocket Book 2006”, Office for Official Publications of the European Communities, Luxembourg.

2) The 25 member states after the enlargement of May 2004.

3) “Survey of foreign vehicle activity in GB – 2003” Department for Transport, London, UK, 2003.

4) Association of British insurers survey, quoted on autotraderblog.co.uk.

5) House of Commons - Hansard written Answers, 27th November 2006.

6) Cooper, Meckle, Nasvadi, Wiggins. (May 2007) “The Safety of Right-Hand Drive Vehicles in British Columbia” Insurance Company of British Columbia Performance Analysis Services.

7) “Accident data collected between 1997 and 2004” Kent Police (2004).

8) European Truck Accident Causation Study (ETAC). European Commission, Brussels, 2008.

9) “Fitting blind spot mirrors on existing trucks A consultation paper” Inland transport services, Directorate General for Energy and Transport, DGTren E3, 12th April 2006.

10) European Road Safety Observatory, www.erso.eu.

11) ETSC Enforcement Program, www.ETSC.be

12) “Safety Study - Factors that affect fatigue in heavy truck accidents” National Transportation Safety Board, Washington, USA.

13) “Driver fatigue and road accidents. A literature review and position paper” RoSPA, February 2001, RoSPA, Birmingham, UK

14) Yannis, Golias and Papadimitriou “Accident risk of foreign drivers in various road environments” Journal of Safety Research, volume 38, issue 4, 2007, pp 471- 480

15) Leviakangas (1998) “Accident risk of foreign drivers – the case of Russian drivers in South-Eastern Finland” Accident Analysis and Prevention, volume 30 no 2, pp 245 – 254, 1998

16) Vis, M.A. and Van Gent, A.L. (Eds.) (2007) *Road Safety Performance Indicators: Country Profiles.* Deliverable D3.7b of the EC SafetyNet project.

17) “Left-Hand drive HGVs: Dangers and Solutions” RoSPA, Birmingham, April 2007.

18) Sivak, Schoettle, Reed, Flannagan “Influence of visibility out of the vehicle cabin on lane-change crashes”, Accident Analysis and Prevention, volume 38 (2006) pp 969 – 972.

19) Tait and Cook (May 1998) “Factors Influencing Drivers’ Vision”, ICE Ergonomics Limited, Loughborough.

20) “Retrofitting of Mirrors to Increase the Field of Indirect Vision (Blind Spot) of Goods Vehicles.” Partial regulatory impact assessment, Department for Transport, London, UK.

21) Tait and Southall, (1999) “Drivers' field of view from large vehicles”, Report for the Department of the Environment, Transport and the Regions. ICE, Loughborough University.

22) Jeon JK, Damon T, Kawashima H (2004) “A Study on instructing information based on driving character and behaviour when the driver who is used to driving right-hand car drives a left-hand car. 2004 SAE World Congress, Detroit MI, Society of Automotive Engineers.

23) http://www.timesonline.co.uk/tol/news/uk/article1701531.ece, (April 25th 2007) “Half of foreign lorries tested on Britain's roads found to be dangerous”.

24) J. Lenard & J. Hill, (2004) Interaction of road environment, vehicle and human factors in the causation of pedestrian accidents.

25) Hickford & Hall, University of Southampton (2003), Review of the contributory factors system.

26) www.bbc.co.uk/pressoffice/pressreleases/stories/2006/10_october/25/real.shtml, (25th October 2006) “Lorry drivers from abroad putting lives at risk, says police chief in BBC report”.

27) www.dailymail.co.uk/news/article-499831/Sideswiping-foreign-lorries-reduced-half-introduction-special-lenses.html, (5th December 2007) “Sideswiping by foreign lorries reduced by half after introduction of special lenses”.

28) Motorpoint is a large UK car supermarket. David Shelton quoted on www.roadtransport.com/artic

29) John Fitch, (2007) "Final Report LHD Vehicles Blind Spot Version 1.3", VOSA Research & Development Team.

30) Instructions for the Completion of Road Accident Reports, STATS20, October 2004, Department for Transport, London, UK.

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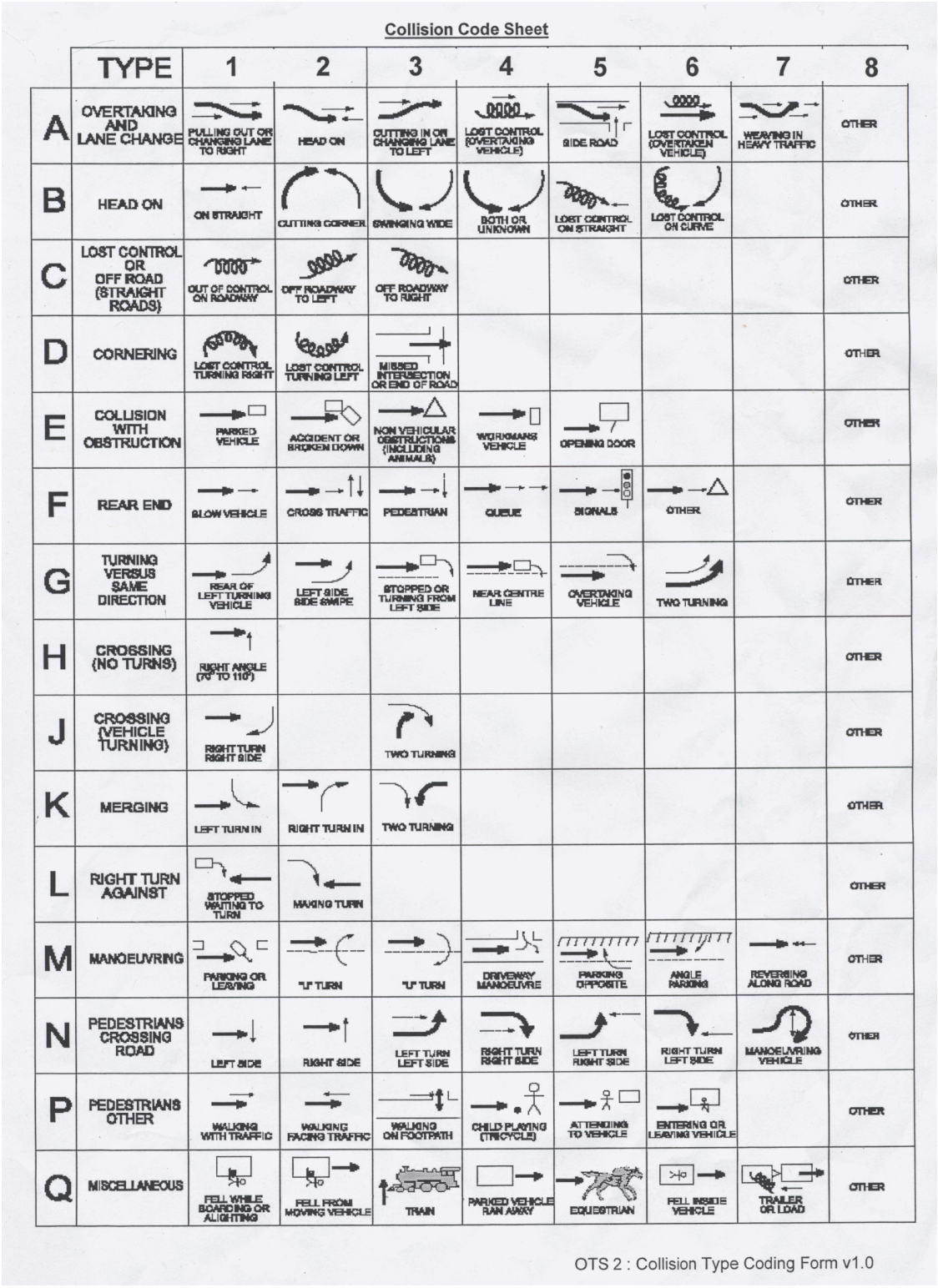
12. APPENDIX

12.1. Collision Classification Codes



12.2. Accident Causation System Codes

Precipitating Factors

FAILURES OF DRIVER or RIDER 1 Failed to stop (mandatory sign) 2 Failed to give way 3 Failed to avoid pedestrian (pedestrian not to blame) 4 Failed to avoid vehicle or object in carriageway 5 Failure to signal/misleading signal 6 Loss of control of vehicle		MANOEUVRES 9 Swerved to avoid object in carriageway 10 Sudden Braking 11 Poor turn/manoeuvre 12 Poor overtaking 13 Drove wrong way (e.g. 1-way street) 14 Operating door carelessly
FAILURES OF PEDESTRIAN or PASSENGER 7 Pedestrian entered carriageway without due care (driver/rider not to blame) 8 Passenger fell in or near PSV		15 OTHER

Contributory Factors

PERSONAL DETAILS 1 Impairment alcohol 2 drugs 3 fatigue 4 illness		VEHICLE DEFECTS 28 Tyres wrong pressure 29 deflation before impact 30 worn/insufficient tread
5 Distraction stress/emotional state of mind 6 physical in/on vehicle 7 physical outside vehicle		31 Defective lights or signals 32 Defective brakes 33 OTHER
8 Behaviour panic 9 careless/thoughtless/reckless 10 nervous/uncertain 11 in a hurry		LOCAL CONDITIONS 34 Site details poor road surface 35 poor/no street lighting 36 inadequate signing 37 steep hill 38 narrow road 39 bend/winding road 40 road-works
12 Failure to judge other person's path or speed 13 Disability 14 Failed to look 15 Looked but did not see 16 Inattention 17 Person hit wore dark or inconspicuous clothing 18 OTHER		41 Slippery road 42 High winds 43 Earlier accident 44 OTHER
PEDESTRIAN DETAILS 19 Crossed from behind parked vehicle etc 20 Ignored lights at crossing		OBSCURATION 45 View windows obscured 46 glare from sun 47 glare from headlights
DRIVER DETAILS 21 Excessive Speed 22 Following too close		48 Surroundings bend/winding road 49 stationary or parked vehicle 50 moving vehicle 51 buildings, fences, vegetation etc.
23 Inexperience of driving 24 of vehicle		52 Weather (e.g. mist or sleet) 53 Failed to see pedestrian or vehicle in blind spot
25 Interaction or competition with other road users 26 Aggressive driving 27 Lack of judgement of own path		ANIMAL INVOLVEMENT 54 Animal out of control

12.3. Contributory Factors 2005 System Codes

Driver / Rider Only (includes Pedal Cyclists and Horse riders)

Injudicious Action	Error or Reaction	Impairment or Distraction	Behaviour or Experience	Vision Affected by
Disobeyed automatic traffic signal **301**	Junction Overshoot **401**	Impaired by alcohol **501**	Aggressive driving **601**	Stationary or parked Vehicle(s) **701**
Disobeyed Give Way or Stop Sign or Markings **302**	Junction restart (moving off at a junction) **402**	Impaired by drugs (illicit or medicinal) **502**	Careless, Reckless or in a hurry **602**	Vegetation **702**
Disobeyed Double White Lines **303**	Poor Turn or Manoeuvre **403**	Fatigue **503**	Nervous, Uncertain or Panic **603**	Road Layout (e.g. bend, winding road or crest) **703**
Disobeyed Pedestrian Crossing Facility **304**	Failed to signal or misleading Signal **404**	Uncorrected, defective eyesight **504**	Driving too Slow for Conditions or slow Vehicle **604**	Building, Road Signs or Street Furniture **704**
Illegal Turn or Direction of Travel **305**	Failed to Look Properly **405**	Illness or Disability, Mental or Physical **505**	Learner or inexperienced Driver/Rider **605**	Dazzling Headlights **705**
Exceeding Speed Limit **306**	Failed to Judge other Person's Path or Speed **406**	Not displaying Lights at Night or in Poor Visibility **506**	Inexperience of Driving on the Left **606**	Dazzling Sun **706**
Travelling too Fast for Conditions **307**	Passing too Close to Cyclist, Horse or Pedestrian **407**	Cyclist Wearing Dark Clothing at Night **507**	Unfamiliar with Model of Vehicle **607**	Rain, Sleet, Snow or Fog **707**
Following too Close **308**	Sudden Braking **408**	Driver Using Mobile Phone **508**		Spray from Other Vehicles **708**
Vehicle Travelling along Footway **309**	Swerved **409**	Distraction in Vehicle **509**		Visor or Windscreen Dirty or Scratched **709**
Cyclist entering Road from Footway **310**	Loss of Control **410**	Distraction Outside Vehicle **510**		Vehicle Blind Spot **710**
Road Environment	**Vehicle Defects**	**If 999 Give Details Below:**	**Pedestrian Only**	**Special Codes**
Poor or Defective Road Surface **101**	Tyres illegal, defective or Under inflated **201**		Xing Road Masked by Stationary, Parked Vehicle **801**	Stolen Vehicle **901**
Deposit on Road (e.g. Oil, Mud, Chippings) **102**	Defective Lights or Indicators **202**		Failed to Look Properly **802**	Vehicle in Course of Crime **902**
Slippery Road (Due to Weather) **103**	Defective Brakes **203**		Failed to Judge Vehicle's Path or Speed **803**	Emergency Vehicle on a Call **904**
Inadequate or Masked Signs or Road Markings **104**	Defective Steering or Suspension **204**		Wrong use of Pedestrian Crossing Facility **804**	Vehicle Door Opened or Closed Negligently **905**
Defective Traffic Signals **105**	Defective or Missing Mirrors **205**		Dangerous Action in Carriageway (e.g. Playing) **805**	
Traffic Calming (e.g. Speed Cushions, Road Humps) **106**	Overloaded or Poorly Loaded Vehicle or Trailer **206**		Impaired By Alcohol **806**	
Temporary Road Layout (e.g. Contra flow) **107**			Impaired by Drugs (illicit or Medicinal) **807**	
Road Layout (e.g. bend, Hill or narrow Carriageway **108**			Careless, Reckless or in a Hurry **808**	
Animal or Object in Carriageway **109**			Pedestrian Wearing Dark Clothing at Night **809**	
			Illness or Disability, Mental or Physical **810**	Other – Please Specify in Central box **999**

12.4. Human Interactions System Codes

Legal	119	Travelled above posted speed limit on
Legal	121	Disobeyed a Yield instruction (Give Way) on
Legal	122	Disobeyed a Yield instruction (Stop & Give Way) on
Legal	123	Disobeyed a Yield instruction (Red signal) on
Legal	124	Disobeyed a mandatory Lane Marking (inc One Way instruction) on
Legal	129	Disobeyed Signs or Markings on
Legal	131	Was legally unfit to drive due to alcohol
Legal	132	Was legally unfit to drive due to recreational drugs
Legal	139	Was legally unfit to drive due to consumed substance NFS
Legal	149	Was driving beyond permitted length of time
Legal	159	Was legally responsible for defect(s) existing in
Legal	199	Breached law (NFS) in relation to
Perception	219	Did not look for
Perception	221	Looked but did not notice item in plain view
Perception	222	Looked but did not discern (e.g. lights against similar background)
Perception	223	Looked but did not see, due to physical obstruction on carriageway
Perception	224	Looked but did not see, due to physical obstruction off carriageway
Perception	225	Looked but did not see, due to carriageway geometry (e.g. bend/crest)
Perception	226	Looked but did not see, due to vehicle geometry (e.g. blind spot; windows obscured)
Perception	229	Looked but did not see NFS
Perception	249	Saw, but did not perceive a hazard from (or in, or on)
Perception	251	Anticipated incorrectly the likely position of
Perception	252	Anticipated incorrectly the likely path of
Perception	253	Anticipated incorrectly the likely speed of
Perception	254	Anticipated incorrectly the likely acceleration of
Perception	255	Anticipated incorrectly the likely deceleration of
Perception	259	Anticipated incorrectly the likely (motion NFS) of
Perception	271	Perceived incorrectly the road layout (visual through effect) on
Perception	279	Perceived incorrectly the road layout (NFS) on
Perception	299	Perceived incorrectly a likely event NFS
Judgement	319	Travelled above vehicle-control speed on
Judgement	321	Misinterpreted a Yield instruction (Give Way) on
Judgement	322	Misinterpreted a Yield instruction (Stop & Give Way) on
Judgement	323	Misinterpreted a Yield instruction (Red signal) on
Judgement	324	Misinterpreted a mandatory Lane marking (inc One Way instruction) on
Judgement	329	Misinterpreted Signs or Markings on
Judgement	339	Changed intention and acted beyond point of no return for original manoeuvre
Judgement	349	Travelled excessively close to
Judgement	351	Misjudged the established position of
Judgement	352	Misjudged the established path of
Judgement	353	Misjudged the established speed of
Judgement	354	Misjudged the established acceleration of
Judgement	355	Misjudged the established deceleration of
Judgement	359	Misjudged the established (motion NFS) of
Judgement	361	Interpreted correctly information or signal from
Judgement	365	Interpreted incorrectly information or signal from
Judgement	369	Received information or signal (NFS) from
Judgement	379	Misjudged own conspicuity to
Judgement	399	Misjudged an actual event NFS

Loss of control	419	Lost control due to excessive braking of
Loss of control	429	Lost control due to excessive acceleration of
Loss of control	431	Lost control due to excessive cornering - understeer of
Loss of control	432	Lost control due to excessive cornering - oversteer of
Loss of control	439	Lost control due to excessive cornering - NFS of
Loss of control	449	Loss of control due to incorrect operation of controls of
Loss of control	459	Lost control due to (new or existing) vehicle defect of
Loss of control	469	Lost control due to reaction to transient nuisance feature (e.g. dog) on
Loss of control	471	Lost control due to poor surface characteristics or contaminant on
Loss of control	472	Lost control due to rapid change of surface characteristics on
Loss of control	479	Lost control due to road-surface issue NFS on
Loss of control	499	Lost control (NFS) of
Conflict	511	Accidentally / Uncontrollably entered (e.g. fell into) path of
Conflict	512	Unintentionally entered (e.g. drifted into) path of
Conflict	513	Intentionally entered (e.g. swerved or stepped into) path of
Conflict	519	Adopted a path conflicting with that of
Conflict	539	Sought competition with
Conflict	549	Behaved aggressively towards
Conflict	559	Purposefully precipitated conflict with
Conflict	561	Gave appropriate information or signal to
Conflict	565	Gave misleading information or signal to
Conflict	566	Omitted to Give useful information or signal to
Conflict	569	Gave information or signal (NFS) to
Conflict	599	Failed to avoid / Unable to avoid (NFS)
Attention	611	Suffered a distraction by a passenger in own vehicle
Attention	619	Suffered a distraction by an internal event (e.g. phone, radio) in
Attention	621	Suffered distraction due to another road user (e.g. attractive pedestrian)
Attention	622	Suffered distraction due to previous accident / incident on
Attention	629	Suffered a distraction by an external event (e.g. another accident) on
Attention	631	Was inattentive due to panic / nervousness
Attention	632	Was inattentive due to stress
Attention	633	Was inattentive due to being in a hurry
Attention	639	Was inattentive for personal reason NFS
Attention	699	Was inattentive NFS
Impairment	711	Suffered non-fatal illness
Impairment	712	Died of natural causes
Impairment	719	Suffered illness NFS
Impairment	731	Suffered impairment due to alcohol
Impairment	732	Suffered impairment due to recreational drugs
Impairment	733	Suffered impairment due to medicinal drugs
Impairment	739	Suffered impairment due to consumed substance NFS
Impairment	749	Suffered impairment due to fatigue
Impairment	751	Was locally temporarily visually impaired by glare (from lights or sun) by / on
Impairment	752	Was locally temporarily visually impaired by weather condition (e.g. mist) on
Impairment	759	Was locally temporarily visually impaired NFS on
Impairment	799	Was personally impaired NFS
Inert	899	Truly helpless: No opportunity for any interaction at all, not even 599. (e.g. stationary and shunted). This should be coded very rarely.
Unknown	999	Interaction unknown - Code only used if the case is not understood !