

# Evaluation of the Longer Semi-Trailer Trial: Annual Report 2014

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A report for the Department for Transport  
July 2015  
Issue 1



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Annual Report 2014

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July 2015

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Issue 1

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## LST TRIAL EVALUATION : 2014 HEADLINES

At 31 Dec 2014	Latest figures	
<b>Trial Take Up</b>		Trial target total : 1,800 LSTs
<b>1,439</b> (80%)	<b>1,641</b> (91%)	LSTs registered on Vehicle Special Orders (VSO)s (% of trial target of 1,800 trailers)
<b>1,194</b> (66%)	<b>1,323</b> (74%)	LSTs on the road and submitted trial data (% of trial target of 1,800 trailers)
<b>114</b>	<b>123</b>	Number of operators with trailers on the road (based on data submitted for this report)
<b>Utilisation and km saved</b>		
<b>0.93m</b>	<b>1.18m</b>	Journey legs travelled by LSTs during the trial
<b>108m</b>	<b>137m</b>	km travelled by LSTs during the trial
<b>4.2 – 5.2m</b>		Vehicle km 'saved' by LST operations Lower bound - Upper bound (including retail return legs saved)
<b>Journeys saved</b>		Estimates of equivalent 'standard trailer' journeys saved across whole trial period and all operators
<b>1 in 22</b>		Average saving across all operators
<b>1 in 9</b>		Highest saving achieved by individual operators
<b>Safety incidents involving LSTs</b>		
<b>Collisions</b> resulting in injury	<b>Casualties</b>	<i>Collisions / Casualties on public highways or public access areas</i>
<b>7</b>	<b>7</b>	<b>Personal injury incidents involving an LST.</b> (2012-2014 – public highway or public place)
<p><b>To date, the experience from LSTs in the trial is that, on a per kilometre basis, they have been involved in around 60% fewer injury collisions and 70% fewer casualties, in comparison to the average for standard articulated HGVs.</b></p>		
<p><b>There have been no fatal LST incidents and no vulnerable road users injured.</b></p>		

## Executive summary

### Background

The Department for Transport (DfT) is evaluating the impact of the operation of longer semi-trailers (LSTs) on Great Britain's (GB) roads. These trailers are up to 2.05m longer than the standard 13.6m units commonly seen on the roads in this country. DfT launched the 10-year trial in 2012; it will permit up to 1,800 trailers in two length categories (up to 14.6m and up to 15.65m) to operate under Vehicle Special Orders (VSOs) granted by the Vehicle Certification Agency (VCA). The trial is designed to evaluate the impact of LST operations on efficiency, emissions and safety. A reduction in emissions may be expected because the increased trailer capacity should allow the same quantity of goods to be transported in fewer journeys. Evaluation of the trial will determine whether this potential reduction in emissions is realised.

The first LSTs started to operate in March 2012 and formal data collection began in 1 May 2012, with operators recording details for every journey leg operated by each LST, as well as any safety related incidents experienced. Data is submitted in periods covering four months of operations after which a period report is submitted to DfT.

An annual report on the progress of the trial is published each year, once the final period of data from that year has been processed and validated. In March 2015, DfT published an interim report on the results for 2014, so that they could be available for briefings within the Department and at an industry LST forum on 21 April 2015. This document is the full 2014 Annual Report, containing full analysis of the 2014 data with some updates to the March 2015 interim results.

### Key facts and figures

At the end of 2014, almost **1,200 of the planned 1,800 LSTs were on the road**, with **over 1,400 VSOs granted** as of February 2015. At the time of writing those figures have risen to 1,323 on the road and 1,641 (91% of the target 1,800) on VSOs.

The results presented here include **data from 101 operators**, and represent the results from **929,000 LST journey legs** covering a distance of **108 million km**.

### Safety related incidents.

The following table shows the total number of safety related incidents involving LSTs in 2014, and the severity of the injuries to those people affected. The figures in brackets are the numbers for 2013.

Injury Collisions from Trial Logs	Casualties	Fatal	Serious	Slight
All Injuries	<b>10 (6)</b>	0	3 (1)	7 (5)
All Injuries in Public Road/Place	<b>7 (3)</b>	0	3 (1)	4 (2)
All Injuries judged LST related (any location)	<b>3 (2)</b>	0	0	3 (2)
All Injuries judged LST related in Public Road/Place	<b>1 (1)</b>	0	0	1 (1)

Source: LST Trial data - figures in brackets are the numbers for 2013.

**There have been no reported incidents involving an LST resulting in either a fatality or multiple injury. There have been no public injury incidents involving vulnerable roads users (pedestrians, cyclists, motor-cyclists).**

During 2014 the number of reported incidents involving a serious injury increased by two. Similarly, the number of incidents involving a slight injury increased by two. Only one of these four incidents (a slight injury incident) has been judged to be potentially LST-related by the operators concerned.

Of the total number of ten injury incidents on the trial to the end of 2014, only three have been found to be related to the fact that the trailer was an LST. Of these, only one occurred on the public highway or private land accessible to the public.

### Comparison to injury rates for all UK articulated HGVs

We compare the incident rate for LSTs to that for the overall UK articulated HGV fleet using a method described in the 2013 Annual Report. This involves consideration of road traffic collision data involving personal injuries (STATS19), and DfT's traffic flow statistics for the whole trial period: 2012-2014.

### Comparison of LST public road collision and casualty rates (to end Dec 2014) vs. GB general articulated fleet

Injury incidents Public access locations	LST Rate (per billion vkm)	GB Artic HGV Rate (per billion vkm)	Ratio LST/GB-HGV
<b>Collisions</b>	<b>64.8</b> (73.2)	<b>170.0</b> (187.4)	<b>38%</b> (39%)
<b>Casualties</b>	<b>64.8</b> (73.2)	<b>241.3</b> (262.5)	<b>27%</b> (28%)

Sources: LST from trial data. GB from STATS19 and TRA3105 – all 2012-2014 (Figures in brackets are the figures reported to end 2013).

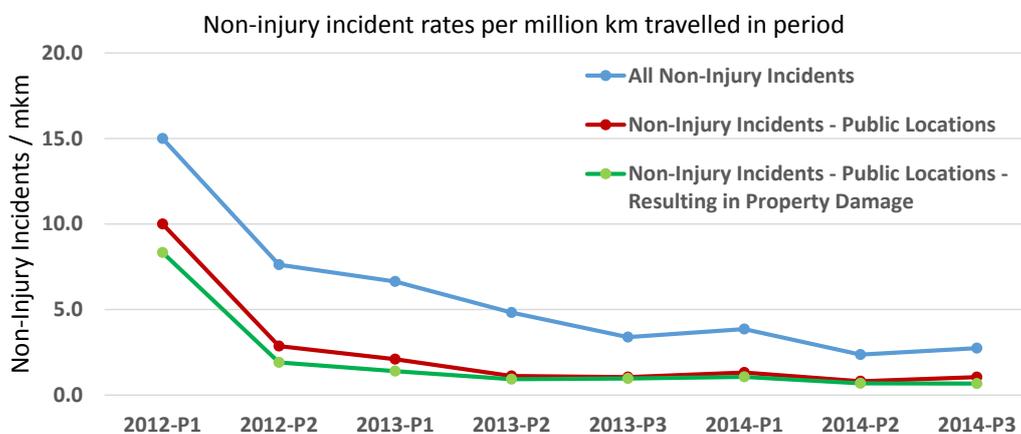
**At the national level, there is no evidence that LSTs are experiencing a higher rate of road traffic collisions than that experienced by the national fleet of articulated HGVs. To date, the experience from LSTs in the trial is that, on a per kilometre basis, they have been involved in around 60% fewer injury collisions and 70% fewer casualties, in comparison to the average for standard articulated HGVs.**

We have done some preliminary work to examine the possibility that in urban operations, LSTs might pose a higher risk than standard trailers, but this is masked by the dominance of long distance motorway travel in the LST dataset.

We have reviewed the ten injury incidents to date in detail and found that only one took place on the public highway in an urban setting. Our initial analysis has concluded that the number of urban LST injury incident events to date is too few for any statistically significant inference to be made.

### Damage only (non-injury) incidents

We have analysed the 421 events reported that did not result in any personal injuries.



Source: LST Trial data

Of these 421 events, only 360 noted damage to either the trailer or property.

Over half of the events occurred on private property and the majority of these damage only incidents occurred during turning or moving off/ stopping. We also note that the rate of non-injury events fell significantly after the first few periods of the trial and that this probably reflects a period of 'bedding in'.

The key challenge in using damage only data is the lack of a single robust dataset on damage events for the national standard trailer fleet, comparable to STATS19 for the injury data.

We continue to refine our analysis of non-injury incidents in several ways:

- Detailed review of the incident logs to check the classification of events that are not reported as 'not on public highway', but appear to have occurred in depots. Some of these are events at the entry/exit point of private sites
- A joint initiative with a group of operators who run large LST fleets and have high quality in-house incident reporting systems. These operators capture data for both LSTs and standard sized trailers on injury and non-injury events. We are seeking to merge data from several large operators into a common data format so that we can compare damage only data for LSTs and non-LSTs. A particular focus for this will be on urban operations.

### HGV vehicle kilometres (vkm) saved

We have estimated the number of vehicle km saved by LST operations using the same methodology used for 2013. Savings are expressed in vehicle km travelled and include a small loss factor to reflect a marginal increase in fuel consumption (and hence environmental impact) by LSTs over standard length trailers.

**We estimate that between 4.2 and 5.2 million vehicle km of HGV movements have been removed from the road during the operation of LSTs since September 2012.**

We have also recalculated the equivalent figures for 2013, following the changes to utilisation bands proposed in the 2013 annual report and subsequently reported by the operators. These changes removed an inherent conservatism in the previous estimates.

### Vehicle km saved by using LSTs

Distance saved (million vehicle km)	2014	2013 New Calculation	2013 Annual Report
Lower bound	4.2	1.4	0.6
Upper bound	5.2	1.7	0.9

Source: LST Trial data

**The upper bound estimate represents a saving of around 4.7% on the distance that would have been travelled by standard 13.6m trailers to move the same cargo. Alternatively, assuming average journey distances, this is equivalent to a saving of 1 journey in 22 across the whole trial to date.**

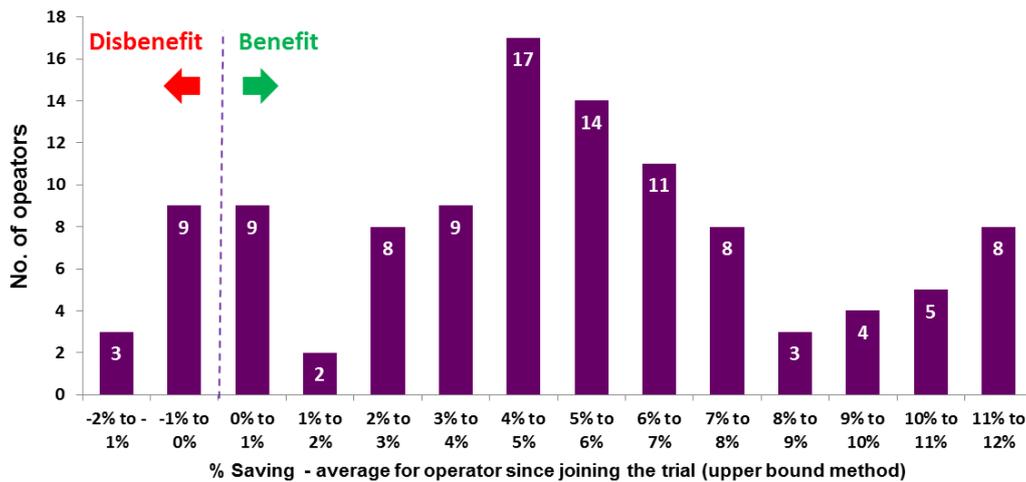
### Journeys saved by individual operator

We have refined the calculation process so that we can analyse the savings results in more detail including the range of savings estimated for each individual operator.

**Estimated vehicle km savings by individual operators range from a maximum of 11.5% to a minimum of -1.8%.**

At the top of this range, operators are saving **up to 1 in 9 journeys** in the way they are operating the LSTs in the trial. This is the maximum that might be anticipated. There are 13 operators with estimated savings over 10%. They have 43 LSTs between them.

### Distribution of % distance saved using LSTs - by operator



Source: LST Trial data

The operators experiencing a dis-benefit from their use of the LSTs are rarely operating them full, and almost all their journeys could be undertaken with standard 13.6m trailers. The loss factor in the calculation for increased emissions then produces a net loss when expressed in vkm. There are 12 operators in this group. They have 72 LSTs between them, although only seven of those fall into the very bottom band on the chart above.

We discuss the difference between the operators at extremes of this distribution, based on our knowledge of their data, qualitative survey submissions and one-to-one conversations during data submission.

#### Qualitative Data

We have analysed 100 qualitative survey files submitted by operators to date. These indicate the views and experiences of operators after their first few months of operation. The results are mostly positive, both in terms of ease of operation and the benefits in terms of reduced journeys for a given quantity of cargo. This information will be updated at the end of 2015.

#### Looking Ahead

Our process priorities for 2015/16 include:

- To see the remaining participants begin LST operations and start submitting data.
- To resolve remaining issues with submission timeliness for some operators
- To retain the current high level of participant engagement with the process

Our special analysis planned activities for 2015/16 include:

- Further discussion of how urban risk might be assessed using the existing trial data
- The pilot stage of our 'Operator In-house Data' analysis for damage only events comparing LSTs with operators' standard sized fleet
- An updated 'snapshot' of the qualitative experience of operators using LSTs.

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# 1 INTRODUCTION AND EVALUATION FRAMEWORK

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- 1.1 The Department for Transport (DfT) wants to evaluate a trial of the operation of longer semi-trailers (LSTs) on roads in Great Britain (GB). These trailers are permitted to be up to 2.05m longer than the standard 13.6m units commonly seen on the roads in this country.
- 1.2 A trial has been created to gather evidence about the operational performance of LSTs in terms of safety, environmental impact and economics. The trial is proposed to last for 10 years from its launch in 2012. The first semi-trailers were granted Vehicle Special Orders (VSOs) early in 2012 and data collection began on 1 May 2012.
- 1.3 The outputs from the trial will feed into a decision about whether to permit an increase in the length of semi-trailers authorised for operation on roads in GB. More broadly, the trial will contribute to DfT's work to:
- identify de-regulatory measures to reduce burdens on business; and
  - identify measures to reduce emissions from HGVs.
- 1.4 In December 2011, the Freight, Operator Licensing and Roadworthiness Division (FOLR) of the DfT commissioned Risk Solutions to:
- Design a process to collect data to support the evaluation of operational performance of LSTs.
  - Set up the initial systems for data collection.
  - Initiate the process and support participants during the first year of the trial (2012).
  - Report on progress achieved during the year.
- 1.5 Terminology specifically related to the trial and the data gathering is used throughout this report and is defined either in the text or the appendices. Terms that are in common use in the industry are used without further explanation.
- 1.6 Risk Solutions has been commissioned to continue in the role of independent evaluation consultant for the trial through to March 2017.
- 1.7 Results from the LST operations to the end of 2013 were reported in the second Trial Annual Report<sup>1</sup>.
- 1.8 An interim report on the 2014 trial data was published in March 2015 to allow results to be made available prior to the 2015 General Election<sup>2</sup>.
- 1.9 This third annual report follows the format adopted in 2013 based around the evaluation framework. The report expands on (and updates) the data shown in the 2014 Interim Results report.
- 1.10 New or expanded sections in this report include:
- A new analysis of the 100 qualitative survey files (QSFs) submitted since the start of the trial, primarily by operators at the end of their first four months of operation
  - An extended analysis of utilisation expressed as 'vehicle km saved' examining:
    - savings expressed as a percentage of the total distance that would have been covered if LSTs had not been used
    - the range of the percentage savings by operator (anonymised).

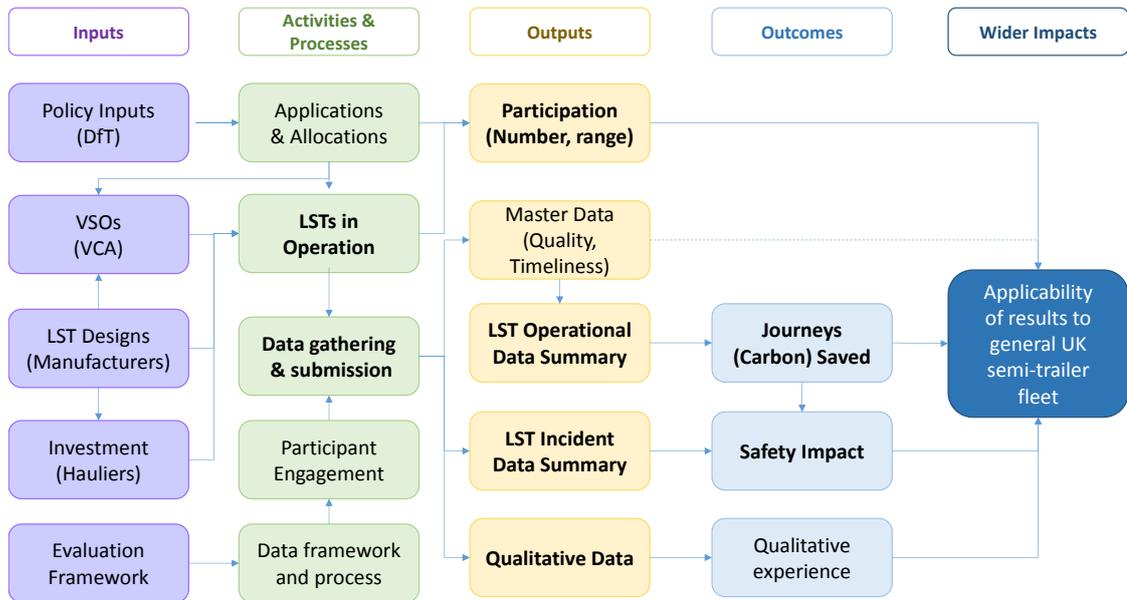
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<sup>1</sup> Evaluation of the high volume semi-trailer trial: annual report 2013. DfT June 2014  
<https://www.gov.uk/government/publications/evaluation-of-the-longer-semi-trailer-trial-annual-report-2013>

<sup>2</sup> Evaluation of Longer Semi-Trailers: 2014 Interim Results Report.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/421934/longer-semi-trailer-trial-interim-report-2014.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/421934/longer-semi-trailer-trial-interim-report-2014.pdf)



- 1.14 The PLM provides a structure for evidence gathering, collation and analysis, mapping how the inputs, key activities and outputs are used to deliver the desired outcomes. An expanded explanation of PLMs as outlined in the HMT guidance is given in Appendix B.
- 1.15 Ideally, a full evaluation framework would have been drawn up prior to the start of the trial. However, the circumstances at the time precluded this, although many of the necessary elements were present in the work done to define the trial data collection processes. We are therefore able to start to 'back fit' the existing trial aims and structure on a PLM. The current version is shown in Figure 2.



**Figure 2: LST Trial Evaluation Programme Logic Model (v1)**

- 1.16 Some elements of the model and the progress being made on them can be expressed as metrics (e.g. How many operators have been signed up? How many LSTs are operating compared with the planned total?). Others may only be expressed qualitatively (e.g. Has the trial attracted a range of operator types and sizes as was hoped?) as no numeric or quantified target was set at the start of the trial.
- 1.17 Where metrics were explicit in the original formation of the trial (e.g. 1,800 LSTs on the road), they are clearly identified in this report and progress against them will be evaluated as the trial continues.
- 1.18 Where no quantitative measure can be established, progress is reported qualitatively.
- 1.19 The PLM will be developed further as the trial continues. This report has been structured to align with the PLM evaluation stages as follows:
  - Section 2 Inputs
  - Section 3 Activities and Processes
  - Section 4 Outputs
  - Sections 5 and 6 Outcomes
  - Section 7 Wider Impacts
- 1.20 Section 8 brings together the key conclusions and observations from the work to date.

## 2 PROGRESS ON TRIAL INPUTS

### Policy inputs

		Inputs
<b>Trial requirements and LST allocations</b>		
2.1	The core framework for the trial was established by DfT at the end of 2011 and, with one exception, has remained largely unchanged. Full details are on the DfT website <sup>5</sup> .	Policy Inputs (DfT)
2.2	In 2013 the LST allocation process was reviewed to reflect the fact that take up was slower than anticipated and there was evidence for strong operator preference for the longer design (up to 15.65m) over the shorter one (up to 14.6m).	VSOs VCA
2.3	A final allocation round was opened in the autumn of 2014, inviting operators to bid for the approximately 400 remaining allocations that had expired.  The new allocation process had the following features: <ul style="list-style-type: none"> <li>• a 'deck of cards approach' was used until each bidder had received one allocation, then a second and a third and so on, until each reached its full bid when it dropped out of further rounds.</li> <li>• This continued until all 400 had been allocated</li> <li>• Operators' bids for a share of the allocation were submitted during a four week period ending Friday 26 September 2014.</li> <li>• DfT received bids that exceeded the number of LSTs available to be allocated and so scaled back the bids accordingly.</li> <li>• Operators were free to use their allocations for either length of longer semi-trailer, either 14.6 metres or 15.65 metres.</li> <li>• Allocations were subject to the overall cap that was applied as part of the original allocation process, to ensure that no operator received too large a share of the total quota</li> <li>• All new allocations were valid for six weeks, by which time the operator had to provide DfT with proof that the trailers have been ordered or a VSO had been issued</li> </ul>	LST Designs (Manufacturers)
		Investment (Hauliers)
		Evaluation framework
2.4	The aim of this last allocation process was to ensure that the original aim of 1,800 LSTs (approximately 2% of the total GB semi-trailer fleet) running in the trial could be realised as soon as possible, and to meet demand from those in the industry who were ready to use longer semi-trailers.	
<b>Data requirement</b>		
2.5	The other core policy input by DfT was definition of the original data requirement, which was first drafted in December 2011. Risk Solutions and DfT rationalised that original data requirement for the first version of the data submissions to be completed by operators. DfT's rationale for each data item is given in Appendix A1.	
2.6	As described in last year's annual report, the data collection process uses Excel templates. The Excel templates are described in Appendix A, and are available on the DfT website along with the guidance provided to managers and operators <sup>6</sup> .	

<sup>5</sup> <https://www.gov.uk/government/policies/providing-effective-regulation-of-freight-transport/supporting-pages/trialling-longer-hgv-semi-trailers>

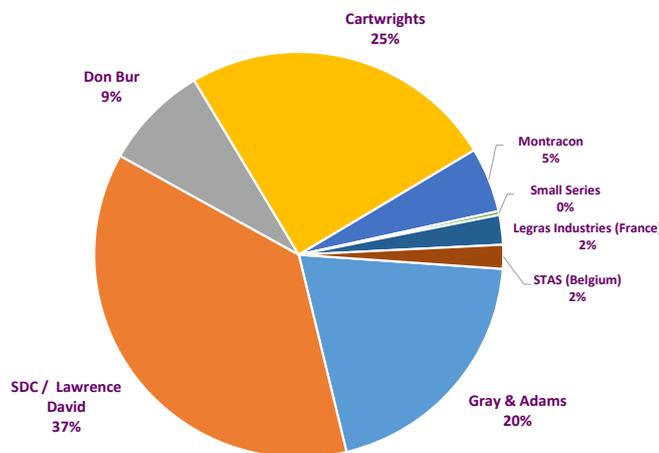
<sup>6</sup> The latest trial data process templates, user guide and management summary are available on the DfT website at <https://www.gov.uk/government/publications/longer-semi-trailers-trial-data-guidance-and-documentation>

### Vehicle Special Orders (VSOs)

- 2.7 The Vehicle Certification Agency (VCA) issues the Vehicle Special Orders (VSOs) under which the LSTs are permitted to run on GB roads. For new designs this involves rigorous testing by VCA at Millbrook Proving Ground or at the manufacturer’s site, leading to a Model Report which records the design parameters of the LST design being approved, and its performance in the various tests. For further builds of a design under an existing model report, each new trailer is sent for a simple conformance test.
- 2.8 In a few cases, a National Small Series number has been issued to a manufacturer covering a number of repeat builds of a proven design without further VCA testing of individual units, unless there are modifications to any of the chassis systems.
- 2.9 Beyond this, VCA’s role also involves advice to DfT, operators and Risk Solutions on matters relating to LST operations under VSO where required.
- 2.10 Risk Solutions has added further checking steps to our process to identify where there are differences between the VINS stated in the data by operators, and the VINS recorded by VCA and DfT, so that they can be corrected. This is important as the detailed analysis depends on the VIN to identify each trailer consistently across all the datasets.
- 2.11 Risk Solutions and VCA are currently working together to codify key data from the VCA model reports<sup>7</sup> so that we will be able to match operational data back to key design features, such as tail-swing distance.

### LST design development and manufacturing

- 2.12 The LST designs are emerging from a combination of proposals by manufacturers and bespoke designs prompted by user specifications developed by the operators. The numbers of any one design being produced are determined by the demand from the market.
- 2.13 At the time of writing, the LSTs on the road were provided by 12 manufacturers (Figure 3).



Source: LST Trial data

Figure 3: LST fleet by manufacturer (WMI)<sup>8</sup>

<sup>7</sup> Each LST design is tested by VCA to ensure it conforms to the requirements laid down for the trial by DfT. This includes a practical test of the turning circle requirements, on-the-road tests of performance and stability, and measurements such as the cut-in and kick-out (tail swing) of each design under a pre-defined set of turning and speed conditions.

<sup>8</sup> The manufacturer is derived from the World Manufacturer Identifier (WMI) code noted in the first three characters of the trailer VIN number. Note: SDC and Lawrence David both cite WMI=SDC because SDC provide all the chassis.

- 2.14 The LSTs are largely being produced by the major UK builders, with just four trailers built by small manufacturers (<500 unit per year). In addition, 31 LSTs have been sourced from two suppliers in mainland Europe.
- 2.15 The majority of designs are variants on the standard single deck box/curtain sider. Additionally, there are more complex designs produced to satisfy operator requirements, including step frames, dual deck (fixed and moving), a small number with two steering axles and a few flatbed and skeletal models. (See section 3).

### Investment

- 2.16 DfT's financial commitment under the trial covers their project management of the trial, the time required by VCA for the testing of LST designs prior to issue of a VSO and the contract with Risk Solutions for independent evaluation support.
- 2.17 The decision that the trailers would be funded wholly by the market, without any subsidy from public money, was one of the drivers for setting the trial up as a ten year programme.
- 2.18 While the take up of allocations was initially slower than DfT anticipated, the take up during 2012-13, and the oversubscription of the revised allocation processes in 2013 and in 2014 suggest that there is, at least for many operators, a good business case to justify investing in the trailers. Some manufacturers have also produced trailers for lease. Analyses later in this report (see Section 6) will give some insight into the extent of efficiency savings being realised by different types of operation.

### Evaluation Framework

- 2.19 The evaluation data framework and process was originally drafted by DfT and is being further developed jointly, by DfT and Risk Solutions.
- 2.20 The data gathering processes now in place provide for:
- basic reporting of trial statistics to DfT after each four month data collection period
  - this annual report
  - special topic analyses during any year to provide more in depth study of the data.
- 2.21 The evaluation work is funded by DfT.

## Summary evaluation of trial inputs

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- **The roles of each organisation are now well established and appear to be fit for purpose, with special cases being handled by the relevant combination of DfT, VCA and Risk Solutions.**
- **Work is underway to make it possible to link the LST data submitted by operators back to more detailed design information held by VCA.**
- **The trial arrangements, with the revised allocation process, are judged to be fit for purpose, noting specifically the willingness of operators to join the trial and invest in the trailers**

## 3 TRIAL ACTIVITY AND PROCESSES

### Core trial activities

- 3.1** The consultation on the allocation process and the launch of the revised processes in September 2013 and 2014 were significant activities for DfT, designed to ensure the trial reached its goal of 1,800 LSTs on the road. The number and nature of LSTs in operation is not, of itself, an output of the trial, but realising this objective is considered important so that a credible evidence base from the trial can be established.
- 3.2** For operators, safe and efficient operation of the LSTs is a primary goal, to generate a commercial return on their investment. The commercial return is not an output of the trial, but without it there would be no trial, because there would be no participants.
- 3.3** For Risk Solutions, the primary focus during 2014 remained refining the process for data collection and checking submissions, maintaining engagement with existing participants and inducting new applicants into the process.
- 3.4** All these activities need to be sustained to ensure that the required trial outputs and evidence are generated. We report on progress in each area in this section.

Activities &  
Processes

Applications  
& Allocations

LSTs in  
Operation

Data gathering  
& submission

Participant  
Engagement

Data framework  
and process

### Applications and allocations

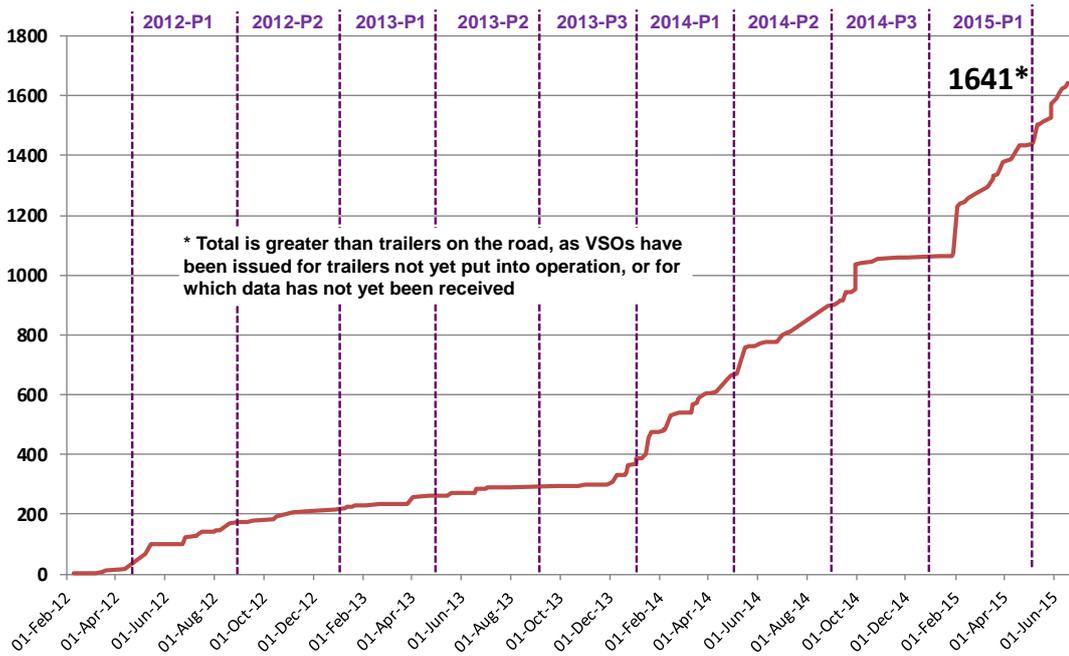
- 3.5** A further two allocation processes in September 2013 and September 2014 ensured that the remaining allocations were taken up by operators, as set out in paragraphs 2.2 to 2.4.
- 3.6** At the time of writing, there were more than 1,641 trailers registered on VSOs with just over 130 operators. Another 30<sup>9</sup> operators hold an allocation and have provided evidence of an order being placed with a manufacturer.

### LSTs in operation

#### Number of LSTs in operation

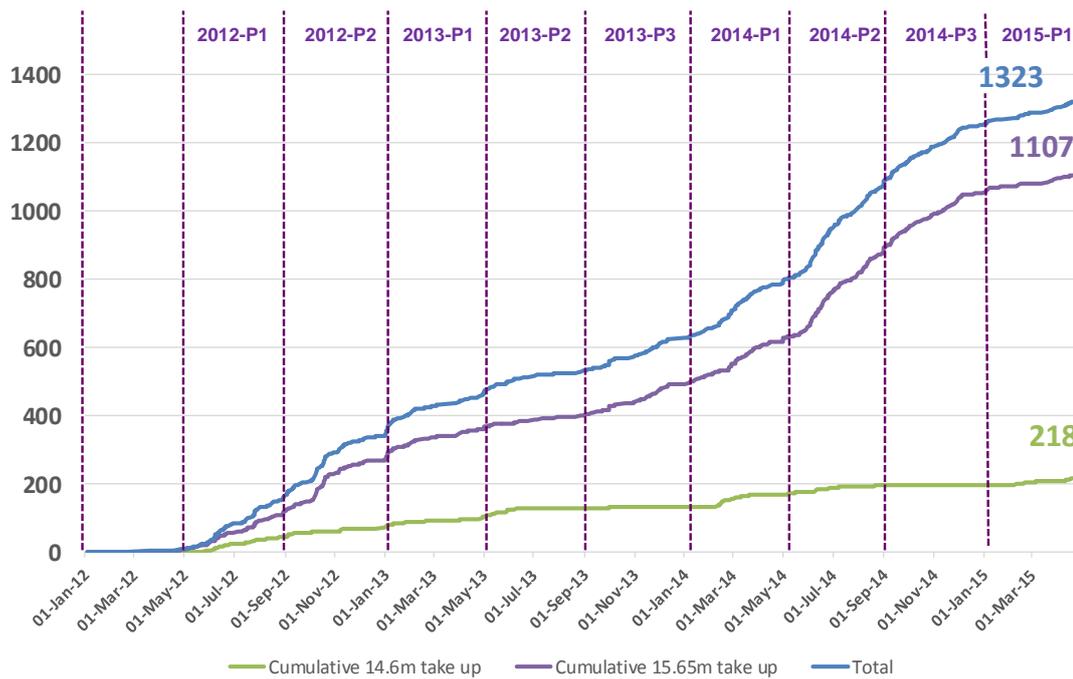
- 3.7** Progress towards the total complement of LSTs being in operation can be seen by tracking the number of VSOs granted (from DfT data) and the number of LSTs known to be on the road by the date on which they appear in the journey logs submitted by the operators.
- 3.8** Figure 4 shows the growth in trailers on VSOs, with 1,265 counted at the end 2014, although as the chart indicates, there was a delay in updating the VSO database so the last 100 of these appear in a 'spike' at Feb 2015 (denoted by dashed line). At the time of writing, the data from 2015-P1 show 1,641 LSTs on VSOs, which is 91% of the target fleet of 1,800.
- 3.9** Once the VSO is granted there can be a delay before the trailers are built, commissioned and brought into service, especially for a run of a new design. The lag may be smaller where an operator is adding further units of an existing design to their fleet. The first on the road date of each trailer is extracted from the data submitted by operators to give the cumulative profile of LSTs shown in Figure 5.

<sup>9</sup> Estimate provided by DfT, December 2014.



Source: DfT trial data - VIN database

Figure 4: Number of LSTs on live VSOs by date



Source: LST Trial data

Figure 5: LSTs 'On the Road' by date, based on Journey Logs

3.10 The figure shows that at the end of 2014, almost three years since the launch of the trial, 1,200 LSTs were in service on the road (67% of the target). At the time of writing, the 2015-P1 submission contained data from 1,323 trailers (approximately 75% of the target), although that did not include data from a small number of delayed submissions.

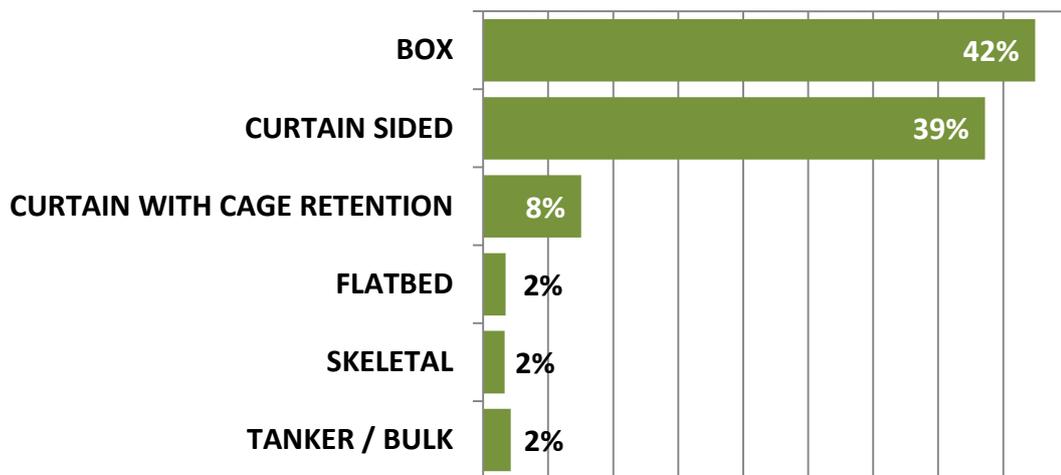
- 3.11 Around 200 of the fleet are in the 'up to 14.6m' group, with very few trailers of this length added since the middle of 2014. Thus, the percentage of the LSTs in this group has reduced from 20% (in 2013) to 16%, as the total number in the longer category continues to grow.

### LST design mix

- 3.12 The detailed design of the underlying semi-trailer (exact dimensions, detailed axle data etc.) is contained in the vehicle model report held by VCA as part of the process of granting a VSO to an operator. As noted in Section 2, VCA and Risk Solutions are working to codify the key elements of the model report so that it can be used for future analysis.
- 3.13 Even if the model report data were provided, it would not necessarily give details of the design above the deck, in terms of the body design, whether the units are chilled or whether any special safety systems were added.
- 3.14 Data gathering for the trial therefore requires operators to submit some basic design information in a worksheet inside every data submission file (DSF). Most of the data remains unchanged from period to period, but the sheet allows operators to indicate time when the trailer was off the road and flag up any changes in status, or sale of the units.
- 3.15 An outline of the data collected is provided in Appendix A5.

### Body design and features

- 3.16 Figure 6 shows the basic body design of LSTs on the road in 2014; almost all of them are either solid box construction (tail loading) or curtain-siders. A proportion of the latter have some form of retention system built in to allow the curtain-sider to be loaded with roller cages or goods in similar modes of appearance requiring such additional restraint.



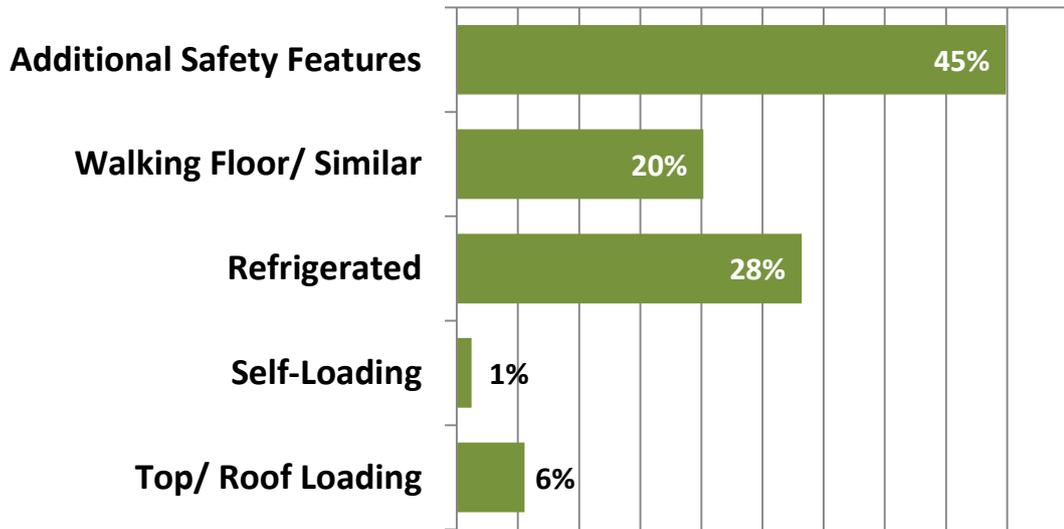
Source: LST Trial data

**Figure 6: Body design of all LSTs on the road<sup>10</sup>**

- 3.17 As the fleet has grown during 2014, the split between box and curtain-siders has shifted. At the end of 2012, just over 60% of LSTs were box construction, at the end of 2013 this had reduced to about 50%, while at the end of 2014 it had reduced a little further to 42%. The change is reflected largely in an increase in the proportion of curtain sided trailers up from 31 to 39%) as well as groups of more specialist designs

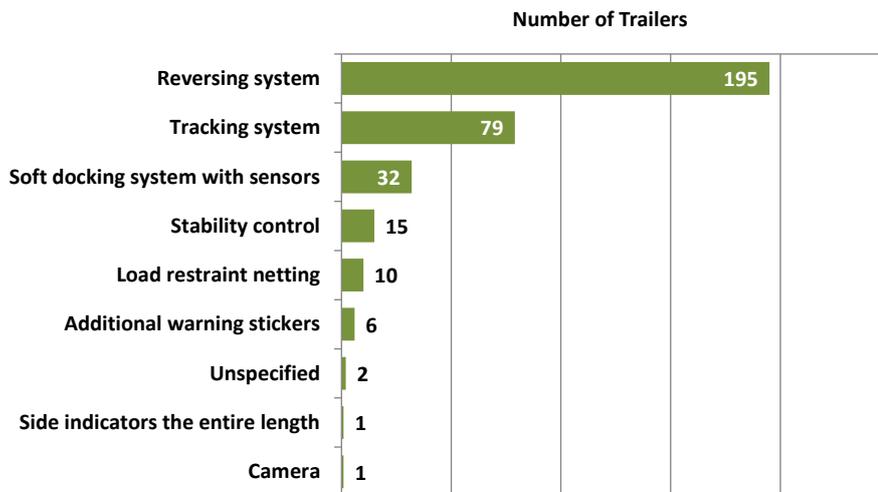
<sup>10</sup> Total on road at the waiver date for 2014-P3 – i.e. 1 December 2014– for operators new to the trial, and by 31 December 2014 for operators already part of the trail by this date. This also applies to subsequent figures.

3.18 Figure 7 shows that 28% (35% at the end of 2013) of all operational LSTs are refrigerated units<sup>11</sup>. This figure also shows that 20% (17% at the end of 2013) of LSTs have walking floor or similar system to aid loading and unloading. The 1% recorded as self-loading are flat bed units with loading ramps at the rear.



Source: LST Trial data

Figure 7: Other features of all LSTs on the road



Source: LST Trial data

Figure 8: Additional safety features (where data provided)

3.19 Figure 8 shows the additional safety features reported by the operators in their trailer reference information. This chart is not shown as a percentage of the LST fleet, but simply as the number of trailers where some additional features have been noted. This is because what one operator may regard as ‘additional’, another may regard as ‘standard kit’. Trailers may also be fitted with more than one additional feature. A decision was made not to create a comprehensive list of every conceivable safety feature and require operators to select from the list, but simply to provide the opportunity for operators to note such features and examine what

<sup>11</sup> Knowing which trailers are refrigerated is an example of where the construction is important for later analysis. In this case, estimates of volume utilisation must recognise that refrigerated trailers have around 30% of the volume (above the cargo) free to permit circulation of chilled air.

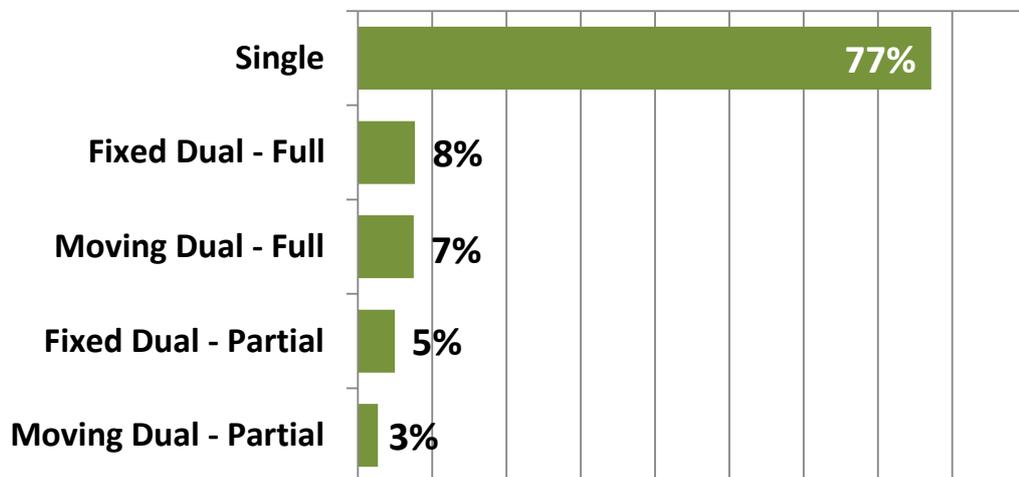
emerged

3.20 Reversing aids have clearly been the most common additional feature noted and text notes indicate that these include proximity warning systems and cameras. The ‘soft docking’ systems have a related purpose, providing protection for dock asset and trailer when the LST is being reversed onto a loading bay. This reflects operators’ recognition of the risks to fixed assets and people during reversing movements.

3.21 We believe that the reported number of LSTs with tracking systems added (79) is much lower than is actually the case as we are aware of whole fleets of 30 or more LSTs that are tracked. Telematics are now more common and many larger operators no longer consider this as an additional feature, but one they have on most tractor units and many trailers. We also know of a number of operators who did not fit tracking at the time of ordering their LSTs – and hence did not note it in their Company Information return – but who are now retro-fitting tractor and or trailer telematics on the longer trailers or their whole fleet.

**Deck arrangements**

3.22 Figure 9 reports the deck arrangements of the trailers. The presence of dual or part-dual decks is relevant to the analysis of volume and deck-space utilisation.



Source: LST Trial data

**Figure 9: Deck arrangements of all LSTs on the road**

3.23 Just over 75% of the LSTs reported here are single deck, which is perhaps as expected given the additional cost and weight penalty of the various forms of dual deck, along with the need to have loading/unloading arrangements which are able to manage such designs.

3.24 The data behind this chart shows that 65%<sup>12</sup> or more of the Moving Dual-Full deck units are being used by the Mail/Parcels/Courier businesses, with the other dual deck designs spread amongst general hauliers, retailers and pallet/groupage operators. A more refined analysis of the design choices by operator type will be appropriate once the full complement of participants is reached.

3.25 Figure 10 shows the different axle arrangements present in the fleet. Most manufacturers have demonstrated that designs using a single steering axle at the rear of the trailer can be built to comply with the requirements of the trial in terms of the manoeuvrability requirements, etc. and it is clear that for almost all operations a single steer axle has been considered sufficient to meet users’ operational requirements. We note that up to this point, no operator has found Active Steer technology necessary to meet legislative manoeuvrability

<sup>12</sup> The 2013 Annual Report stated a figure of approximately 50%. Since then one company has been reclassified from ‘Other’ to ‘Courier/Parcels, which accounts for a significant part of the change.

requirements.

- 3.26 As the fleet grows, it will be interesting to see whether the benefits of self-steer vs. command steer and one vs. two steering axles emerge either in the data or in the choices made by different business types. We can then also plan to insert qualitative survey questions to assess the reasons operators select a particular design.



Source: LST Trial data

**Figure 10: Axle steering arrangements of all LSTs on the road**

## Data collection framework

- 3.27 Operators submit three types of data: company information; qualitative information; and LST operational data.

### Company information

- 3.28 This is submitted once only, when the operator enters the trial (when their first VSO is granted).
- 3.29 This includes some basic information about the size and nature of the operator's business and a set of summary figures about their non-LST semi-trailer fleet.

### Qualitative information

- 3.30 This is submitted when the operator enters the trial and then optionally at later times.
- 3.31 This is a set of open questions about the experience of the company, its staff and clients in operating the new trailers. The questions may vary as the trial develops.

### LST operational data

- 3.32 This is submitted every data period and covers all LST operations in that period.
- 3.33 This is the primary trial data and includes:
- An aggregated journey log of all LST journeys on the public road network in the period. The log includes details of locations and times, the nature of the journey, load and mode of appearance (MOA) types, load weight and two measures of utilisation.
  - A set of trailer reference information relating trailer IDs to their vehicle identification number (VIN), basic design details and numbers of days 'off the road' in the period.
  - An incident log covering all LST incidents on the public highway and certain types of incident on private property (e.g. in depots, at client sites).
- 3.34 All files submitted are checked for basic errors and inconsistencies by Risk Solutions and then
- comments and requests for revisions are sent back to the operator, **OR**

- an 'Accepted' email is sent, signifying the completion of the process.
- 3.35 All three sets of data are collected using Excel templates provided by Risk Solutions. The operator's manager/primary contact is responsible for:
- ensuring that the latest versions of the templates (from the DfT website) are in use as they may be updated periodically.
  - ensuring that the process has been completed, evidenced by receipt of an 'Accepted' email for each file of data submitted.

### Support

- 3.36 Risk Solutions staff provide email and telephone support to operators of all sizes in setting up their data collection processes at whatever level, whether it is giving advice on completing the Excel template manually for a single trailer, or liaising directly with the operator's IT or telematics specialists on large scale data download formats.

## Data collection process

- 3.37 Data is collected three times per year.
- 3.38 The agreed submission cycle adopted for the period 2012-2014 is shown in Table 1.

**Table 1: Data submission schedule**

Period Ref	2012 P1 <sup>13</sup>	2012 P2	2013 P1	2013 P2	2013 P3	2014 P1	2014 P2	2014 P3
Data Collection Period	May-Aug 2012	Sep-Dec 2012	Jan-Apr 2013	May-Aug 2013	Sep-Dec 2013	Jan-Apr 2014	May-Aug 2014	Sep-Dec 2014
Data Submission Month	Sept 2012	Jan 2013	May 2013	Sept 2013	Jan 2014	May 2014	Sept 2014	Jan 2015

- 3.39 In last year's annual report we noted that DfT and Risk Solutions were considering the feasibility of reducing submission frequency to twice per year. In November 2014 we decided to reconsider this once all trial participants had been enrolled, and the data submission process was consistent across operators. At this stage, with many new operators joining the trial during 2015, we judged that moving to a lower frequency of submissions would not be the best method in which to obtain as robust a data set as possible.
- 3.40 The submission periods for 2015 and, at present, 2016 continue the pattern shown in Table 1.

### Timely Submission

- 3.41 Operators are required to send in their draft data by the end of the second week of the month and to finalise their data in response to any comments from Risk Solutions by the end of a further two weeks.
- 3.42 Throughout 2014 we have seen a similar pattern in each period, with around 20% of operators unable to reach an 'Accepted' state until two to three weeks after the target deadline. The pattern is shown in detail in Appendix C. Our conversations and email communications with these 'late' cases continue to point to one or more of the following factors leading to late submission:
- Change of staff involved, often exacerbated by poor handover (we have also seen very

<sup>13</sup> Periods were previously referred to using the format P1-1, P1-2 for year 1, periods 1 and 2.

good handovers) – including changes in the staff who collect data in depots.

- Continued failure to establish a robust process that gathers and collates the data on a weekly or monthly basis, resulting in problems because collation begins just before (or after) the due date
- Failure to record the due dates and plan for submission.

### Missing/late submissions

- 3.43 About 10% of operators in each period fail to submit by the time we ‘freeze’ the data for that period. Their data still has to be submitted but is not included in any analysis until the subsequent period.
- 3.44 Since mid-2013, we have made it clear to operators that while Risk Solutions will seek to assist operators with their data processes in whatever way we can, there is a fundamental expectation that as they gain experience in the operation of the trailers and the data gathering process, the level of support needed will reduce.
- 3.45 DfT and Risk Solutions have a formal escalation process referred to as the ‘Missing/late data process’. The process is fully explained in Appendix C and is fully explained to operators in the guidance published on the DfT website as well as in these annual reports.
- 3.46 Risk Solutions classifies each operator shown on the list into one of five categories, each of which has an associated action outcome, although the specific steps for each case are discussed with DfT rather than following this in detail. Only the top two categories trigger action by DfT.
- 3.47 At the end of 2014, four operators (out of 123 expected submissions) reached Category 1, compared with one out of 75 for the same period in 2013.
- 3.48 The response of most operators, even those finding themselves on the list, has been positive with the gradual escalation being seen as fair.
- 3.49 Risk Solutions and DfT will continue to monitor the timeliness of submissions and seek further opportunities to guide operators in setting up sustainable and efficient processes for collating data, as indeed the majority are doing. We will also consider whether any further measures need to be taken when operators fail to demonstrate such a process over an extended period.

## Changes to data submission guidance during 2014

### DSF: Journey leg data

- 3.50 The structure of the journey log data has remained unchanged since September 2012 and no fundamental changes are currently planned.
- 3.51 In last year’s annual report, we noted plans to make some small adjustments to the guidance on the meaning or completion of selected data fields to remove inconsistencies as shown in Table 2. We have made these changes during 2014, which in most cases simply reflect practices already in use by the majority of participants.

**Table 2: DSF field clarifications enacted in 2014**

Case:	Consistency Clarification
<b>Training / Trailer testing</b>	‘Client’ column to be marked ‘Training or ‘Testing’ Leg Type = ‘Other’
<b>Goods Type 1) Empties / Waste Packaging</b>	Mode of Appearance (MOA) set to same value rather than Pallets, Cages etc.
<b>No Cargo</b>	‘Leg Type’ to be selected only from the three ‘Empty’ leg types or ‘Other’ (e.g. rather than ‘4) distribution centre (DC) to DC’ )

3.52 Further updates were made to the Excel DSF template in September 2014<sup>14</sup>, which have greatly improved the self-checking features, making it easier for operators to locate errors in their data before submitting.

#### DSF: trailer reference data

3.53 Apart from added self-checking features noted above, the trailer reference data sheet is unchanged from September 2012 and is, in general, completed well by most participants.

3.54 During 2014, we added an 'Ownership' field to accommodate the emergence of a consortium of operators who occasionally operate backhaul legs using other operator's trailers to reduce empty running. Where both the operators are participants in the trial, this practice has been approved by DfT subject to a policy statement they have developed and arrangements are being put in place to ensure the complete data record is collected.

#### DSF: Incident data<sup>15</sup>

3.55 There have been no changes to the incident log during 2014.

3.56 All participants are required to report incidents involving LSTs in two ways:

1. All significant events must be reported to DfT as quickly as possible so that DfT is aware of them<sup>16</sup>.
2. A more complete record of LST incidents is required in the incident log – one of the worksheets in the DSF submitted to Risk Solutions at the end of each data reporting period.

3.57 The clarifications made in the 2013 annual report regarding incident reporting remain valid and are repeated here to ensure newer operators are clear:

- The meaning of 'significant' by DfT – i.e. what must be reported to DfT at the time of the incident. The trial guide notes were updated with a statement that immediate reporting was required **"... for any incident involving injury or serious damage, or which could be picked up by the media for any reason."**
- What must be recorded in the incident log. The guidance is:
  - all incidents on the public highway involving either injury or damage to property
  - all incidents on private land (e.g. depots) where there was injury or a risk of injury.
  - Some operators are choosing to use the incident log to record all incidents involving LSTs, even those involving minor damage in depots only, simply as a tool for their internal analysis.

3.58 The guidance has always required that a judgement is made for each incident noting whether the occurrence or the outcome was 'LST related' – by which we mean would the event have occurred or developed in the same way, had the trailer been a regular 13.6m unit.

3.59 Since 2013, operators have been required to classify their judgment on whether each incident was 'LST Related' using the options in Table 3.

3.60 Risk Solutions reviews all incidents, focusing especially on those where there was any injury

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<sup>14</sup> The new template contains embedded consistency checks which reformat the colour of cells where an error or suspicious values has been entered. A trial version of the new sheet was used with selected operators during the 2014-P2 submission and operator comments incorporated into the version released to all operators for 2014-P3.

<sup>15</sup> The text of this subsection was included in the Annual Report 2012 but has been retained here as it is an area which both DfT and Risk Solutions wish to ensure is clearly understood by all parties.

<sup>16</sup> In most of the cases we have seen, incidents are being reported within a few days, with many being reported in 24 hours or less. However, in early 2015 we did note two cases, from a single operator, where we became aware of the incident through media channels before a direct report was made to DfT and some weeks after the events themselves. Investigation with the operator revealed that the manager in question had instructed a member of staff to report the events to DfT, but for whatever reason, that action was not completed and the manager had not followed them up. Other incidents from the same operator do appear to have been reported in a timely manner and the operator is clearly aware of the reporting requirements.

or damage in a public environment. Where there is an apparent mismatch between the log entry and the operator's selection from the LST Related classification, we call or email the operator and a discussion resolves the final judgement.

**Table 3: 'LST Related' incident judgement scale**

LST Related?	Judgement Guidance
<b>YES</b>	The fact that the trailer was an LST was the major contributor to either the fact the event occurred or the severity of the outcome.
<b>YES - PARTLY</b>	The fact that the trailer was an LST was only one of the contributors to the event occurring or the severity of the outcome.
<b>MAYBE</b>	It is possible that the fact the trailer was an LST was a factor, but not certain.
<b>NO</b>	The fact the trailer was an LST was not a factor in the event.
<b>UNCLEAR</b>	The information about the event, or the circumstances mean no judgement can be made. (For example, damage to the trailer discovered on depot 'walk round' – no information of how and when it was sustained)

### Company Information Files (CIFs)

- 3.61 The Company Information File (CIF) format was last changed in January 2013, when the process was moved from an online survey platform to a simpler, Excel template. The only update to the sheet was to enable the user to change the 'base year', reflecting the extension of the allocation process for LSTs into a third year. The CIF questions are summarised in Appendix A2.
- 3.62 A process to collect this data from those who have failed to submit the file or finalise a draft version has continued throughout 2014 and is ongoing.

### Qualitative Survey Files (QSFs)

- 3.63 The Qualitative Survey File (QSF) format is unchanged since January 2013 when it was also moved from an online survey to an Excel template.
- 3.64 Operator comments continue to inform our interpretation of the quantitative data and give useful insights into the special circumstances of different operations.
- 3.65 We anticipate that once the full LST trial fleet is on the road, we will update the QSF to ask a revised set of questions based on the key areas of interest emerging from the analysis.

## Data sources and confidentiality

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### Data sources

- 3.66 The primary source of data for this report is the data submission files (DSF) received from operators.
- 3.67 This has been augmented by:
- Company information files (CIFs) submitted by operators
  - Qualitative survey files (QSFs) submitted by operators
  - LST allocation and VIN data provided by DfT
  - Published data on road safety and transport including:
    1. STATS19 – Person injury from road traffic incidents gathered by the police
    2. Published figures on HGV traffic flows (DfT TRA3105)
    3. Road traffic census data (DfT).

- 3.68 Where comparisons are made between the LST operations and any general population or counterfactual data, only statistically significant results are discussed.
- 3.69 We are currently testing the feasibility of gathering in-house data from a sample of operators to create a comparison of off-road injury and damage-only incident rates with a comparable set of data for their non-LST fleets (see paragraph 5.80).

### Data confidentiality

- 3.70 All datasets submitted by trial participants contain commercially sensitive data and are held securely on Risk Solutions servers or the encrypted personal computers of the project team. The data files are only accessible by members of the team who have a project-related reason to do so. Risk Solutions does not make raw data available to DfT or any third parties.
- 3.71 As part of our responsibilities as the independent evaluator, we anonymise any figures or results from the data collection and analysis that are included in period summary reports and annual reports. We vet analysis results to ensure that there is no commercially sensitive or confidential data identifiable. Where data is segmented, we review any analysis to ensure that the identity of an individual company cannot be deduced from the nature of the data segment.

## Participant engagement

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- 3.72 Risk Solutions continues to support trial participants in setting up efficient data processes and advising on possible improvements, based on good practices seen across the trial.
- 3.73 In general, engagement with operators continues to be positive with both managers and direct data contacts demonstrating good intent and a conscientious approach to data gathering. Where problems have arisen and more senior staff have become involved, this has also been done efficiently and without loss of relationships in almost all cases.
- 3.74 There are a small number of cases where stronger DfT intervention is being undertaken and the early evidence from those cases is also that matters can be resolved quickly and normal engagement resumed.
- 3.75 Since January 2013, a contact monitoring system has been in place to log all phone and email contact with the participants, which is accessible only to the core project team members involved in the engagement. This acts in parallel with a common email inbox for the trial communications which the core evaluation team can all see.
- 3.76 These systems fulfil a number of functions:
- Listing the operators who it is anticipated will be submitting data in any new period (based on the list of approved VSOs provided by DfT)
  - Allowing any of the core project team to see the 'thread' of discussion and support given to an operator so that our response does not depend on individual staff availability
  - Tracking of operator contact in any period and the status of DSF, CIF and QSF files (Draft, Accepted, Updated)
  - Reporting progress to DfT during each period – as numbers of submissions & status
  - Tracking support time provided per operator (as well as on common tasks supporting all operators)
  - Comparing progress metrics between periods and against forecast profiles drawn up by Risk Solutions and DfT.
- 3.77 These tracking systems proved fit for purpose for smaller numbers of participating companies. We noted in our 2013 annual report that they need upgrading to manage the full complement of participants over the long term. Since the end of 2014 we have finalised product appraisal of a commercial CRM package to monitor engagement; at the time of writing, we have implemented the first version of the system and used it in support of data submission 2015-P1. We are satisfied that it is proving useful and the full version will be in place for 2015-P2.

### Industry Forum

- 3.78 In the autumns of 2012 and 2013 the Freight Transport Association (FTA) generously organised an industry forum open to all companies participating in the trial (not just FTA members). It was not possible to arrange an event at the same time in 2014, but one did take place in April 2015.
- 3.79 At each of these events, there has been input from DfT, VCA and Risk Solutions, as well as a panel of operators sharing their experiences on the trial and open question and answer sessions involving all the parties.
- 3.80 These events have been well received by the participants who have attended and provide DfT, VCA and Risk Solutions with a further input on how the trial is progress and what issues the participants are facing.

## Summary evaluation of trial activities and processes (to Dec 2014)

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- The number of participants has grown during 2014, but expansion to the full projected total is now expected to occur by the end of 2015.
- At the time of writing, over 90% of the target fleet of 1,800 LSTs is already registered on a VSO with around 75% on the road by 1 April 2015 and hence submitting data in the first period for 2015.
- DfT's requirement that the trial involve operators of all sizes appears to be being met, with a good range of operator types.
- Engagement with participants continues to be largely positive. Further effort is required to reduce the number of submissions that are not accepted within a short time after the target deadline.

## 4 TRIAL OUTPUTS: LST FACTS AND FIGURES 2014

4.1 This chapter provides an overview of the key statistics of the trial under three headings:

- The number and range of participating companies
- The extent and nature of LST operations
- The number and nature of incidents involving LSTs.

Outputs

Participation  
(Number, range)

### Participants – number and range

Master Data  
(Quality, Timeliness)

4.2 The data on who is participating in the trial and the nature and size of their operations is drawn from the company information file (CIF) completed by each trial participant. Although only submitted once, the CIF requires data from a number of parts of a business and hence can take some time to collate, especially in larger companies (where the information is dispersed) or in very small ones (where historic records may be on paper).

LST Operational  
Data Summary

4.3 At the time the charts below were generated, we finalised 89 company information files (CIFs).

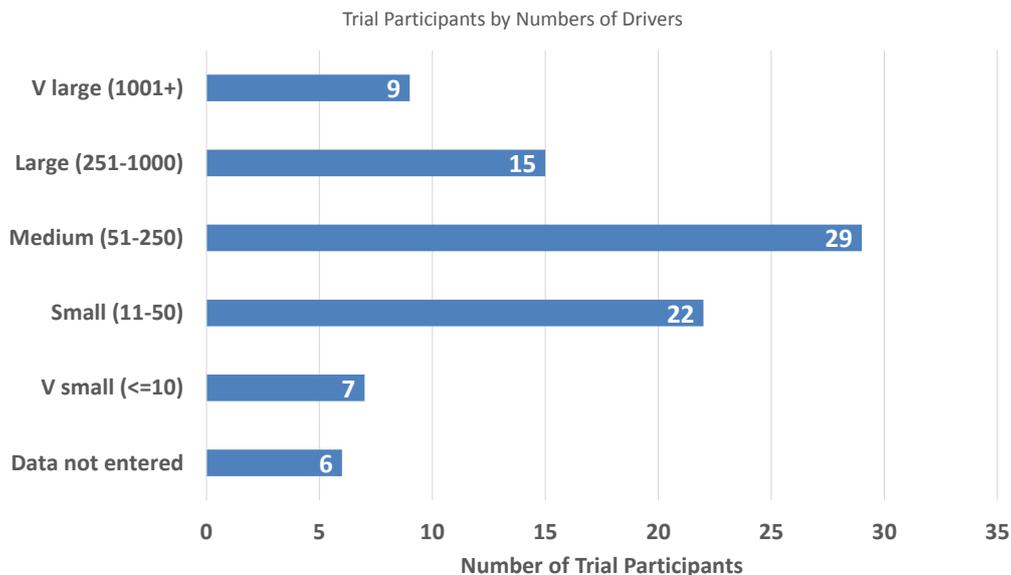
LST Incident Data  
Summary

4.4 At the time of writing, of the 123 potential participants in 2015-P1, we have 94 and are actively pursuing the remaining 29. Many of these are recent joiners, but some have been in the trial for some time. We continue to follow up the missing files. The new Gold Vision monitoring system we have installed should help in tracking this process better.

Qualitative Data

### Operator size and primary business

4.5 One of DfT's stated intentions was that the trial should be accessible to operators of all sizes – not just large operators. Figure 11 presents the declared business size of the operators for whom we have completed company information, expressed by the number of drivers.



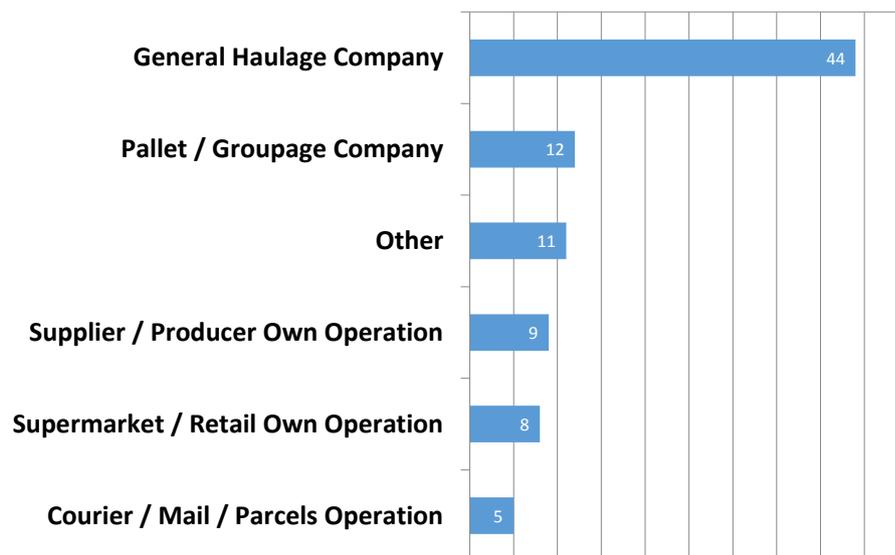
Source: LST Trial data

**Figure 11: Size of business by number of drivers**

4.6 It is notable since last year that growth in participant numbers during 2014 has been in the middle three size categories on the chart, rather than among the very large or very small. The

greatest changes were in the small and medium categories.

- 4.7 The spread of operators by their main business, presented in Figure 12, is in line with expectations. The greatest change since 2013 is the increase in general haulage companies. Directly operated fleets of retailers and mail operators are relatively few, but represent some of the largest individual LST fleets. What is not shown here, but is clear from the raw data, is that a portion of the LST operations being undertaken by general hauliers is fulfilling long term contracts for major retailers. This will become more apparent in analysis of the type of goods where the volumes of Fast Moving Consumer Goods (FMCG) and the legs 'To/From Retailer' are shown.



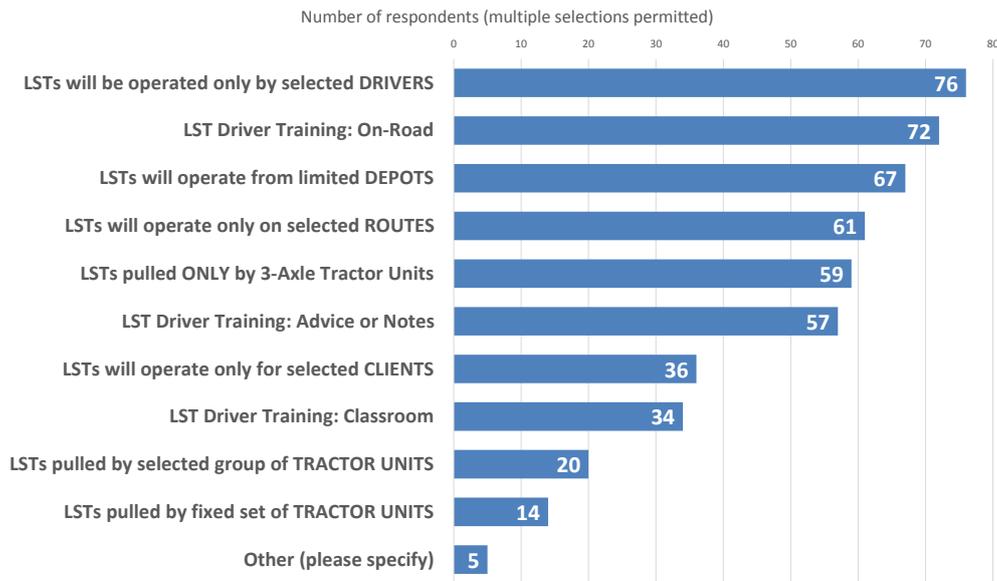
Source: LST Trial data

**Figure 12: Respondents' stated primary business types**

- 4.8 The 'Other' category includes two sets of operations:
- Defined categories – for which there were only one or two cases so they are merged to avoid identification of individual operators.
  - Specialist operators, in particular heavy haulage, usually operating flatbed trailers.
- 4.9 It will be interesting to see how this spread of business types continues to develop as the new entrants from the revised allocation process start to enter the trial. Categories such as Livestock or Tanker/Bulk operators may not become a major part of the fleet. In our 2013 annual report we noted the first order of a skeletal trailer designed to carry a 50ft ISO container; the operator concerned is now operating 19 such trailers although their full operation will not be seen until the 2015 data is processed.

### Special LST operational measures

- 4.10 One of the earliest questions to be considered by all participants is the extent to which they would constrain the use of LSTs within their operation, at least during their early use.
- 4.11 Figure 13 shows operator responses to a series of possible special arrangements which might be put in place, with operators selecting as many as applied.
- 4.12 As we noted last year, conversations with operator contacts confirms that these constraints were being applied for both practical considerations (e.g. could the trailer access the route or site easily) as well as operational factors, including direct contact between fleet or depot managers and the drivers to pick up on any issues as quickly as possible. The profile of constraints remains very similar to that observed at the end of 2013.
- 4.13 We will revisit this later in the trial and explore the extent to which these constraints may have been relaxed by operators as they gain experience with the LSTs.



Source: LST Trial data

**Figure 13: Limits placed by respondents on longer trailer operations**

## LST operational data summary

- 4.14 The outputs below give an overview of the operations of LSTs from the start of the trial to the end of 2014 based on the journey leg data entered into the survey by operators.
- 4.15 Journeys are expressed as legs in the data, meaning a single point-to-point trip without loading or unloading stops en-route. Any multi-drop journeys with fewer than five loading/unloading points are recorded as individual legs for each part of the trip. Where there were five or more drops, the journey is recorded as a single record in the data, with the number of drops noted.<sup>17</sup>
- 4.16 The summary figures for LST operations to the end of 2014 are shown in Table 4. The equivalent figures to the end of 2013 show the effect of the doubling of the size of the LST fleet during the last year.

**Table 4: LST total and average distances**

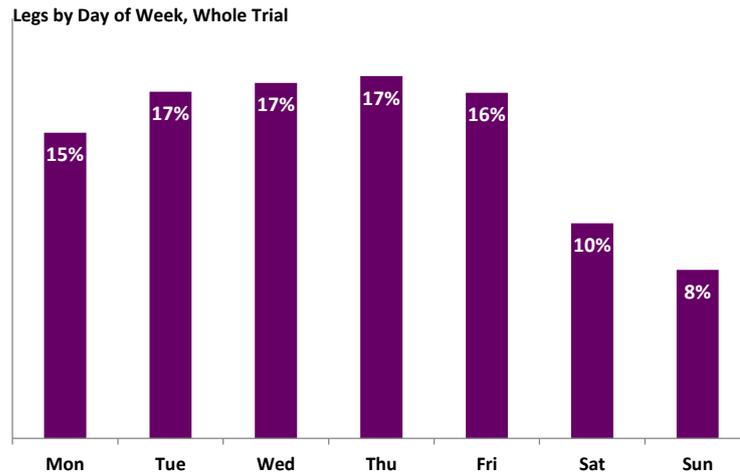
	To end 2014	To end 2013
Total recorded vkm	108 million	41 million
Number of recorded legs	928,134	345,560
Average leg distance	117 km	117 km

Source: LST Trial data

### Day of the week Source: LST Trial data

- 4.17 Figure 14 shows the profile of LST journeys by day of the week. It shows the trailers being used in a similar pattern to much of the regular 13.6m fleet, with a rise in the number of legs in the run up to the weekend reflecting the dominance of the retail trade and its supply chain on the operations of both general hauliers and directly operated retail fleets. The profile remains similar to that observed in 2013.

<sup>17</sup> This approach is the same as that used in the DfT Continuing Survey of Road Goods Transport.

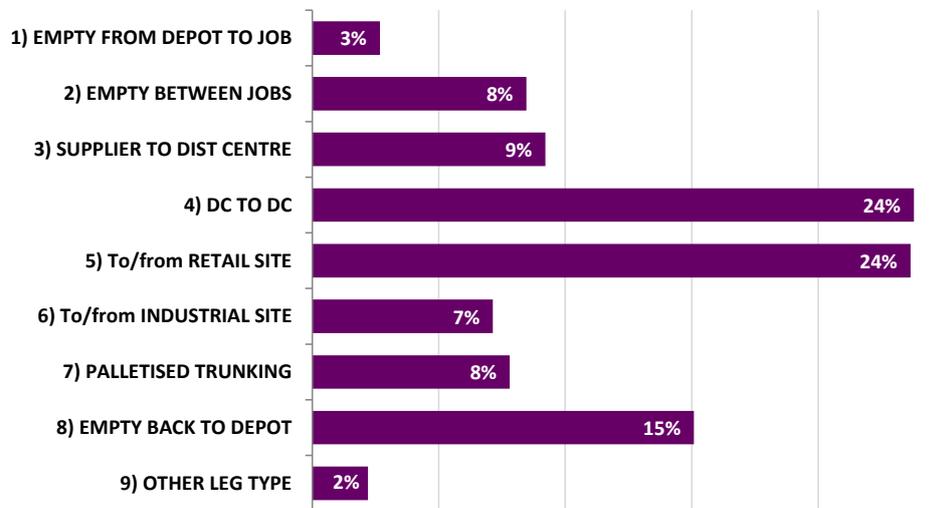


Source: LST Trial data

**Figure 14: Distribution of longer semi-trailer journeys by day of week, all respondents**

**Leg type**

4.18 The dominance of loads related to the retail trade and its supply chain is shown clearly in Figure 15 where 24% of the recorded legs were to or from a retail site (compared with 29% in 2013)



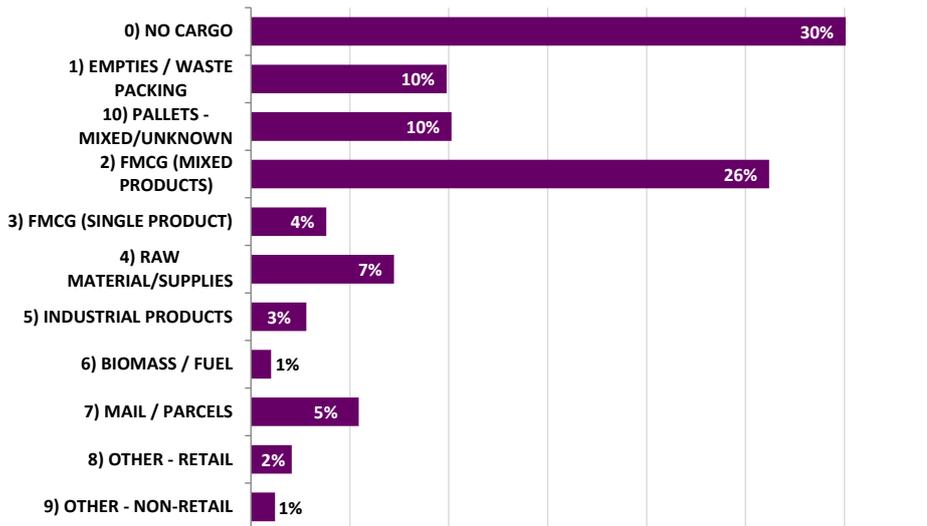
Source: LST Trial data

**Figure 15: Distribution of longer semi-trailer journeys by leg type, all respondents**

4.19 We note that this understates the position on retail operations, since this only states the outbound (loaded) leg. Where the return leg is empty on retail deliveries it is recorded as 8) Empty Back to Depot. This becomes important in our later analysis of the trailer utilisation (Section 6).

4.20 The 24% of legs between distribution centres (30% in 2013) would also, in part, be retail supply chain work, with the remainder being pallet or groupage loads and operations by the mail/parcels sector.

- 4.21 This pattern shows that the primary uses of the LSTs continue to be in the areas anticipated in the DfT Impact Assessment<sup>18</sup>.
- 4.22 Figure 15 also gives an indication of empty running by the number of legs. Adding up the three relevant leg types (1, 2 and 8) gives an estimate of around 26% (compared with 23% in 2013) of legs being operated without cargo, the majority being return legs to the depot following delivery of goods. However, as noted earlier, there is also some empty running being recorded under other leg types, describing the nature of the journey.
- 4.23 Figure 16 presents the same breakdown, but measured by the distance travelled rather than the number of legs. When measured by distance travelled the figure is only 19% (18% in 2013).



Source: LST Trial data

**Figure 16: Goods types for all recorded LST journey legs, all respondents**

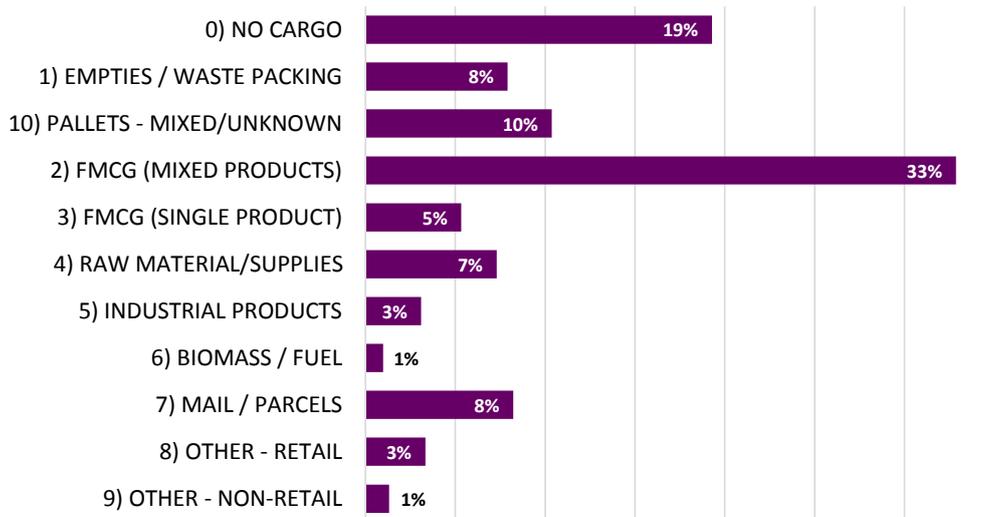
- 4.24 This is considerably lower than the average figure for all articulated HGV traffic recorded in the latest available DfT statistics, which is 29% by distance travelled.<sup>19</sup>
- 4.25 This lower empty running figure for the LSTs needs to be interpreted correctly. There is no inherent reason to believe that LSTs would run empty less often than standard trailers across all operations. Rather, this difference is showing the extent to which the trial participants are placing the LSTs on operations where there is more limited empty running, such as trunking and depot to depot routes. In doing so, we see that many of the trial operators have such work available on which they can deploy the LSTs and are successfully doing so.
- 4.26 Retail trade operations are included in the FMCG<sup>20</sup> loads, whether of a single product or a mixed load. These constitute 26% of all legs and 33% of distance travelled, unchanged since 2013. However, as we will in the later analysis, many of these legs have a corresponding 'empty' return leg, which needs to be considered carefully in analysing the results.

<sup>18</sup> Op Cit. Page 31 and Page 40 Table 5 of the impact assessment lists the categories of journeys which were assumed to see transfer of loads from regular 13.6m trailers to LSTs were the longer trailers to be generally available. This is a direct comparison of the percentage swaps since the table relates to assumed transfers of loads across the entire market.

<sup>19</sup> Source – Latest CSRGT Data for 2013 Table RFS0117 Percentage empty1 running and loading factors2 by type and weight of vehicle: annual

<sup>20</sup> FMCG Fast Moving Consumer Goods – refer to products with a short dwell time in the final retail outlet.

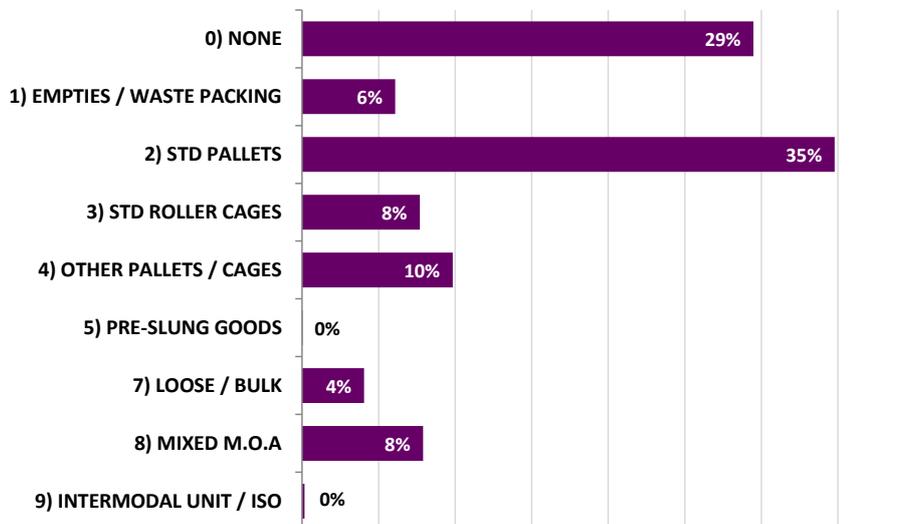
4.27 Mail and parcels work represents 8% of all vehicle km, compared with 11% in 2013 and 8% in 2012 alone. As has been noted earlier, this is the sector running the most dual-deck LSTs.



Source: LST Trial data

**Figure 17: Goods types for all recorded LST vehicle kilometres, all respondents**

4.28 The mix of Mode of Appearance (MOA), shown in Figure 18 is much as we would anticipate at this stage, with cages and pallets being the primary mode, given the dominance of FMCG and mail/parcels cargo.



Source: LST Trial data

**Figure 18: Goods mode of appearance for recorded LST journey legs, all respondents**

**Utilisation**

4.29 Utilisation data is gathered by both deck % and volume % to give both perspectives on how well the total load potential of the trailer is being used.

4.30 A field also records whether the load was ‘weight limited’ so that cases where the deck or volume is not being used only because no additional weight can be added. However, only 2.5% of legs are noted as being weight limited, as may be anticipated with the LSTs being primarily of interest to those hauling lower density – higher volume goods. Indeed if a

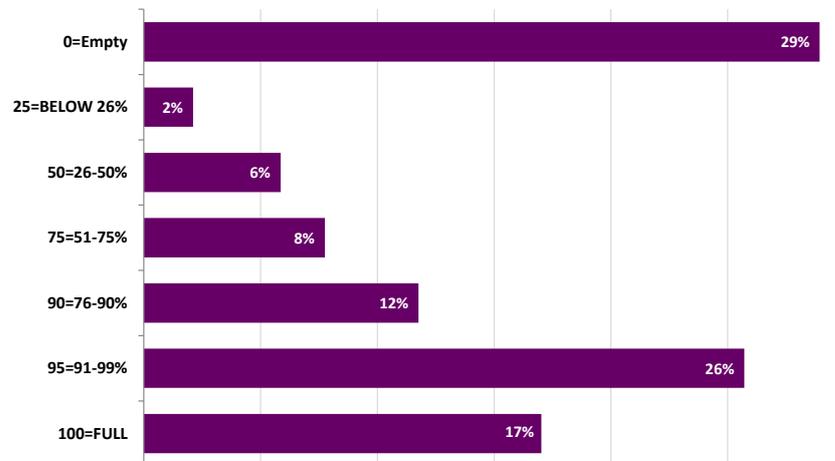
significant proportion of a company's LST legs were to be weight limited and showed low deck % figures, it might call into question whether the use of LSTs for that operation was justified.

4.31 Figure 19 shows the utilisation by deck space covered and Figure 20 the utilisation by volume.

4.32 Section 4 includes an analysis of the deck % utilisation data and what it might mean in terms of reductions in vehicle km compared to the same work being done on 13.6m trailers.

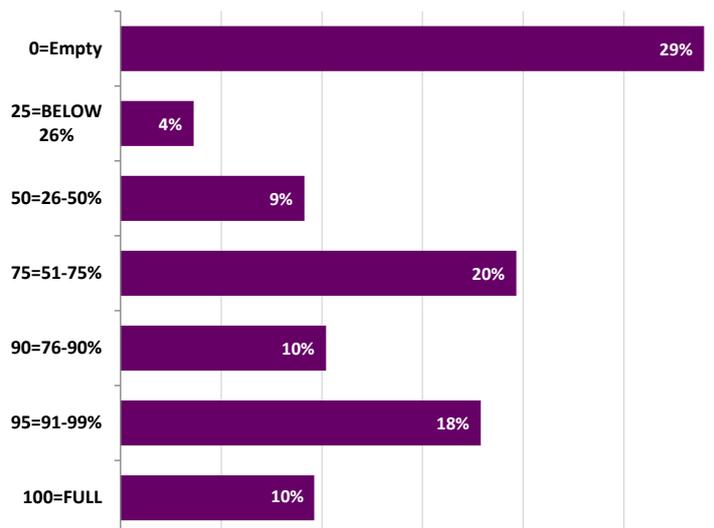
4.33 Any analysis by volume % will require a larger dataset so that it can be split out by different types of operation and trailer type. For example, an assessment by volume needs to take into account the trailer design:

- For refrigerated trailers, a free space of perhaps 20-30% of the volume may be required to permit circulation of the air and hence for such trailer designs, a figure of 70% may be regarded as 'full' by volume in analysis.
- For flatbed trailers, volume fill is not measureable in a meaningful way and so volume analysis will need to exclude these units.



Source: LST Trial data

**Figure 19: Utilisation by deck space % covered**



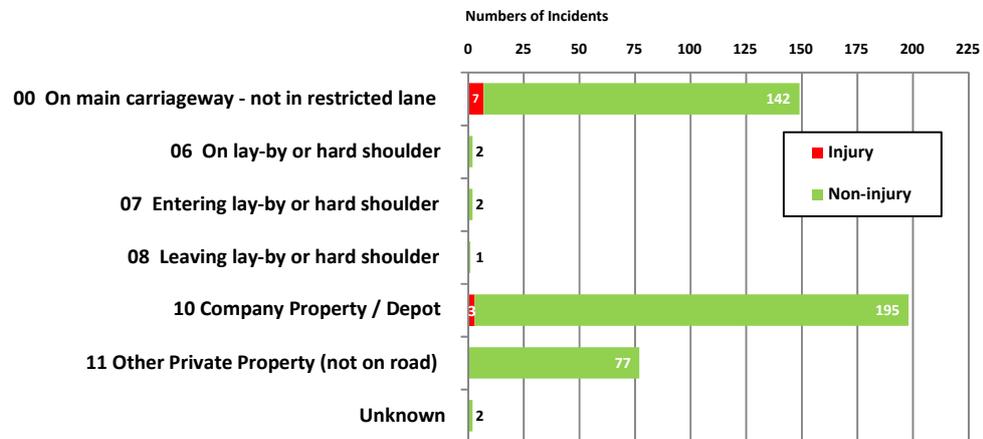
Source: LST Trial data

**Figure 20: Utilisation by volume % filled**

4.34 This report provides an overview of the main outputs. For a full list of the data fields being collected and hence an indication of the analysis which may be possible once the dataset increases to support it, see Appendix A.

## LST incident data summary

- 4.35 Figure 21 provides a summary of the incidents involving LSTs, reported by operators.
- 4.36 An analysis of the incident data to date has been undertaken and is reported in Section 4; the other charts of results have been placed in that section for easy reference.



Source: LST Trial data

### Figure 21: Incidents involving LSTs (Summary to end 2014)

- 4.37 The analysis of incidents is a primary reason for the trial. The low incidence of road traffic collisions means that we can expect to have to collect data for an extended period of time before we are able to analyse trends or contributory factors to risk.
- 4.38 The primary focus of analysis at this stage is to provide assurance that there are no early indications of the operation of the LSTs in the trial causing a measurable increase in risk compared to standard sized trailers.

## Qualitative Survey File (QSF) analysis

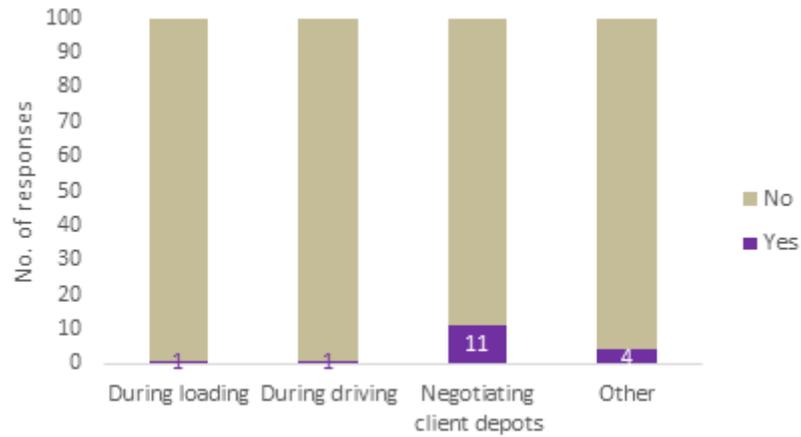
- 4.39 The Qualitative Survey File (QSF) is a short set of open questions about the experiences of company participants in the trial, and of their staff in operating the new trailers. In some cases the responses include comments from their clients.
- 4.40 The QSF provides an opportunity for operators to provide some narrative about their experience of operating the LSTs from the perspective of a range of staff and the business as a whole. It allows a space to record both the benefits they are gaining from running the LSTs as well as any challenges and adjustments they have made. It therefore provides evidence that can contribute to 'lessons learned', which might benefit future companies who decide to operate LSTs. There is a small overlap between some of the areas covered in the QSF and those noted in the CIF.
- 4.41 In previous reports we have simply noted selected comments from the QSF data. We have now collated the results from the first **100 QSFs** received and analysed the results in more depth. For each of the six questions, we present the semi-quantitative result (how many respondents ticked a given box), followed by a summary of the types of narrative comments, with examples. The number of any particular type of comment is not given as the QSF part of the data gathering is not a quantitative analysis. Numbers of, for example, damage events, are covered in the quantitative incident analysis in this report.
- 4.42 The operators are encouraged to submit a QSF early in their trial experience, usually at the end of their first four months of operation. Where operators share new experience with Risk Solutions or DfT later in their use of the trailers, we encourage them to capture it in a further QSF, but most of the results here should be read as being the early experiences of operators.

4.43 Once the full LST fleet is on the road, we plan to prompt a follow-up QSF from all operators to reflect their experiences after a longer period of operation.

**Incorporating LSTs into the existing haulage operation**

4.44 Question 1:

Did you encounter any issues or problems with incorporating the LSTs into your operation?



Source: LST Trial data

**Figure 22: QSF responses noting issues incorporating LSTs into existing operations**

4.45 Twenty operators added narrative comment types falling into five categories:

- Restrictions to operations due to depot layout / infrastructure
- Restrictions leading to operator modifying depot/loading area
- Restrictions in the client site/depot
- Recording of LST data
- Minor damage events in early operation.

**Specialised training prior to LST operations**

4.46 Question 2:

Did you undertake any special training of staff in advance of operating the LSTs?



Source: LST Trial data

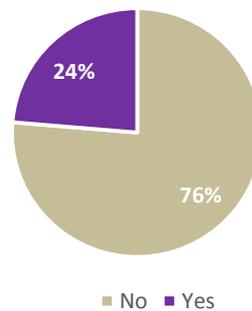
**Figure 23: QSF responses noting specialist training before introduction of LSTs**

- 4.47 86 operators added narrative comment types falling into six categories:
- Driving assessment (11 comments)
  - Classroom based learning (19)
  - On-the-road training (2)
  - In-house training with on-the-road practice (28)
  - In-house training and assessment (4)
  - Externally delivered training (10).

**Other preparation before operating LSTs**

4.48 Question 3: Did you undertake any other special preparation in advance of operating the LSTs? (e.g. staff training, physical changes to loading areas or depots, changes to planning or operations processes etc.)

4.49 There is a slight mismatch between the 25% of operators stating they made some specialist provision here and the 81 who stated they provided special driver training under question 2. The question probably ought to have excluded the overlap with training, but the interpretation we have adopted is that respondents have focused on the things other than driver training that were important.



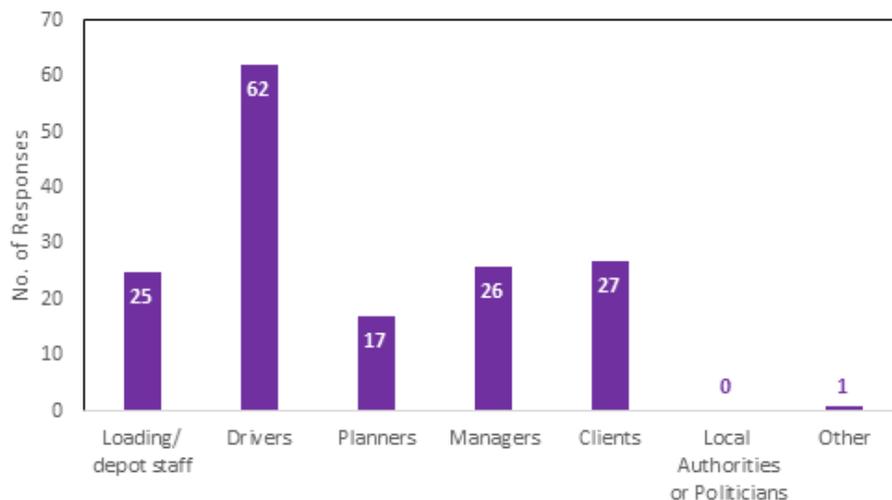
4.50 38 operators added narrative comments falling into six categories:

- Risk assessments (4 comments)
- Training (3)
- Cosmetic change to depot (2)
- Structural change to depot (6)
- Assessed client depot (10)
- Changed systems/processes (6).

**Figure 24: QSF responses noting other specialist preparation for LSTs**

**Feedback from user / stakeholder groups**

4.51 Question 4: Have you had any feedback (from key stakeholders)?



Source: LST Trial data

**Figure 25: QSF responses noting feedback by stakeholder group**

4.52 The comments section of this question allowed space for the operator to comment on feedback from specific groups or the overall impression.

4.53 Over 95% of all the comments noted that the feedback was either positive or ‘mostly positive’. The positive responses received tended to cut across issues covered by this and other questions. The comments covered the full range of anticipated benefits from reduced numbers of legs to deliver the same goods, increased flexibility in loading and resulting direct commercial gains.

4.54 The few neutral comments were where the operator filled out the QSF before they felt they had sufficient experience to receive meaningful feedback. The negative comments fell into two groups. The first were cases where the operator noted early apprehension, mainly from drivers, but also noted that after training or a short period of settling in, those concerns were reduced or eliminated.

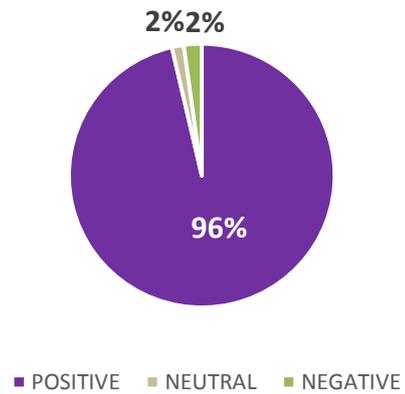


Figure 26: QSF feedback comments rating

**Self-imposed restrictions on LST operations**

4.55 Questions 5: Have you chosen to operate the LSTs in a more restrictive way than your other semi-trailers?

4.56 60% of the 100 respondents noted that they chose to operate their LSTs in a more restrictive way than their general semi-trailer fleet. These are restrictions beyond what was required as a condition of the trial. Reviewing our wider understanding of the operations on the trial, many of the remaining 40% will not have needed to impose any additional constraint because the nature of their general operation (for example, palletised trunking) is inherently suited to LSTs.

4.57 Of those that did note self-imposed restrictions, 59 added narrative comments showing five main strategies adopted (Figure 28) The most commonly were noted as being operation on approved routes, for selected clients and by selected drivers

4.58 It is worth noting that some of the companies did not see their choices as negative, but simply a reflection of choosing to operate the LSTs in the most efficient or cost effective way.

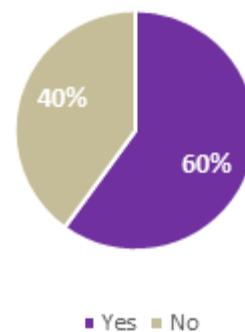
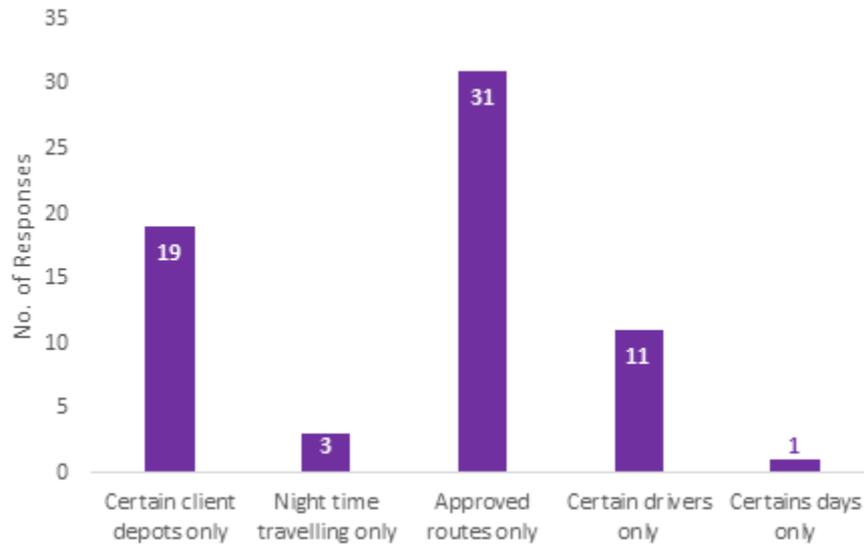


Figure 27: QSF responses noting self-imposed restrictions for LSTs



Source: LST Trial data

**Figure 28: QSF Self-imposed operational restrictions for LSTs**

### Overall performance of LSTs for business (so far)

4.59 Question 6: what is your view of the performance of the LSTs for your business?

4.60 82 operators add narrative comments. The summary below shows a cross section of the qualitative responses that best reflect the majority of responses.

#### Increased commercial returns

- “They have given a good saving to the business, they have been able to cut out 5 trunks a week on average”
- “They are a good investment and have removed the need to use an additional 18t (rigid) or additional standard single deck (artic) to move stock between the DCs due to the extra space so have reduced cost to the business. due the good internal design they are easier and quicker to load/unload”

#### No problems- excellent

- “So far no problems. Excellent for particular job trailer purchased for”
- “Very positive”

#### Greater flexibility

- “I believe that the introduction of the LST was a good step forward for our business, thus enabling for a greater flexibility in the handling of several products from our customers”

#### Reduced carbon footprint

- “They have helped us reduce our carbon foot print by reducing the journeys that we make”

4.61 Some comments note early challenges in operating the trailers.

#### Hurdles still to overcome

- “The trailer works very well on one particular contract, for general haulage - multi drop operation I don’t think the trailer is suitable”

- “Take up has been slower than anticipated, suitable for certain operations only, customer loathe to pay extra for the additional investment which makes them less utilised”

#### Not suitable

- “Not really as suitable for the majority of our business as we had expected. The majority of the loads are a specialised container. Four of these containers utilised the floor space of a 13.6m semi-trailer. Five containers will not go in the new LST, so it was anticipated to use the available space for general palletised freight but the additional business did not materialise”

- 4.62 Three operators noted that they judged it was too early to tell the value of the trailers at the point they responded.

#### Summary of QSF analysis

- The general experience expressed in the QSFs is clearly positive, even though most of the responses were completed within the first few months of operation.
- The value of the training of drivers, but also of other staff and even clients is clearly a focus for most of the respondents, as is the selection of the routes and sites where the LSTs can be operated efficiently and without infrastructure constraints.
- The requirement to adapt depots to accept the trailers appears to have been limited, but clearly necessary in some cases. From other comments received informally, the modifications have often been precautionary to manage safety risks associated with trailer length when in the loading bay (for example, loading LSTs at one end of the yard).
- As we noted in the 2013 Annual Report, there have clearly been a very small number of operators who purchased an LST with a view to meeting a specific contract or work stream, where that specific work has not emerged as they expected. Our reflection as the trial has developed and the industry experience has grown, is that operators have gained a clearer insight into whether LSTs might offer value for money for their particular type of work and contract

#### Summary evaluation of trial outputs (to Dec 2014)

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- Data submissions are now being processed efficiently to produce summary outputs to form the basis of outcome analysis.
- Qualitative feedback from operators on operating LSTs remains very largely positive.

## 5 TRIAL OUTCOMES 1: SAFETY IMPACT

- 5.1 In 2013, the annual report included preliminary analysis of the outcomes on the two key issues of:
1. Incidents
  2. Utilisation (Journeys saved)
- 5.2 The same calculations were repeated for the 2014 Interim Results report, updated with 2014 data.
- 5.3 The analysis here fulfils a number of purposes:
1. The analysis of injury incidents is vital to establish whether there are any indications that LST operations are increasing safety risk, particularly to other road users and vulnerable groups.
  2. The analysis of utilisation is important as it will be the first time DfT has published data on the loading of the trailers during the trial so far.
  3. Each of these analyses will act as a baseline from which we can monitor changes in the key metrics as the trial progresses
- 5.4 Both analyses will be expanded and refined as the trial dataset expands to permit finer segmentation and cross-referencing. Where appropriate these deeper analyses could draw on experience from outside the project team or, for example, on results from special data studies involving selected volunteer companies from among the trial participants.
- 5.5 In this year's report, we have added a **segmentation of utilisation gain**, analysing the vehicle km saving by the different company types, including the spread of percentage savings calculated across all the operators for which we have data.
- 5.6 The final element of the evaluation framework, the outcomes in qualitative experience, have been covered in the discussion in the previous section as we judged there was little value in separating them at this stage.

Outcomes

Journeys  
(Carbon) Saved

Safety Impact

Qualitative  
experience

### Other ongoing work

- 5.7 We have two other pieces of work currently in progress, but not yet at a stage where results can be reported here.
- 5.8 We have a special topic analysis looking at non-injury (damage only) incidents. In this report we have included a description of the approach which involves sampling the in-house incident databases of a selection of LST operators.
- 5.9 We have also been conducting some statistical analysis to see if there is enough data yet to make any meaningful comment on whether LSTs have a higher or lower collision rate in urban operations, compared to the UK non-LST articulated fleet. (The current conclusion is that there is not yet sufficient data to say either way).

### Section outline

- 5.10 The remainder of this section of the report deals with safety impact outcomes
- 5.11 The analysis of Utilisation (journeys saved) is reported in Section 6.

## LST safety impact

### Data sources

- 5.12 The LST incident data and the distance travelled by LSTs is available from the trial data and has been updated to incorporate the 2014 figures. The data for non-LST articulated vehicles comes from three data sources, all of which are publically available, as shown in Table 5.

**Table 5: Incident analysis data source updates**

Data & Source	2013 Annual Report	2014 Interim Results
LST Incidents & Casualties	Trial data to end 2013	Trial data to end 2014
LST Distance travelled (Billion Vehicle km)		
Incidents involving UK Artics > 7.5T and resulting casualties	STATS19 5 Years 2008-12	STATS19 5 Years 2010-2014
Distance travelled by UK Artics > 7.5T	DfT Table TRA 3105 5 years 2008-12	DfT TRA 3105 4 years 2010-2014 (2013/14 to be published 10/7)

- 5.13 The analysis reported here has been conducted by Risk Solutions as the independent evaluator of the trial. The methodology is the same as that shown in the previous annual report and has been reviewed by the relevant DfT statisticians; their comments have been incorporated where appropriate. Further detail of the analysis is shown in Appendix C.

### Additional Event

- 5.14 In previous discussions relating specifically to overturning events, we have indicated that we were aware of one event which took place prior to delivery of the trailer to the operator (it was being taken for testing). The trailer overturned on a roundabout, no other vehicle was involved and the driver sustained a slight injury. The event took place late in 2012, and from more recent investigation with the manufacturer it appears it was being driven by an agency driver at a very early stage of the trial.
- 5.15 This event has not previously appeared in the numeric tables, since it did not 'belong' to any of the operator datasets. We have now created a place for it in the database, associating it with the manufacturer. Hence in this report, where 2013 values are given for comparison, they have been recalculated to take account of this additional event.

### Injury incident reporting

- 5.16 Incidents involving LSTs have to be reported in the incident log by each operator with their data submission file for each period of the trial.
- 5.17 All injury incidents must be reported, regardless of where they occur and whether the injured person is a member of the public or a member of staff.
- 5.18 Incidents are recorded against a sub-set of the STATS19 data fields, modified to add options to cover non-injury events and incidents occurring off the public roads.
- 5.19 Operators record casualty severity according to STATS19 injury categories and injury types.
- 5.20 All incidents include a narrative by the operator of the trailer and a judgement of whether the event was 'LST Related', meaning whether the fact it was an LST rather than a standard trailer, was in any way relevant to the occurrence or outcome of the incident. In the early reporting periods, this judgement was added by Risk Solutions and based on a review of the incident log report. In later periods the judgement is made by the operator and reviewed by Risk Solutions.

## Injuries incidents involving LSTs

5.21 Table 6 shows the number of recorded incidents from the start of the trial to the end of 2014, submitted by operators and accepted as part of their DSF<sup>21</sup>. The figures in brackets are those presented in the 2013 annual report (recalculated to include the additional event noted above)

5.22 The table introduces a measure called FWI – Fatalities and Weighted Injuries. FWI differs from the measure KSI (Killed and Seriously Injured) in two ways:

- FWI takes **Slight** injuries into account
- FWI is a **weighted** measure in which different severities of injury are assigned a proportionate 'value' in the total

$$\text{FWI for a collision} = \text{Fatal} + (n \times \text{Serious}) + (m \times \text{Slight})$$

Normally, in transport applications,  $n=0.1$   $m = 0.01$

- In KSI there is no weighting – a broken arm is counted the same as a fatality although there is a fairly common understanding that the majority of any KSI total will be injuries rather than fatalities.)

5.23 For the evaluation of the safety aspect of the LST trial, we believe using the FWI measure will, once we have more data, provide a more refined basis for analysis that makes use of the larger population of slight injuries. See Appendix C for a more complete discussion of FWI.

**Table 6: Incidents involving LSTs - Trial start to 31 Dec 2014**

Injury Collisions from Trial Logs	Total Casualties	Fatal	Serious	Slight
All Injuries	<b>10 (6)</b>	0	3 (1)	7 (5)
All Injuries in Public Road/Place	<b>7 (3)</b>	0	3 (1)	4 (2)
All Injuries judged LST related (any location)	<b>3 (2)</b>	0	0	3 (2)
All Injuries judged LST related * in Public Road/Place	<b>1 (1)</b>	0	0	1 (1)

Source LST trial data. \*Note: When the interim results for 2014 were reported, there was a slight injury incident where it was unclear how the incident occurred and whether this was related to the length of the trailer. The incident investigation has now confirmed that the incident was clearly not LST related. This adjustment is in addition to the additional event noted above.

5.24 **There have been no fatal accidents involving LSTs during the trial to date.**

5.25 **There have been no public injury incidents involving vulnerable roads users.**

5.26 **There has been one slight injury incident to a member of staff on foot inside a depot.**

5.27 As indicated in the 2013 report, the number of incidents resulting in injury is very small. The 2013 report also indicated that almost half of the non-injury incidents were very minor events that did not result in any property damage. The chart shows that there have been two additional **serious injuries** in incidents involving an LST during 2014, both of which took place on the public highway. However, the fact that the trailer was an LST was not judged to be a causal factor in either incident.

<sup>21</sup> Note that there are a small number of operators with data outstanding or seen only in draft and not yet 'accepted'. Since the data which has not been accepted is not included in this analysis, there is a small amount of under-reporting in these figures.  
**We can confirm that we know of no further injury incidents in the pending data.**

- 5.28 In the first, the driver of the tractor unit pulling the LST was injured when he collided with a previously jack-knifed vehicle that was partly blocking lane one of the motorway. The third party vehicle did not have any lights operating and the section of motorway was unlit. The driver was unable to see the incident early enough to avoid it completely. In the second incident, the person injured was in a vehicle that collided with the rear of an LST as it travelled in lane one of the motorway.
- 5.29 There were also two additional **slight injury** incidents in 2014. In one of these, the driver of another vehicle ran into the back of the LST on a motorway and so the event is not considered to be LST related. The second involved the driver of the LST losing control and the vehicle overturning. Incident investigation by the operator attributed the event to fatigue arising from stress factors outside work, but not reported to the company by the member of staff. The incident was therefore not deemed to be LST related.

#### **Manoeuvre and junction proximity**

- 5.30 Table 7 and Table 8 show the manoeuvre being attempted or undertaken by the LST when the incident occurred and whether the event took place near a junction.
- 5.31 The patterns are similar to earlier periods, with the majority of events associated with moving off, reversing and turning and at least half of them (219) classified as being '09 Not on public highway'.
- 5.32 We have recently started a more in depth review of the non-injury incident data and we can already see that this 50/50 split of incidents on the public highway vs those on private land, may well be rather conservative and overstate the proportion of incidents on the public highway. This is indicated by the data presented in Table 13 using an alternative set of fields to analyse the split by Public/Private location, suggests that the split of the 421 non-injury events by location is closer to 273 Private vs 154 Public.
- 5.33 Further work is needed, but it is clear that within the group of 75 non-injury incidents in Table 8 classified as '00 Not at, or within 20m of junction', there are around 50 where another field in the incident log called 'Vehicle Location at time of incident' states that the event took place on company or on other private land. An initial review of the incident narratives suggests that this mismatch in data entry occurs in three situations:
- The event took place at the depot boundary – in many cases causing damage at the point the LST was being taken past the gatehouse (where there is often a start/stop and turning manoeuvre at low speed). We may need to consider issuing specific guidance on how to treat such events and consider adding an automated check to the incident log template.
  - The event took place at a motorway services. In this case we have already issued guidance that services and retail car park areas be treated as 'PUBLIC' because there is free access to members of the public, even though they are technically private land. Again, we may need to issue a reminder and see if an automated check can be created in the template.
  - The data entry is simply incorrect, probably because the STATS19 categories used for this field (Table 8) focus on junction proximity and users may pick the first code 00 and not spot the code 09 for events not on the highway. Again, we can look at adding an automated check to the template to highlight any mismatch with the other vehicle location data field.
- 5.34 We will need to review this data during the next year and if necessary, update the tables for the next annual report.
- 5.35 As the dataset grows, it should be possible to analyse the relative proportions of incidents in each category vs. STATS19 (on which the categories are based), to see whether the pattern of events is any different from that for standard trailers.

**Table 7: LST Incidents: Manoeuvre before incident**

Manoeuvre before incident	Injury	Non-injury	Grand Total
01 Reversing	1	81	82
02 Parked		19	19
03 Waiting to go ahead but held up		1	1
04 Slowing or stopping	2	4	6
05 Moving off	1	69	70
06 U turn		22	22
07 Turning left	2	101	103
08 Waiting to turn left		3	3
09 Turning right	1	87	88
10 Waiting to turn right		4	4
11 Changing lane to left		6	6
12 Changing lane to right		1	1
15 Overtaking on nearside		1	1
16 Going ahead left hand bend		4	4
17 Going ahead right hand bend		1	1
18 Going ahead other	3	16	19
Unknown		1	1
<b>Grand Total</b>	<b>10</b>	<b>421</b>	<b>431</b>

Source.: LST Trial data

**Table 8: LST Incidents: Proximity to junction**

Incident proximity to junction	Injury	Non-injury	Grand Total
00 Not at, or within 20 metres of junction	4	75	79
01 Approaching junction or waiting parked at junct approach	1	30	31
02 Cleared junct or wait/park at exits		8	8
03 Leaving roundabout	1	5	6
04 Entering roundabout		7	7
05 Leaving main road		40	40
06 Entering main road		18	18
07 Entering from slip road		2	2
08 Mid junction - on roundabout or road	1	19	20
09 Not on public highway	3	216	219
Unknown		1	1
<b>Grand Total</b>	<b>10</b>	<b>421</b>	<b>431</b>

Source.: LST Trial data

### Background data: Incidents involving standard articulated HGVs

- 5.36 To produce a meaningful evaluation, we need to compare the collision and casualty rates involving LSTs with the equivalent rates for the articulated HGV population as a whole.
- 5.37 The primary data for all GB road injury statistics is the STATS19 database, maintained by the Department for Transport and populated by the Police for all incidents known to the police where a personal injury occurred.<sup>22</sup>
- 5.38 The vehicles involved are categorised by the reporting police officer. The guidance to officers completing a STATS19 report includes instructions that a vehicle pulled by a tractor unit where the bulk of the load is carried by the trailer is to be categorised as :
- Vehicle Type 21 HGV > 7.5 Tonnes mgw **AND**
  - Towing and Articulation Code 1.
- Note that this coding intentionally excludes drawbar combinations.*
- 5.39 For the analysis in this report we have used this categorisation scheme as a filter on the STATS19 data so that we identify only road collisions where the collision involved at least one Tractor + Semi-Trailer unit.
- 5.40 The 2014 Interim Results published earlier in the year used the STATS19 data available at the time, i.e. up to 2013. The timing of this full annual report - delayed slightly because of the general election - allows us to use 2014 STATS19 data. As a result, the analysis here is comparing the LST trial data with the STATS19 background data for the same time period (2012-2014) rather than being offset by a year. The figures are shown in Table 9.

**Table 9: Number of GB road traffic collisions involving articulated HGVs >7.5T and severity of the associated casualties (STATS19 2010-14)**

	2010	2011	2012	2013	2014	3yr avg '12-14
<b>Number of Collisions</b>	<b>2,618</b>	<b>2,467</b>	<b>2,222</b>	<b>2,193</b>	<b>2,367</b>	<b>2,261</b>
Collision Severity (Worst)						
Fatal	117	111	103	111	99	
Serious	363	356	293	355	333	
Slight	2138	2000	1826	1727	1935	
<b>Casualties in Collisions</b>	<b>3,556</b>	<b>3,559</b>	<b>3,121</b>	<b>3,107</b>	<b>3,399</b>	<b>3,209</b>
Fatal	124	130	116	117	111	
Serious	420	440	355	443	410	
Slight	3012	2989	2650	2547	2878	
<b>FWI (Fatalities &amp; Weighted Injuries)<sup>23</sup></b>	<b>196</b>	<b>204</b>	<b>178</b>	<b>187</b>	<b>181</b>	<b>182</b>

Source: STATS19

<sup>22</sup> STATS19 Data available at [https://www.gov.uk/government/collections/road-accidents-and-safety-statistics & STATS20](https://www.gov.uk/government/collections/road-accidents-and-safety-statistics-&-stats20), guidance notes from [http://www.stats19.org.uk/html/stats\\_20\\_notes.html](http://www.stats19.org.uk/html/stats_20_notes.html)

<sup>23</sup> FWI standard definition for any event FWI = Fatalities + (Serious x 0.1) + (Slight x 0.01)

- 5.41 We note that the original trial impact assessment undertook some detailed analysis examining the robustness of this assumption regarding coding of vehicles by police. It concluded that there might be some under-reporting of the number of events involving semi-trailers, due to miscoding by the reporting police officers<sup>22</sup>. However, the analysis did not offer sufficient evidence to justify modifying the published figures for analysis. The analysis was also based on data that is now almost ten years old and there has been significant work done on STATS19 reporting in the intervening period that should have improved the quality of reporting. **Any miscoding is just as likely to apply to standard trailers as to LSTs.**
- 5.42 We note that the concerns expressed in the trial impact assessment mean that, if they were well founded, any background collision rate calculated on this basis for comparison with LSTs, would be under-estimated.
- 5.43 It is notable in the data that both collision and casualty numbers reduced in 2012 and 2013, mainly due to a drop in the number of slight injuries, followed by a small rise again in 2014. The use of a 3 year rolling average for the calculations that follow smooths out this effect and indeed the average figures used last year (2011-2013) and this year (2012-2014) will be about the same.

### Exposure –vehicle kilometres (vkm)

- 5.44 The trial data returns indicate that the aggregate distance travelled by the LSTs in the trial, up to the end of December 2014, was about **108 million km**.
- 5.45 An estimate of comparable data for the standard semi-trailer fleet can be derived from DfT's published traffic statistics<sup>24</sup> which has a classification specifically for Articulated HGVs. The data are shown in Table 10. (As with STATS19, 2014 data now available).

**Table 10: GB annual distance covered by articulated HGVs (2010-14)**

Billion vkm*	2010	2011	2012	2013	2014	3yr Avg '10-12
3 or 4 Axles	1.5	1.1	1.1	0.9	1.0	
5 Axles	5.6	4.9	4.9	4.3	4.8	
>= 6 Axles	6.0	6.9	7.0	8.1	7.8	
All Artics	13.1	12.9	13.0	13.3	13.6	13.3

Source: TRA3105 \* 1 billion vkm = 1 million vkm

- 5.46 The collision and flow data over time are summarised in Figure 29. The notable feature of the data is the decline and then recovery in vehicle flows, reflecting the movement in UK economic activity during the period. The movement in collisions/casualties follows a similar profile.
- 5.47 The analysis here will be based on a 3 year average for the most recent years available, 2012-2014.

<sup>24</sup> Heavy goods vehicle traffic by axle configuration and road category in Great Britain 2007-2012 Table 3105 <https://www.gov.uk/government/statistical-data-sets/tra31-heavy-goods-vehicle-traffic>



Sources: Incidents - STATS19 / Veh km TRA 3105

Figure 29: GB Articulated HGV collision and flow summary 2010-2014

## Comparing LST incident rates to background HGV incident rates

- 5.48 We have performed two sets of tests comparing the rates of events per million vehicle km for LSTs so far on the trial with the background rates for the general articulated HGV fleet.
- 5.49 Test 1: Conservative including ALL the injury events, regardless of where they occurred. (See Appendix D2-1).
- 5.50 Test 2: Realistic including only the incidents on the public highway or public access areas. (See Appendix D2-2).
- 5.51 This is not to suggest that incidents in depots and on other private property are not important, but to include them in a comparison with STATS19 data would be conservative, since STATS19 relates only to personal injury accidents on the public highway that have been reported by the police.
- 5.52 The injuries realised in depots and on other private property need to be analysed in comparison with a relevant source of background data. We could consider RIDDOR, but that would only pick up the more serious incidents, of which there have been very few. An alternative approach, using a sample of operator in-house data, is being explored (see paragraph 5.80).
- 5.53 Each comparison between the LST rate and the background rate is tested for statistical significance and results are only presented where the test confirms that the comparison is significant at a 95% confidence level<sup>25</sup>.
- 5.54 The analysis calculation details and results are shown in Appendix D, for three metrics:
  - Road traffic collisions per billion vehicle km
  - Casualties per billion vehicle km
  - FWI (Fatalities and Weighted Injuries) per billion vehicle km.
- 5.55 The results show that at the end of 2014 there was sufficient data from the trial to produce a statistically significant comparison in both tests, for collision and casualty rates, but not yet for FWI.
- 5.56 We have sufficient data to report a statistically significant difference between the incident rates

<sup>25</sup> The two populations of incidents are assumed to be Poisson distributed and a Chi-squared test was applied to the difference in the mean rates for the two populations (events per million vehicle km). Test results <0.05 confirm that there is less than a 5% chance that the difference in the two mean rates is due to random chance.

being observed for LSTs compared with the background rates for non-LSTs. The results shown here update those given in the 2014 Interim Results by using the background population data up to 2014 as noted earlier.

- 5.57 The results are summarised in Table 11, and show the LST fleet continues to have an incident rate that is only 38% of that seen in the general UK articulated HGV fleet and when measured as a casualty rate, only 27%. The figures in parentheses show the figures from the 2013 Annual Report, re-calculated to take account of the additional slight injury incident in 2012.

**Table 11: Summary comparison of LST public road collision and casualty rates (to end Dec 2014) vs. GB general articulated fleet**

Injury incidents Public access locations	LST Rate per billion vkm	GB Artic HGV Rate per billion vkm	Ratio LST/GB-HGV
<b>Collisions</b>	<b>64.8</b> (73.2)*	<b>170.0</b> (187.4)	<b>38%</b> (39%)
<b>Casualties</b>	<b>64.8</b> (73.2)	<b>241.3</b> (262.5)	<b>27%</b> (28%)

\* Sources: LST from trial data. GB from STATS19 and TRA3105 – all 2012-2014. Result reported in 2013 Annual report in parentheses, recalculated adding in the additional event in paragraph 5.14. Note that with these figures the 39% ratio for collisions in 2013 was fractionally outside the 95% statistical significance range, but the casualty comparison remains acceptable.

- 5.58 When we reported in 2013, the more conservative test case, which includes the events that occurred in depots etc., failed to yield statistically valid comparisons to the background rate. With the addition of another year of trial data, both these calculations now pass the significance test and give:
- LST 'all injury incident' rate is only 54% of STATS19 'on road only' rate
  - LST 'all casualty' rate is only 38% of STATS19 'on road only' rate.

### Discussion of injury incident results

- 5.59 The original 2010 pre-trial impact studies<sup>26</sup> did not forecast any significant difference in the risk associated with LSTs compared to the regular trailers (see Table 12)..

**Table 12: Pre-trial impact assessment estimate of LST safety risk**

- In like-for-like operations, there could be a very small increase in the incident rate per million vehicle km, but this would be associated with stability risk of the taller LSTs (4.6-4.9m) arising from side wind issues, rather than from an increase in low speed manoeuvring collisions.
- ANY predicted increase in the incidence of collisions was likely to be so small as to be immeasurable in any monitoring data.
- ANY increase in incidence of collisions for the longer trailers would be offset by the reduction in collisions that would be realised by a reduction in the number of journeys required to transport the same loads; if the assumed load factors were achieved in LSTs.

<sup>26</sup> Op Cit in footnote 2.

- 5.60 The key difference between the actual trial to date and the assumptions of the impact assessment is that the trailers are not being operated on a like-for-like basis compared with standard trailers, but under very specific conditions. From the operator data submissions, we know that in comparison with the standard HGV trailer fleet, LSTs are operating in a very particular way
- 5.61 LSTs are operating under special operating conditions such as:
- limited, often repetitive routes rather than a full range of destinations
  - pre-assessment of routes and sites for loading and unloading, especially when deciding which retail or supplier sites can receive the vehicles
  - selected drivers with special training
  - dedicated bays in DCs and warehouses with special arrangements to accommodate the additional length.
- 5.62 LSTs are operating under special scrutiny – i.e. all staff, including drivers, despatchers and their managers, are still aware that the trailers are new, and also that the whole trial is under special monitoring for the evaluation.
- 5.63 LSTs are operating a high proportion of their journeys between DCs, so the majority of the distance is covered on motorways and major roads, which tend to have lower accident and casualty rates in general. However, to examine this would require analysis segmented by road type or class as outlined in the 2013 annual report.
- During the past year, Risk Solutions and DfT have discussed the options at length, reviewing options such as accessing samples of actual LST telematics data or modelling the most likely route of each LST leg using the origin and destination data gathered in the journey logs. We concluded that while such methods were possible, they would require a significant investment of time and effort, including perhaps some resource from selected operators. Such an investment would need to be justified by some initial indication in the data that there was a problem to be analysed.
  - We then identified a possible method for a 'bounding calculation', designed to see whether there was any credible way of interpreting the data we do have that would indicate any increased risk from LSTs in urban operations, compared with non-LSTs. The results of an initial cycle of this bounding calculation are given in the next section.

### LST urban operations bounding calculation

- 5.64 We developed a methodology for a bounding analysis, which has been approved by DfT's statistical team.
- 5.65 The calculation is designed to see whether the basic injury incident observations on the LST trial are sufficient to show whether there is any credible base to suggest that LST operations are exposing vulnerable road users in urban areas to a greater risk than the standard length semi-trailer fleet.
- 5.66 The calculation works by using the known split (by distance covered) of rural to urban operations for non-LST articulated HGVs. The analysis then considers what the rural/urban split for LSTs would need to be for statistically robust analysis of the risk from LSTs to be compared with that from non-LSTs.
- 5.67 We have analysed the few incidents involving LSTs that have occurred and classified them as urban (not including motorways) or rural/motorway.  
**We found only one injury incident that could be clearly classed as urban.**
- 5.68 As might be expected with only a single incident, the statistical analysis is currently showing that there is simply not enough data to make a meaningful conclusion at this stage, even with sensitivity scenarios such as counting all depot incidents as being 'like an urban operation'.
- 5.69 We will continue to look at this with DfT and review whether there is any work that could be done to give a meaningful result or, when would we expect there to be sufficient data on the trial to give a statistically significant conclusion.

- 5.70 In later evaluation reporting periods, as the size of the dataset increases, we expect to be able to analyse the data in more refined ways so that the influence of other factors such as the operator types, leg types, distances, route types, trailer designs, tail-swing distances (from the VCA model report data) etc. on collision rates can be assessed. However, each time the data is segmented into more and more refined subsets, a larger overall population of data is required to produce statistically robust results and hence the depth of analysis will only grow as the trial database grows

### Summary of injury incident analysis

- **Given the comments above, we draw the following conclusions from the injury incident evidence so far.**
  - **The evidence to date indicates that operating the LSTs on the trial so far has not led to an increase in casualty rates above that seen in the general operation of GB registered articulated HGVs.**
  - **The evidence to date, while encouraging, cannot be used to infer longer term conclusions about the safety of the trailers in general operation, since there are still many factors constraining their operation as noted above.**
- **As the trial continues we will continue to monitor the injury collision and casualty rates as more operators enter the trial and as the operation of the LST fleet becomes more mature**

## Non-injury incidents

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### Non-injury incident reporting

- 5.71 The DfT reporting requirements for incidents involving an LST, but not resulting in any injury, vary depending on where the incident took place.
- Any incident occurring on the public highway or on land where the public have access (e.g. motorway service areas, retail parks) must be logged, even if no injury resulted.
  - Incidents occurring on private land where there is no public right of access (e.g. depots, loading areas, supplier sites) only have to be logged if there was an injury or, in the view of the operator, a serious precursor to injury (a near miss).
- 5.72 Some operators have chosen to use the trial data recording system to log ALL incidents involving their LSTs, since it provides them with a useful repository for the data and means no judgements need be made regarding whether to include an event or not.
- 5.73 The incidents are assigned a judgement of the degree to which they were 'LST Related' as described earlier in Table 3.
- 5.74 Table 13 shows a summary of ALL the 421 non-injury incidents recorded in the logs in the trial periods up to the end of December 2014. Table 14 shows a reduced dataset of only 360 incidents where some resulting damage to property (private or public) or vehicles was noted in the incident log. As in 2013, we judge that it is appropriate to look primarily at this 'damage only incident' dataset on the basis that it should contain the more significant events.
- 5.75 In both tables, the number of incidents has of course increased with the addition of another year of data and significantly more LSTs on the road. The comparison can only be made once the figures are normalised by distance travelled (discussed later in this section).

**Table 13: Non-injury incidents involving LSTs (by vehicle location)**

LST Related? (See Table 3 – page 16)	Yes	Yes - Partly	Maybe	Unclear	No	Grand Total
<b>Public</b>	<b>45</b>	<b>16</b>	<b>24</b>	<b>5</b>	<b>58</b>	<b>154</b>
00 On main carriageway - not in restricted lane	44	15	22	5	56	142
06 On lay-by or hard shoulder	1		1			2
07 Entering lay-by or hard shoulder					2	2
08 Leaving lay-by or hard shoulder		1				1
Unknown			1			1
<b>Private</b>	<b>99</b>	<b>38</b>	<b>42</b>	<b>8</b>	<b>89</b>	<b>273</b>
10 Company Property / Depot	72	24	30	1	69	196
11 Other Private Property (not on road)	25	14	12	7	19	77
<b>Grand Total</b>	<b>142</b>	<b>54</b>	<b>66</b>	<b>13</b>	<b>146</b>	<b>421</b>

**Table 14: Non-injury incidents involving LSTs resulting in damage (by vehicle location and manouvre)**

LST Related?	Yes	Yes - Partly	Maybe	Unclear	No	Grand Total
<b>Public</b>	<b>33</b>	<b>12</b>	<b>17</b>	<b>5</b>	<b>46</b>	<b>113</b>
01 Reversing		1	2	1	2	6
04 Slowing or stopping					1	1
05 Moving off		1			4	5
06 U turn	2		1	1		4
07 Turning left	21	2	6	1	6	36
09 Turning right	9	7	6	1	14	37
10 Waiting to turn right			1			1
11 Changing lane to left		1			3	4
12 Changing lane to right					1	1
15 Overtaking on nearside					1	1
16 Going ahead left hand bend				1	2	3
18 Going ahead other	1		1		12	14
<b>Private</b>	<b>92</b>	<b>32</b>	<b>38</b>	<b>6</b>	<b>79</b>	<b>247</b>
01 Reversing	11	11	19	1	24	66
02 Parked			1		17	18
03 Waiting to go ahead but held up			1			1
04 Slowing or stopping			1		1	2
05 Moving off	23	10	4	2	16	55
06 U turn		10				16
07 Turning left	25	8	7		9	49
08 Waiting to turn left	1					1
09 Turning right	20	3	2	2	8	35
10 Waiting to turn right	1					1
16 Going ahead left hand bend				1		1
17 Going ahead right hand bend					1	1
18 Going ahead other	1					1
<b>Grand Total</b>	<b>125</b>	<b>44</b>	<b>55</b>	<b>11</b>	<b>125</b>	<b>360</b>

Source (both tables): LST Trial data

## Locations of incidents resulting in damage to property: public vs. private

- 5.76 The public/private location grouping here is based on the field 'Incident location at time' field rather than the 'proximity to junction' field. The difference between these was discussed in paragraphs 5.32 to 5.35. Using this approach to the public/private split, of the events where damage to property or to the vehicle is recorded, two thirds of them occurred on private property with no public access in Table 13.
- 5.77 If we compare the extremes of the table – where the 'LST Related' judgement is most clearly stated - we get the values shown in Table 15. For damage events judged to be in publically accessible location, only 40% were judged to be LST related, with a similar 40% seen as not LST related. For the events in private locations, 50% were seen to be clearly LST related and 30% not. This might reflect the fact that the private locations are largely depots and delivery yards. Such locations naturally demand constant low speed, higher angle manoeuvring in close proximity to other parked vehicles and infrastructure, perhaps with some design requirements based on 13.6m trailers, mean that drivers face a greater challenge when pulling an LST, compared to a standard trailer.

**Table 15: Public/Private location of damage incidents with clear LST Related judgement**

	PUBLIC	PRIVATE
All non-injury with damage.	113	247
LST Related = Yes + Yes Partly	45	124
As % of all Public/Private	40%	50%
LST Related = No	46	79
As % of all Public/Private	41%	32%

Source: LST trial data

## Incident rates over time, allowing for increase in LST fleet size

- 5.78 The charts in Figure 30 show a time trend of the 421 non-injury incidents. The key observation that can be made at this stage of the trial is that the normalised rate of non-injury events reduced from the start of the trial until the end of 2013. During 2014, we saw a slight rise in period 1, before a return to end-2013 levels for periods 2 and 3.
- 5.79 Some operators have commented that they have also detected a reduction in all incidents once a group of drivers in a depot have 'settled in', with the pattern being repeated, albeit with fewer events, each time trailers are introduced at a new location. While this seems plausible, we have not been able to verify such a pattern in the data.

### Figure 30: Analysis of non-injury incidents by trial period

Source: LST Trial data

Figure 30 (a) Summary Data

	2012		2013			2014			Total 2012-14
	P1	P2	P1	P2	P3	P1	P2	P3	
	May-Aug	Sep-Dec	Jan-Apr	May-Aug	Sep-Dec	Jan-Apr	May-Aug	Sep-Dec	
<b>INCIDENT COUNTS</b>									
All Non-Injury Incidents	27	48	57	52	42	62	59	74	<b>421</b>
Non-Injury Incidents - Public Locations	18	18	18	12	13	21	20	28	<b>148</b>
Non-Injury Incidents - Public Locations - Resulting in Property Damage	15	12	12	10	12	17	17	18	<b>113</b>
<b>NORMALISING FACTORS</b>									
LSTs Operating (by period end)	161	334	383	570	576	707	964	1194	
Million Vehicle Km (in period)	1.8	6.3	8.6	10.8	12.4	16.1	25	27	<b>108</b>

Figure 30 (b) Non-injury incidents by number of LSTs in operation

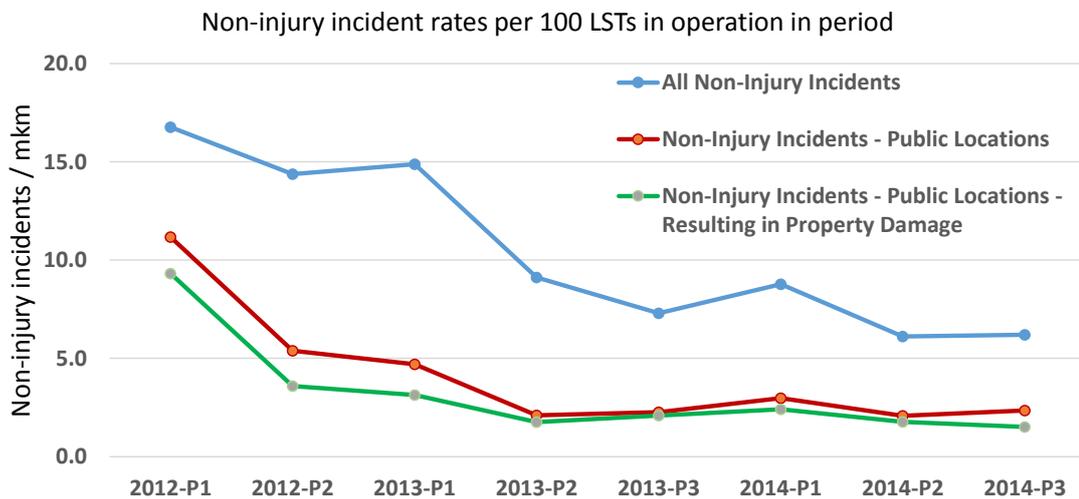
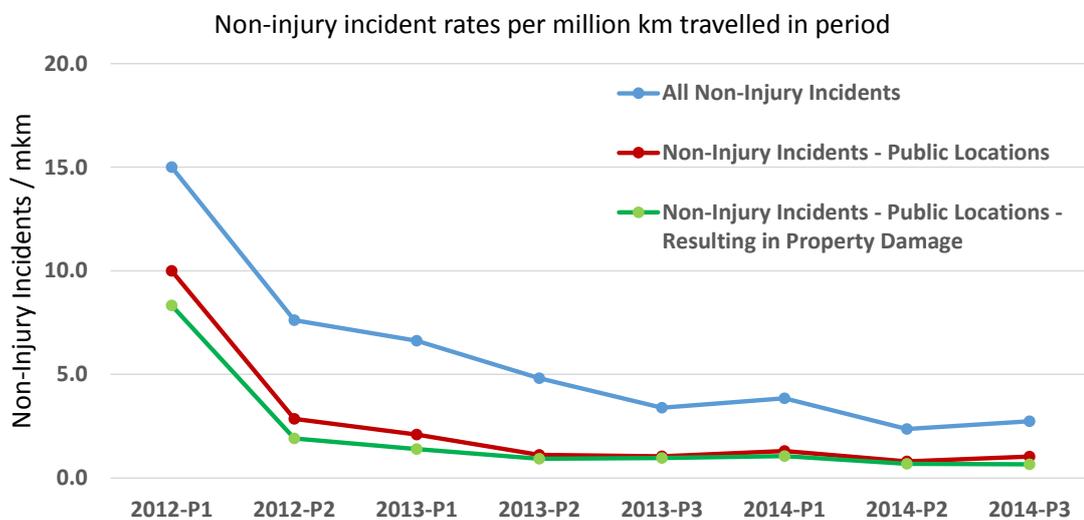


Figure 30 (c) Non-injury incidents by total LST distance travelled



## Comparison with standard articulated HGV non-injury incident data

- 5.80 There is no simple method of comparing the rates at which damage-only accidents are occurring with the rate in the general articulated HGV fleet, since there is no database of damage only accidents comparable to STATS19.
- 5.81 As reported last year, options for creating a robust comparison of damage only incident patterns and rates between the LSTs and a suitable sample population of 'standard' semi-trailers were discussed at a forum of trial participants in November 2013<sup>27</sup>. One suggestion was that it could be done using a sub-set of the trial participants – those with existing large scale incident monitoring and tracking data systems containing both LST events and the general fleet. Such a sample analysis could, in principle, also cover workplace injury accidents and hence provide one basis for analysing the LST incidents in depots / on private land.

## Special topic analysis 2015: Operator In-House Incident Data Analysis

- 5.82 We have revisited this idea during the past year and in Autumn 2014 had initial discussions with a small number of operators to test the feasibility of this option. A budget for a special topic analysis on this subject was then included in the 2015 budget.
- 5.83 Early in 2015, we invited four of the six largest operators of LSTs in the trial to a telecom in which we looked together at the sorts of incident recording systems they operate, the feasibility of building an aggregated dataset based on their individual systems and what sort of analysis it would support. From this, we have confirmed a set of data that appear to be available, and which would support useful analysis to enhance the evaluation. We have developed a proposed data categorisation for those items of information, and have now agreed to pilot the concept with these three or four operators, to establish the feasibility of the approach on real data.
- 5.84 The next question, assuming the pilot is successful, is whether we would be able to replicate the process for a sufficiently representative sample of the trial operators to give a meaningful set of results. To get an indication of this we surveyed 31 operators present at the FTA LST Forum on 21 April 2015, to explore to what extent similar data might be available from their systems. Many of these operators were much smaller than our first sample and we asked in what form data was collected (hard copies or electronic). We sought information on whether operators keep records relating to incidents involving injuries, and those involving damage, including to third party infrastructure or property. We also asked whether they kept corresponding data on the distance travelled by regular (non-LST) trailers, and the numbers of legs completed. Of the 31 operators present, half keep electronic data relating to incidents of interest.
- 5.85 The pilot stage of the analysis will start during the summer of 2015, aiming to:
- Test the feasibility of aggregating company in-house data in this way
  - Demonstrate the sort of analysis that it can support
  - Yield real results of relevance to the trial covering a substantial sub-set of the overall LST fleet, albeit from a small sample of the largest companies
  - Provide both a case study and a methodology that might be expanded to incorporate data from further LST operators.

If the pilot stage demonstrates the value of the approach and funding is available, the aim will then be to expand the analysis to a larger sample of operators and include results in next year's annual report.

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<sup>27</sup> Longer Semi-Trailer Operators Forum Organised by Freight Transport Association 6 Nov 2013 Volvo, Warwick

## 6 TRIAL OUTCOMES 2: LST UTILISATION ANALYSIS

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- 6.1 This analysis was first presented in the 2013 Annual Report, and led to some recommendations for refinements to the data reporting structure. These changes were applied by operators in the latter half of 2014.
- 6.2 The results here include a re-statement of the end of 2013 position, as it would have appeared if the new calculation features and assumptions had been used.
- 6.3 In the 2013 report we included an extensive exploration of the loading levels split by leg type, MOA and other factors which were produced as background but did not lead directly to any substantial conclusions. The exploration was necessary and useful in the development of the process, but we judged that it was not necessary or informative to replicate that detail in this year's report. The data are available if required by DfT or Risk Solutions for future analysis.

### Utilisation (journeys saved) - methodology

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- 6.4 Having presented the entire methodology in the main 2013 report, we have now moved it to Appendix E, and give a simpler summary of the key points here.

#### Environmental impact

- 6.5 One of the purposes of the LST trial is to understand the environmental impact of the LSTs. While there are likely to be some whole-lifecycle impacts related to the slightly larger size (and hence greater material consumption) of the longer trailers, and their slightly increased weight due to additional steering axles, we are not in a position to estimate these from the data captured in the trial itself.
- 6.6 The trial outcomes are being measured in terms of the estimated reduction in the number of journeys, and hence vehicle kilometres, as a result of the operation of fully laden longer semi-trailers. This provides a good proxy for the reduction in direct environmental impact by operating the LSTs in place of standard trailers, for the same journeys.
- 6.7 The distance savings calculated from the journey logs and loading data are moderated by a 'loss factor' (0.018 x distance) – a reduction in the distance saving (only present where the LST is loaded beyond 13.6m length) reflecting the marginally increased direct environmental impacts of the LSTs on all the legs travelled.
- 6.8 We consider this estimate to be reasonable on the basis of present knowledge, although a separate study of the actual impacts of LSTs on tractor unit fuel consumption would need to be carried out to investigate this more robustly.<sup>28</sup>

#### Loading levels

- 6.9 There are two main categories of semi-trailer operated in the trial, trailers up to 14.6m in length and trailers up to 15.65m in length. Of the trailers put into operation during the trial to date 84% have been 15.65m length, an increase from 79% at the end of 2013.
- 6.10 The fundamental assumption in the analysis of how efficiently the LSTs are operating, is whether the additional length is being used, based on the declared 'Deck%' data in the DSF)
- 6.11 The analysis classifies legs that are estimated to be using more than the standard 13.6m UK trailer length as being 'Fully Loaded', meaning they are using the additional length of the LST.

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<sup>28</sup> The LST trial does not capture any data on actual fuel consumption as this would be very difficult to do (fuel use is associated with tractor units rather than trailers) and there are a large number of confounding factors such as loading and traffic conditions which would prevent comparisons from being meaningful. To investigate the actual impact of LSTs on fuel consumption in operation a specific controlled trial would need to be set up, comparing identical tractor units pulling longer and standard semi-trailers over a defined route in the same traffic conditions (i.e. no more than 1 mile apart), capturing fuel consumption via telematics. To date such a controlled trial has not been conducted, although it has been discussed with a small group of trial participants.

The extent to which that extra length is being used is calculated is part of the analysis.

- 6.12 Full detailed of how the loading levels are handled is given in Appendix E.
- 6.13 In analysing utilisation, we also take into account how 'mode of appearance' affects the actual additional load that is possible.

### Utilisation by percentage / by band

- 6.14 The data framework allows operators to submit their utilisation (deck space covered, volume filled) either as estimates of the percentage of the available space or by selecting a band from a given range.
- 6.15 In 2014 we introduced a new '100% Full' top band and amended the lower bands accordingly. All data has been updated to reflect the new banding and the 2013 results re-stated using the new assumptions.
- 6.16 Where operators have used utilisation bands, the data is converted into percentages using set rules. The rules now need to address historic data using the old bands as well as 2014 data created using the new bands.
- 6.17 Full details of the change to the bands are given in Appendix E.

### Summation of savings

- 6.18 For the updated analysis we have used the new bands to remove much of the previous conservatism, and journey savings have been calculated on a 'per leg' basis. In addition, since everything is now expressed as percentages, we have been able to define more accurately the percentage fill as that which exceeds a 13.6m trailer, for each of the two trailer lengths.
- 6.19 The calculation assumptions are given in detail in Appendix E.

### Additional savings for retail site deliveries

- 6.20 As in the 2013 Annual Report, an upper bound calculation is generated by changing the assumption for the specific case of legs to retail sites.
- 6.21 The retail sector is assumed to operate many legs as full from a distribution centre to a retail site, then empty from the retail site back.
- 6.22 For each round trip made, we could assume a percentage saving of the total round trip, as 13.6m trailers would also make outward loaded and return empty trips, but would make more overall round trips than fully loaded longer trailers.
- 6.23 This assumption represents the 'higher bound' of saved vehicle kilometres – for this calculation we double the saved vehicle kilometres associated with fully loaded legs with the leg type 'to/from retail site' only.

## Vehicle kilometre savings (lower and upper bound)

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- 6.24 The changes in the data bands and the calculation process remove conservatism that was present in the 2013 analysis. Table 16 shows the results to the end of 2013, recalculated using the new assumptions and process. Table 17 provides the comparable figures with the 2014 data included.<sup>29</sup>
- 6.25 Table 18 and Table 19 shows the equivalent results to the end of 2013, recalculated using the 'upper bound' assumptions about return legs for retail operations described in above.

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<sup>29</sup> Note that in these calculations, the data from the very first trial period – 2012-P1 has been excluded, because in that first period there was no distinction between volume and deck space utilisation in the data framework. The results are not affected significantly because of the very small numbers of trailers in operation in that period.

**Table 16: Distance savings to end 2013 – recalculated (lower bound)**

Source: LST trial data	Trailer Length:	14.6m	15.65m	Total
Total vkm for legs where LSTs are reported to be full		4,191,593	17,796,836	21,988,428
Total vkm operated by all LSTs		7,077,453	33,636,521	40,713,973
Percentage of vkm operated by full LSTs		59%	53%	54%
Assumed saving for vkm operated by full LSTs (additional load carried)		0-7%	0-15%	
<b>vkm saved (lower bound)</b>		<b>180,344</b>	<b>1,920,050</b>	<b>2,100,394</b>
vkm 'increase' on all LST vkm as a proxy for emissions increase of 1.8%		127,394	605,457	732,852
<b>Estimated net vkm saved</b>		<b>52,949</b>	<b>1,314,593</b>	<b>1,367,542</b>

**Table 17: Distance savings to end 2014 (lower bound)**

Source: LST trial data	Trailer Length:	14.6m	15.65m	Total
	Trailer Length:	14.6m	15.65m	Total
Total vkm for legs where LSTs are reported to be full		9,931,496	48,033,162	57,964,658
Total vkm operated by all LSTs		18,096,310	87,125,648	105,221,958
Percentage of vkm operated by full LSTs		55%	55%	55%
Assumed saving for vkm operated by full LSTs (additional load carried)		0-7%	0-15%	
<b>vkm saved (lower bound)</b>		<b>503,414</b>	<b>5,581,776</b>	<b>6,085,190</b>
vkm 'increase' on all LST vkm as a proxy for emissions increase of 1.8%		325,734	1,568,262	1,893,995
<b>Estimated net vkm saved</b>		<b>177,680</b>	<b>4,013,514</b>	<b>4,191,194</b>

**Table 18: Distance savings to end 2013 - recalculated (upper bound)**

Source: LST trial data	Trailer Length:	14.6m	15.65m	Total
Total vkm for legs where LSTs are reported to be full		4,191,593	17,796,836	21,988,428
Total vkm for legs where LSTs are reported to be full and to/from retail site		743,190	3,275,448	4,018,639
Percentage of full vkm operated to/ from retail sites		18%	18%	18%
vkm saved in non-retail operations		156,524	1,643,851	1,800,376
vkm savings for outward full retail journeys		23,819	276,199	300,018
Total vkm saved in retail operations		47,639	552,398	600,037
<b>vkm saved (upper bound)</b>		<b>204,163</b>	<b>2,196,249</b>	<b>2,400,412</b>
vkm 'increase' on all LST vkm as a proxy for emissions increase of 1.8%		127,394	605,457	732,852
<b>Estimated net vkm saved</b>		<b>76,769</b>	<b>1,590,792</b>	<b>1,667,561</b>

**Table 19: Distance savings to end 2014 (upper bound)**

Source: LST trial data	Trailer Length:	14.6m	15.65m	Total
Total vkm for legs where LSTs are reported to be full		9,931,496	48,033,162	57,964,658
Total vkm for legs where LSTs are reported to be full and to/from retail site		1,305,509	9,543,492	10,849,001
Percentage of full vkm operated to/ from retail sites		13%	20%	19%
vkm saved in non-retail operations		453,706	4,634,367	5,088,073
vkm savings for outward full retail journeys		49,708	947,409	997,117
Total vkm saved in retail operations		99,415	1,894,818	1,994,233
<b>vkm saved (upper bound)</b>		<b>553,122</b>	<b>6,529,184</b>	<b>7,082,306</b>
vkm 'increase' on all LST vkm as a proxy for emissions increase of 1.8%		325,734	1,568,262	1,893,995
<b>Estimated net vkm saved</b>		<b>227,388</b>	<b>4,960,923</b>	<b>5,188,311</b>

## Vehicle kilometre total savings - summary

6.26 The data from the figures above is summarised in Table 20.

**Table 20: Vehicle km saved by using LSTs**

Distance saved (million vehicle km)	2014	2013 New Calculation	2013 Annual Report
Lower bound	4.2	1.4	0.6
Upper bound	5.2	1.7	0.9

Source: LST Trial data

6.27 The removal of the conservatism that was present in the 2013 Annual report, as well as the addition of some journey leg data from 2013 that was submitted late by operators and has now been incorporated into the database, has broadly doubled the estimate of the distances saved.

## LST utilisation analysis – percentage savings

6.28 The analysis to date has been based on the total distance savings. An alternative viewpoint is to ask how those savings appear as a percentage, reflecting the simple ‘rule of thumb’ used by many in the trial, that by adding 2m of additional length to a trailer, you have a potential increase of 15% on any individual journey.<sup>30</sup>

6.29 This value is informally translated into statements such as ‘a 15% saving’, or ‘10-15% fewer legs to move the same amount of cargo. While these ‘headline’ statements are useful in conveying the rough scale of the potential savings, they do not take into account the practical aspects associated with the nature and shape of goods being transported. They are a mathematical expression of the additional length of the trailer (or number of additional pallets), whereas our analysis addresses the saving in distance travelled or trips that would be required to move the same (actual) goods on standard, 13.6m trailers.

6.30 On this basis, on a fully loaded 15.65m LST, we would anticipate that **the maximum savings we would expect to see are 13% (1 in 7.5 journeys) before the application the 1.8% environmental impact factor or 11.5% (1 in 9) journeys after applying the 1.8% factor.**

6.31 By changing the analysis method so that the saving is calculated at a much lower level in the data (i.e. the contribution from each leg, depending on the loading) we are now able to analyse the estimated saving by each operator, as a percentage of the distance they might have had to travel, had all the goods been moved on 13.6m trailers.

6.32 We looked at utilisation on the same basis as the ‘upper bound’ calculation used earlier:

- any longer trailers loaded above the relevant Deck% fill threshold are considered to have made savings in numbers of trips, and hence in vehicle kilometres, compared with standard 13.6m trailers.
- where legs have been identified as leg type ‘To/from RETAIL SITE’, irrespective of the nominal type of operation of the operator declared via their Company Information Form (CIF) return, savings are assumed to be doubled for those legs, assuming a total round trip saving including the empty return leg associated with such work.
- a ‘loss’ of 1.8% has been applied to all vehicle km operated by longer trailers (loaded and empty) to represent the lower fuel efficiency associated with operating the trailers

6.33 We have examined the utilisation and savings made in more detail, both by sector of operation

<sup>30</sup> As noted earlier in the text, this figure of 15% is based on the increase from 26 standard pallets on a single deck 13.6m trailer, to 30 standard pallets on a 15.65 LST (a 15.4% increase). The theoretical gain when loading standard cages is actually higher, with the potential load moving up from 45 to 54 units, i.e. 20%

and on a company basis, to explore whether there are any patterns to be found in operators that make more or less efficient use of the longer trailers

6.34 Savings were calculated as:

$$\text{vkm saving (\%)} = \frac{\text{vkm saved}}{(\text{total LST vkm} + \text{vkm saved})}$$

Where:

- vkm Saved** = Overall vehicle km saved using the upper bound method (after the loss factor has been applied)
- Total LST vkm** = Total vehicle km operated by LST fleet  
= 105.22 m (excluding 2012-P1 see Appendix E for details)

### Average % distance saving

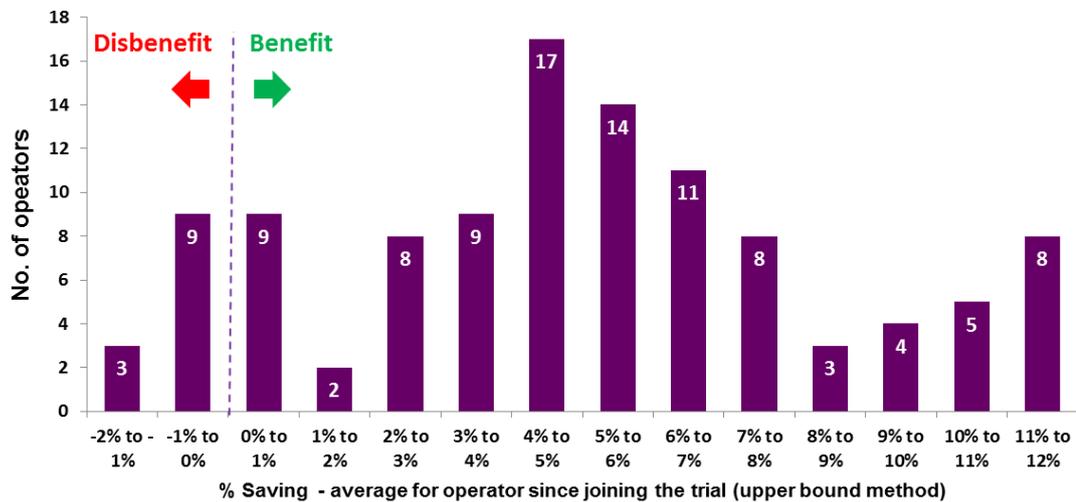
6.35 Using the figures in Table 19, the upper bound vkm saved (after the loss factor is applied) is 5.19m vkm giving,

$$\text{average LST trial fleet vkm saving (\%)} = \frac{5.19}{(105 + 5.19)} = 4.7\%$$

6.36 Alternatively, if the upper bound net savings of 5.19 mvkm (after loss factor is applied, from Table 20) are simply divided by the average LST journey length of 117 km then the savings would equate **average saving across the LST fleet to date of around 1 in 22 journeys.**

### Range and distribution of % distance saving

6.37 However, this simple figure is only an average with a range, as shown in Figure 31.



Source: LST trial data

**Figure 31: Distribution of % distance saved using LSTs - by operator**

6.38 Savings by individual operators range from a **maximum of 11.5% to a minimum of -1.8%.**

6.39 Operators with savings at the upper end of the chart are clearly making a meaningful gain of **over 1 in 9 journeys saved** (using the average journey length of 117 km as above) in the real world operations on which they have chosen to operate their LSTs in the trial.

- 6.40 Operators where the trailers are nominally losing up to 1.8% rather than saving are never or rarely being operated full, and almost all their journeys could apparently have been operated using standard 13.6m trailers. The loss factor in the calculation for increased emissions then produces a net loss when expressed in vkm. Whether or not the 1.8% is exactly the correct factor, what is clear is that a small number of operators are not yet seeing a meaningful gain in terms of reduced journeys by having the LSTs in the fleet.
- 6.41 The operators in the highest and lowest bands of the chart do not operate very large numbers of trailers. For example, in the bands on Figure 31,
- the 13 operators in the top two bands (those above 10%) operate 43 LSTs between them, 23 of them belonging to the eight operators in the top band.
  - the 12 operators in the two negative saving bands operate a total of 72 LSTs between them. Of these, only seven belong to the three operators in the lowest band.
- 6.42 We have not yet extended the analysis process to examine the performance at an individual trailer level, but from inspection of the number of LSTs registered to each operator in Figure 31 we can see that around half of the trailers belong to operators estimated to be saving 4-6% by distance.

### Conservatism and correlation in % saving results

- 6.43 This is the first time the % saving has been expressed at the operator level. It is important to note that there are several factors that might be influencing the results presented in Figure 31.
1. Operators with lower estimated savings might be understating their loading figures. We have always put significant effort into checking the accuracy of data where operators appear to be declaring extremely high deck or volume utilisation, to ensure that the trial data was not being overstated. This focus may mean we have not placed the same emphasis on operators reporting unusually low utilisation, although we have reviewed this with some operators.
  1. The loss factor (0.018 x distance) being applied to reflect increased fuel use might be too conservative.
  2. The results may be biased by factors such as the size of the LST fleet the operator is running or the distances they cover.
- 6.44 Addressing each of these issues in turn:
1. To assess whether operators with lower savings are understating their utilisation values, we would need speak to a selection of them and review how they are estimating their figures
  2. The effect of changing the loss factor would be to move the whole distribution in Figure 31 to the right. There would still be a range of outcomes for different operators. Appendix E explains the basis of the loss factor and the work that would be needed to provide a more refined estimate for the value. If necessary, we can carry out a sensitivity analysis of the effect of a range of loss factors on the main outcomes in a future analysis.
  3. The section below describes some further analysis we have done to see if the saving % correlated to some key factors.
- 6.45 We have completed a simple investigation of this variance in utilisation to see if there are any simple correlations with the more obvious explanatory factors within our data. We explored
- Operation Type (as reported on the CIF),
  - Vehicle km per Period
  - LST Fleet Size
  - Length of time since joining the trial.
- 6.46 **Savings variability was not strongly correlated with any of these factors.**
- 6.47 We have only completed an initial exploration of the data at this stage. We have made some recommendations about further work in this area in Section 8.

## Summary evaluation of trial outcomes (to Dec 2014)

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- The trial data has been shown to support preliminary analysis of two key issues.
  - There is no indication of any increase in road safety risk arising from operation of LSTs on the trial.
  - Utilisation rates have been analysed using an improved methodology, supported by adjustments to the data collection, to provide a statement of the 'journeys saved' due to operations of the LSTs on the trial to date.
- The range of savings by individual operators can now be analysed and explored

## 7 WIDER IMPACTS - LOOKING AHEAD

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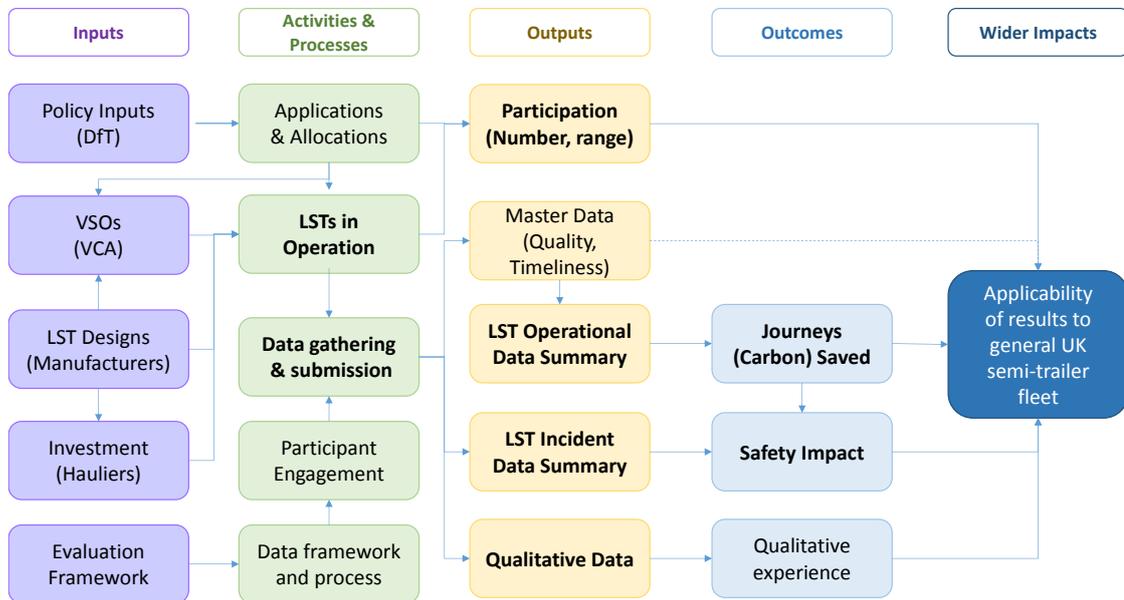
- 7.1 The trial is not yet mature enough for us to make robust conclusions about the applicability of any of the outputs to a more general case of LSTs being operated as a general part of the GB HGV fleet, outside the special conditions imposed by the trial. The dataset is not yet large enough to support the more subtle analysis required for such a projection into general operation, although with this year's report we have been able to start to work with fairly simple segmentation of the data.
- 7.2 The population of LSTs covered by the analyses reported here represents about 75% of the target total of 1,800 (an improvement over the 33% at the end of 2013).
- 7.3 At the time of writing we are now at approximately 90% of the target fleet on a VSO.
- 7.4 Operating LSTs is, for many operators, still a new experience and so the patterns of working we see among trial participants are not necessarily those that would be adopted in the longer term. On the other hand, our vehicle km saving calculations so far show no clear correlation between the time the operator has been on the trial and the % savings being realised.
- 7.5 The training of drivers for newer entrants appears to be similar to that provided by those who joined the trial early on. However, the analysis here does suggest that the higher incident rates seen in the first few periods of the trial with the first cohort of participants are not being repeated in the same way by the newer entrants. In future periods we will need to assess whether the incident rate changes as LSTs become a familiar part of the participants' fleets.
- 7.6 This trial depends very heavily on the continued goodwill of the participants. DfT and Risk Solutions need to continue to engage with the industry and its trade bodies to maintain interest and commitment to the trial. Open dialogue at industry events is generally well received and also provides us with valuable insights into the experience of those operating these new semi-trailers

Wider Impacts

Applicability of results to general UK semi-trailer fleet

## 8 CONCLUSIONS AND RECOMMENDATIONS

- 8.1 We have drawn conclusions and have recommendations (to DfT) based on the material presented in each section of the report, based on the elements of the evaluation framework (below – copy of Figure 2).



### Section 2 Progress on trial inputs

- 8.2 The overall approach to the trial data collection and evaluation appears to be operating as intended. No major changes are proposed at this stage.
- 8.3 A mid-year trial evaluation project review between DfT and Risk Solutions will be held in October or November 2015, covering all aspects of the trial and evaluation.
- 8.4 **Policy Inputs:** The interaction between the parties on the trial appears to be working well in most cases. We still see cases where new entrants have failed to understand one or more of the steps, whether it is the VSO process or the data collection, but these are quickly resolved once they are identified.
- 8.5 **VSOs/VCA:** We want to be able to match operational data back to key design features, such as tail-swing distance, in future analysis. Risk Solutions and VCA are currently working together to codify key data from the VCA model reports.
- 8.6 **LST Designs / Manufacturers and Investment:** The main manufacturers now have a menu of pre-authorized and tested designs, from which many new participants simply selected and ordered. The final allocation process brought new applicants forward as well as requests from existing participants wishing to expand their fleet.
- 8.7 **Evaluation Framework:** We still plan to incorporate key performance indicators at each stage of the evaluation framework logic model. There was not time to do so for this report, although the 'Headlines' page provides a simple version. Metrics of progress are already mentioned in the text of the report, but the process evaluation would benefit from bringing these measure together into a single monitoring dashboard.

### Section 3 Trial activity and processes

- 8.8 **Applications and allocations / LSTs in operation:** The applications and allocation processes are now closed. DfT are monitoring the progress of the final batch of allocations from proof of order through to build and the issue of VSOs. DfT are currently projecting that all

1,800 trailers should be on the road by the end of 2015.

- 8.9 **Data gathering and submission:** We have agreed that the submission process will remain at the present 'three-per-year' for the time being. Once the entire LST fleet is on the road and all participants have submitted data at least once, we will reconsider whether a move to a 'two-per-year' submission cycle would be possible without affecting the quality of the data collected.

### Participant engagement

- 8.10 The top priority during the remainder of 2015 will be to introduce new participants into the trial smoothly so that we can go into 2016 with data being gathered from the full planned LST fleet of 1,800 trailers.

- 8.11 For Risk Solutions this means:

- Helping existing participants to make their data collection more efficient and less demanding in terms of support, as well as improving the quality and completeness of the data produced.
- Supporting new participants in setting up their systems and, where possible, transferring experience and lessons from the existing participants.
- 'Tuning' our monitoring, contact tracking, data checking and resource management to further reduce the average time taken to support each participant.

Risk Solutions has recently installed a new contact management system specifically to support the trial as the number of operators grows. This system will be refined during the remainder of 2015. In particular we need to bring the monitoring of Company Information File submissions up to the same level as that applied to the main Data Submission Files.

- 8.12 During 2015/2016 our focus will:

- Provide the support required to induct the final cohort of operators
- Seek to reduce the incidence of missing or late data submissions by working with operators to improve their data collation and checking processes

- 8.13 A further trial participant forum may be held in the coming year subject to agreement between FTA and DfT.

- 8.14 **Data framework and process:** We have not proposed any major amendments to the data collection and submission framework. However, we will consider minor improvements to the main DSF template to capture more common errors, in particular in the Incident Log.

## Section 4 Trial outputs: LST facts and figures 2014

### Participation

- 8.15 The group of participants on the trial continues to cover a good range of operation types, sizes and types of goods.
- 8.16 The presence of some very large LST fleets (150 or more units) in a few operators, some of them operating long distances, raises the question of whether any of the results are dominated by these 'blocks' in the dataset. As the final mix of operators settles down, we may need to do some statistical analyses to examine the sensitivity of the trial results to the influence of these large fleets, especially in any later application of the results to projections of impact if LSTs were more widely available in the UK.
- 8.17 The majority of participants are engaging well with the process, are positive and proactive in resolving issues with Risk Solutions or seeking support where they need it.

### Data submission (quality, timeliness)

- 8.18 The majority of participants are now managing to finalise their data submission in a reasonable time, although some further improvement will be needed to achieve the aspiration of seeing all data finalised within a month of the period end.

- 8.19 In every period, we continue to see about 20% of participants failing to submit in good time, with half of those being sufficiently late that their data is not included in any analysis until the subsequent period.
- 8.20 A few of these cases are always due to problems in executing the data submission process, usually where local IT skills are limited. These cases are easy to handle and with support in their first few submissions, these participants manage to generate future data in good time. However, up to half of these cases appear to be the result of poor planning or preparation, with the operator not noting the submission date, or only starting to collate their data after the collection period has ended.
- 8.21 We have reviewed the missing/late escalation process established in 2013 and DfT are happy that it is fit for purpose. There are no new recommendations in this area. The only change may be that if we find individual operators are repeatedly late, DfT may need to consider more significant intervention than has been necessary to date.

### **LST operational summary**

- 8.22 The data being collected is in a well established format and the summary charts produced every period inform DfT of the state of the operations on the trial, as well as providing the foundation for the analysis of outcomes.
- 8.23 We have noted again that the empty running for the LST fleet (by distance) is only about 19%, compared with a figure of around 29% for the general articulated HGV data. This is a good indicator of how operators are using LSTs on major trunking work, with loads guaranteed in both directions, more than is possible for the wider range of work that has to be undertaken by the general fleet.

### **LST data from GPS tracking**

- 8.24 We are aware that our information on how many of the LSTs are tracked using GPS is becoming out of date, for two reasons.
- For the 2012 entrants, tracking was just one of a series of 'additional items' they were asked to note in their CIF data. From 2013, they were asked to specify specifically the tracking of LSTs and or tractor units in the CIF, along with the system in use.
  - From our informal conversations with operators, we are aware of cases where GPS tracking has been retro-fitted to LSTs or where the system has been changed/upgraded.
  - We also know of companies where wider upgrades to their corporate IT systems have made tracking data available where it was not previously the case. In particular, we have seen cases where the trailer tracking has been connected up to the job management system in a new way, making new data combinations possible.
- 8.25 We may wish to conduct a small 'CIF update' process to get a more recent snapshot of how much of the fleet is tracked and using which systems, for two reasons
- We have had some success in connecting participants up to other operators using their tracking system, to share experience of how they have managed to download data for the trial, making their data submission easier and more accurate.

### **LST Incident Data**

- 8.26 Most operators have completed incident records without a problem or with telephone advice from Risk Solutions. We are not proposing any change to this part of the system, but we have identified further opportunities to add automatic checking to this part of the DSF.
- 8.27 We have started to look more closely for patterns in the use of the log and the narrative fields to see whether the data is being completed consistently, acknowledging that those doing the data entry, are not trained in the use of the STATS19 fields in the way a police officer would be. We have identified an ambiguity which arises where the event takes place in a depot or at the depot entrance, where it may not be clear how the user should record the 'proximity to a junction'. The effect of this is some variation in whether an event is logged as taking place on

public as opposed to private property.

- 8.28 **Recommendation: Risk Solutions to prepare and issue an updated DSF containing additional automated checking and further assistance in completing the 'proximity to junction' field.**
- 8.29 We regularly remind operators of the need to report incidents and where no incidents are logged, we will often check that this is a correct position, as opposed to an error of omission.
- 8.30 We are aware of a failure by one operator to communicate two events to DfT in early 2015, although both events were logged in the DSF received later. The operator is a large company with a good past record of reporting events, and further investigation suggested that this was a breakdown in internal communication, rather than lack of intention to inform DfT.
- 8.31 DfT have reiterated the incident reporting requirements to all participants on a number of occasions in the past and should continue to do so.
- 8.32 **Recommendation: DfT to reiterate the incident reporting requirements again in September 2015.**

#### Qualitative Data

- 8.33 The existing Qualitative Survey File (QSF) provides a useful additional perspective on the operator experience of using LSTs, albeit at a fixed point in time.
- 8.34 The views of operators after their first few months of operation are predominantly positive, both in terms of ease of operation and the benefits in terms of reduced journeys for a given quantity of cargo.
- 8.35 As we approach the position where we have the final set of operators joining the trial, we believe it would be informative to do an 'update' to the data using the existing form, by encouraging all operators to submit a new file in a single period, probably 2015-P3. This would allow results to be included in the next annual report and any change in the perspectives after a longer period of operation, noted.
- 8.36 **Recommendation: Risk Solutions request that all participants complete an updated QSF as part of the 2015-P3 submission (due in January 2016).**
- 8.37 As has been stated in this and earlier reports, we will then consider whether a new set of QSF questions should be developed and used at the mid-point of the trial in 2016/17.

#### Section 5 Trial outcomes 1: safety impact

- 8.38 Our key conclusion is that there is no immediate concern that the LSTs being operated in the trial are causing an increased rate of injury incidents. There have been only ten reported injury incidents involving LSTs since the start of the trial and only three of these are judged to be LST related. Only one of those three occurred in a publically accessible place and even then, the only injury was to the driver of the LST.
- 8.39 We have demonstrated a statistically valid comparison of incidents involving LSTs to that of all articulated HGV fleet showing that to date, the collision rate is only 38% and the casualty rate only 27% of the rate for the all trailers. This comparison is for all road types.
- 8.40 We have performed a bounding calculation looking at whether the LSTs pose an increased injury risk in urban (non-motorway) locations compared to the general articulated HGV fleet. This calculation has demonstrated that there have been insufficient injury incidents in urban locations to make any robust claims either way on this issue. The calculation also shows that even if we knew the precise split of urban/non-urban distance operated by LSTs to date, there would still not be sufficient data yet to produce a statistically significant result using the methods applied so far.
- 8.41 The issue of urban operations is a question that we would like the trial evaluation to assess, even if the data are sparse. We have two threads of work underway which will contribute to this discussion.

- 8.42 The first is internal work on the statistical analysis of the bounding calculation, which will be reviewed with input from DfT statisticians shortly. We want to consider whether there is any value in applying further statistical methods (perhaps Bayesian) to the existing sparse data and to forecast the point in the trial at which we might get robust results from the observed injury incident data.
- 8.43 The second is our planned work with selected operators reviewing damage-only events, using their in-house datasets.
- 8.44 The raw LST data contains 421 non-injury incidents over which only 360 resulted in reported damage. Of those 360, only 113 occurred in publically accessible locations and only 40% of these were judged to be related to the fact the trailer was an LST.
- 8.45 The work with operators is designed to set these damage only events in the context of a known population of non-LST events, providing the necessary comparison to see whether there is a marginal risk from the LSTs. From there we hope to be able to assess the relative risk by urban/non-urban locations.

## Section 6 Trial outcomes 2: LST utilisation analysis

### Journey savings

- 8.46 There are a number of factors to take into account when considering the likely environmental impact of operating longer semi-trailers. This analysis has used the data available from the LST trial to calculate the impact of longer semi-trailers on overall vehicle kilometres, using assumptions about the vehicle kilometres removed from the road through the operation of fully loaded LSTs. The analysis has also included a simple assumption for the increased energy consumption (and hence emissions) associated with pulling LSTs, and converted this into a measure of increased vehicle kilometres as a common currency for the analysis.
- 8.47 We have also made an assumption about the operation of trailers serving major retailers through journeys to and from retail sites, providing us with an upper and lower bound on the total vehicle kilometres saved. This analysis could be refined and extended to other leg types (see below).
- 8.48 We have removed some conservatism noted in the 2013 results.
- 8.49 According to the analysis we estimate that **between 4.2 and 5.2 million vehicle km) have been removed from the road** during the operation of LSTs since September 2012.
- 8.50 Based on the upper bound calculation, **the average distance saving date by operator is 4% or around 1 in 22 journeys saved (by distance).**

### Savings % by operator results

- 8.51 **The maximum saving estimated for an individual operator is 11.5%, or roughly 1 in 9 journeys saved (by distance).** There are 13 operators with estimated savings of >10%. This group of operators have 43 LSTs between them. The saving of 11.5% matches the maximum anticipated using the estimation method we have applied.
- 8.52 **There are 12 operators who appear to be making little, if any, gain in terms of saved journeys from operating their LSTs.** This group of operators have 72 LSTs between them, with seven in the group operating near to the -1.8% limit.
- 8.53 The spread of savings estimated by operator raises a number of questions which we need to consider during the coming year. We would like to know whether the estimates for each operator seem reasonable to the operator themselves, which would require us to reflect their own results back to each participating company.
- 8.54 We are most interested in the experience of operators who appear to be gaining the most or very little from operating the longer trailers. The natural hypothesis will be that the loading factor will be driven by the extent to which the operator
- can assign consistent work
  - has control (or at least strong influence) over

- the incoming quantity and flow of goods to be carried and/or
- the delivery schedule or demand (i.e. whether trailers can 'wait' until they are full).

- 8.55 These factors would be the same for any haulage operation. The questions we need to explore with operators as the trial dataset grows are, we suggest:
1. Do they believe their estimated % gain is about right (based on general experience or any internal calculations they may have undertaken)? If not, what special factors might we be missing in relation to their operation?
  2. Could it improve in future trial periods? If so, what would be the enabling factors?
  3. For those in the mid or lower range of the distribution, what have been the limiting factors?
- 8.56 There are of course some indications of what the responses will be, in the qualitative analysis presented earlier and also in our informal discussions with operators during data submissions. There are also some data in the pre-trial feasibility studies, where estimates of the likely loading factors for different types of operation were cited, although that evidence is now more than five years old.
- 8.57 **Recommendation:**  
**Risk Solutions develop a method with DfT to investigate this further during 2015-16. The likely approach would include a process to reflect each operator's estimated saving back to them with supporting data and capture their responses.**
- 8.58 **Rationale:** The importance of this is that a key output from the trial should be a good understanding, backed by quantitative evidence, of the factors influencing the efficiency gains offered by LSTs in real world operations, compared with those estimated in models or desktop analysis.

## Section 7 Wider impacts - looking ahead

- 8.59 The trial is not yet mature enough for us to make robust conclusions about the applicability of any of the outputs to a more general case of LSTs being operated as a general part of the GB HGV fleet, outside the special conditions imposed by the trial.

## APPENDIX A: THE DATA FRAMEWORK

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The data framework for use by all participants is defined and explained in a document provided to all participants “**DfT Longer Semi-Trailer (LST) Trial: Trial Evaluation Data Guide**”. The latest version (v2-3) was issued in April 2013, although the work undertaken during 2012 would have used earlier versions issued in April 2012 and updated in August and December 2012. Whilst there has been some change in the formatting, the content of the guide and the data framework itself has not changed substantially since August 2012 and we have therefore chosen to publish the summary information from the latest edition here, so that it is up to date, rather than any of the earlier versions actually used in 2012.

Sections A1-A4 which follow are taken directly from Appendices A-D of the April 2013 guide and hence the language is framed in terms of guidance to participants rather than a report.

### A1 DfT Rationale for data requirement

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**The notes in this appendix have been edited from a DfT document outlining their rationale for the extent of the data being requested. The ‘We’ in these notes refers to DfT.**

#### Company Information File (CIF)

We ask for three years’ information as this helps to ensure that it reflects your true situation (in current circumstances in particular, one year’s information might not be properly representative).

We need the information on size of business and total number of employees because of the requirement on Government to monitor the impact of measures on small or medium enterprises; this is something that we had to cover in the Impact Assessment and that we need to verify through the trial.

The information on the nature of your operation allows us to assess whether the longer semi-trailers are likely to be used by a broad spread of operators.

The section about your preparation for LST Trial / operations gives us background information on the way in which participants are using their vehicles that will help us to assess whether or not the original research was correct in assuming that the introduction of these vehicles would not be likely to have implications for infrastructure.

The questions about your Non-LST fleet provides an initial benchmark information that we need in order to ensure that the comparisons with the standard articulated fleet established through the trial are robust. Again, we are asking for three years’ data to ensure we have a representative picture. Although this is not the only comparison being considered, it is a starting point.

#### Qualitative Survey File (QSF)

The QSF provides an opportunity for operators to convey the experience of operating the LSTs from the perspective of a range of staff and the business as a whole.

#### LST Data Submission File (DSF)

##### Aggregated Journey Log

**Job Code:** there is no obligation to enter anything here but it could be useful for you in cross-checking if there are any queries.

**Client Code:** providing this will allow the Department to get a clear picture of the type of operations where the longer semi-trailers are being used in practice. The Impact Assessment that was derived from the initial research and the consultation in 2011 contained a number of

assumptions on the type of operations – gathering this information will help us to review the original Impact Assessment and adjust it if necessary. In later years we may look at refining this to a set of generic client types from which you select.

**Date/Time:** self-explanatory – time is of specific interest to see the balance of peak/off-peak or day/night usage of the new trailers.

**Company trailer ID:** this means we can cross-reference all the information to the specific trailer; if there were to be a number of incidents, this would give us an indication of whether there was a specific design that was particularly vulnerable. Specifically, it links to the trailer VIN, via the information given in the Trailer Reference Information sheet.

**Journey leg details / Distance:** this also helps build up a picture of the manner in which these vehicles are operating, and provides data for the assessment of the increased efficiency that they allow.

**Incidents on leg:** this column just takes a straight 'yes' or 'no'; the actual reporting of incidents is done on the Incident Log (see below).

**Type of Goods:** this is also to help us verify the assumptions in the research and the Impact Assessment on the type of loads for which these vehicles are most likely to produce the anticipated benefits.

**Mode of appearance / Quantity of Units / Weight of goods carried / Estimated % of volume & % deck space) / Load limited by weight?:** this information will help us to quantify the benefits by giving us data from which we can assess the increase in tonnes per lorry mile. This in turn will give us a more representative view of the carbon reduction than a straight comparison of fuel use would do.

(Note: the trouble with just reporting on fuel consumption, without including load data, is that there could be any number of factors that affect this one way or another. For a start, the additional length of the trailer is likely to affect the fuel consumption so a straight comparison between a 13.6m trailer and a 15.65m trailer could be misleading.)

**Multi-Drop:** multi-drop journeys may treat runs with 5 or more drops as one data record (leg). For 1,2,3 or 4 drops, each part of the journey should be recorded as a separate Leg. This is the same principle as the DfT Continuing Survey of Road Goods Transport which will be familiar to most operators.

### Trailer Reference Information

Relates the usage of a trailer to its VIN and some basic design information.

Some of the design data would be included in the VSO data, but much of it is not, such as the body construction, presence of features such as refrigeration. (An important example, since chilled trailers necessarily have perhaps 30% empty volume above the goods to allow for circulation and this needs to be considered in volume utilisation data.

### Incident Log

**Trailer ID / Job code / Company incident ref / Date incident recorded and reported:** these columns will enable us to keep track of the circumstances of any incidents and cross-relate them to the vehicle.

**Date / Time / Location (by road) / Location (by description):** these will enable us to know what the driving environment was (for instance, trunk road at a time when there would be a steady traffic flow, built-up area in quiet hours).

**Road User Category of Injured Person / Level of Injury/ Damage to vehicle or load / Damage to property:** these will provide information on the degree of severity and the nature of any injuries. **Please note** that we are using STATS19 injury levels: these are explained on the next tab in the workbook. **Please also note** the more detailed lists of category of injured person. For the most part these should be reasonably self-explanatory, but just to clarify:

- The driver of the HGV counts as 'HGV occupant';

- 'Pedestrian' means a member of the general public who is not in/on another vehicle;
- 'Company staff' and 'Client staff' are staff members not in the vehicle at the time of the incident.
- **It is vital that we have information on all injuries, so you will see that you are asked to fill in a separate row for each person injured in any incident.**

**Vehicle location / Incident location etc:** these build up the picture of what happened and the extent to which the trailer length may or may not have been a factor.

**Additional details:** these allow you to enter a certain amount of additional relevant information. They will also allow you to enter 'near misses'; these could cover anything like having difficulty negotiating a roundabout, finding that the tail-swing narrowly misses parked vehicles, street furniture or buildings when turning corners, etc. The important thing is to record enough detail to describe the event and to include any details related to the trailer being an LST rather than a standard 13.6.

**We know there has been a certain amount of concern that if any of these vehicles is involved in a serious incident, the trial could be halted. While we cannot second-guess what Ministers may decide in any given set of circumstances, it's important to remember that the intention of the trial is to compare the performance of these longer semi-trailers against that of the existing fleet. We know that incidents will sometimes occur. Among other things, the trial needs to look for evidence of whether or not the longer semi-trailers are more susceptible to incidents than the existing fleet. We will only know this if the trial uncovers a trend that can be linked to the extra length.**

## A2 CIF (Company Information File) questions (v2-3)

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An outline of the CIF questions in use for every new entrant in to the trial and is collected only once.

### (1) COMPANY AND LST TRIAL INFORMATION

- 1-1 Organisation Information
- 1-2 Respondent Details
- 1-3 Business Scale at end of last 3 years. Can be a best estimate if exact values are not easily available. Can be end of calendar or financial year depending on your data.
- 1-4 What is the PRIMARY or LARGEST part of your operation?
- 1-5 What, if any, systems do you use to generate and manage key data?  
(As with all data, this will remain confidential. The purpose in asking is to allow us to see what the primary sources of data are in the trial) and to enable us to ensure we can keep all the main software systems providers informed about the data element of the trial so that they can support trial participants effectively).  
Select products/suppliers from a list given.
- 1-6 What special limits have you put on your LST operations (Tick as many as apply)
- 1-7 Actual or Estimated Date of LSTs entering service (to be removed from v-2-4 May 2014)

### (2) NON-LST SEMI-TRAILER FLEET INFORMATION

- 2-1 Fleet Size and Body Design Mix
  - 2-1-1 Non-LST Trailer Fleet Size
  - 2-1-2 Non-LST Trailer Fleet Basic Design
- 2-2 Fleet Utilisation Measures
  - 2-2-1 Non-LST Trailer Fleet Utilisation
  - 2-2-2 Trailer Availability. Number of days across all the operational fleet - estimated back in 2-1-1 as shown
  - 2-2-3 Proportion of Journeys/Legs where the available DECK SPACE filled is (list of bands):

- 2-2-4 Proportion of Journeys/Legs where the available VOLUME filled is (list of bands)
- 2-2-5 Proportion of Journeys/Legs where load was limited by weight:
- 2-2-6 Proportion of trips by JOURNEY TYPE ‘
- 2-2-6a If 'Other' is >10% please indicate journey type please describe usage
- 2-3 Goods Transported
  - Estimate of the actual average for your non-LST semi-trailer fleet for 2012 for
  - 2-3-1 Nature of Goods Transported
  - 2-3-1 MODE OF APPEARANCE of Goods Transported
- 2-4 Incidents Involving Non-LST Semi-Trailers
 

We are aware that different companies will hold differing levels of detail on incidents involving their regular fleet. In this section, apply common sense in terms of the materiality of the incidents and where appropriate, give estimates

  - 2-4-1 Incidents Involving Injury
  - 2-4-2 Known Injuries
  - 2-4-3 Accidents where Police Involved
  - 2-4-4 Accidents by location
  - 2-4-5 Damage to Other Vehicles & Property
  - 2-4-6 Damage to Your Vehicle (Ignore minor damage if in depot etc.)

### A3 QSF (Qualitative Survey File) questions (v2-3)

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This sheet differs from the others in three ways.

1. It can be filled in more than once in a single period – for example if the operator would like to submit a copy from each depot to reflect their differing experiences.
2. Not all the questions need to be answered every time it is completed.
3. The questions may change from time to time as the trial develops.

The questions shown here are those used in 2012-P2 and 2013-P1

#### 3-1 Did you encounter any issues or problems with incorporating the LSTs into your operation?

3-1a If 'Yes' to Q1, in which areas did you encounter problems (tick all that apply)?

During loading / During driving / Negotiating client depots / Other

3-1b: If 'Yes' to Q1, please describe the issues or problems you encountered:

#### 3-2 Did you undertake any special training of staff in advance of operating the LSTs?

3-2a If 'Yes' to Q2, which staff underwent training (tick all that apply)?

Loading/ depot staff / Drivers / Planners/ Managers / Other (please specify)

3-2b If 'Yes' to Q2, please briefly describe the training that was given to staff:

#### 3-3 Did you undertake any other special preparation in advance of operating the LSTs? (e.g. staff training, physical changes to loading areas or depots, changes to planning or operations processes etc.)

3-3a If 'Yes' to Q3, please describe the preparations you made

#### 3-4 Have you had any feedback (positive or negative) from any of the staff and/or other groups listed here on the introduction of the LSTs? (tick all that apply)

Loading/ depot staff / Drivers / Planners / Managers / Clients / General Public / Local Authorities or Politicians / Lobby Groups / Other (please specify)

3-4a If 'Yes' to Q4, please briefly summarise the feedback (positive or negative) you

received.

3-4b How would you summarise the feedback you have received (Across all groups together)?

**3-5 Have you chosen to operate the LSTs in a more restrictive way than your other semi-trailers?**

3-5a If 'Yes' to Q5 please describe any restrictions you imposed and the reasons for them:

**3-6 Overall, what is your view of the performance of the LSTs for your business?**

## **A4 Data Submission File (DSF) journey data fields (v2-3)**

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The tables overleaf give a more detailed description of each data field in the journey log.

This information will be of interest in any case where the operator is creating their own data gathering or collating tools, or more likely, in setting up a standard export or report from an existing IT system. In order to ensure the data created using these methods is 100% compatible with data from other operators, the format of key data fields is important.

The key examples are

- date and time fields need to be in Excel Date/Time format
- text fields need to be **Text** or **General**
- numeric fields need to be **Number** or **General**
- percentage fields need to be **Percent format** (which can be forced by simply including a % symbol after any number.

The second important area is where responses to the trial bespoke fields are being generated or derived from existing IT systems and the actual entry is being created automatically. These include Leg Type, Goods Type, MOA and Estimate Volume % or Deck Space % Utilised. Here it is vital that the text (or 'string') generated matches the standard values exactly.

**Existing users from periods prior to 2013-P1 need to note that the text descriptors (e.g. 0=EMPTY) have been changed (tidied up) and hence any embedded copies of the text lines in automated reports needs to be updated. We apologise for this change, but judged that we needed to make this adjustment before the numbers of trial participants increased further.**

### **Special category lists for LST trial in Trailer Reference and Incident Log Sheets**

Other specialised category lists are used in the DSF Trailer Reference Data and Incident Log sheets. However, they are not detailed here as it is expected that operators will simply fill in these data directly into a copy of the worksheet. If participants wish to generate this data by another means and hence required the detailed formats/options used, please contact Risk Solutions for information on how to unlock the file.

**Table 21: Journey Log Data Fields and Validation/Formatting Requirement**

Col	Title	Description ( <i>Purpose</i> )	Validation / Format
A	Row	Log row number (only required in log file)	
B	Company (& Depot)	Hidden and automatically generated in Log file – revealed in Data Submission File (DSF)	Text with '>>' delimiter i.e. <b>Company&gt;&gt;Depot</b>
C	Data Code Stamp	Hidden and automatically generated in Log file – revealed in DSF A coded reference to the originating log file it is actually the exact Excel DATE/Time when the file was last saved.	Excel 'General' – numeric If not from LOG File leave blank or insert own ref.
D	Job Code (Optional)	Company unique reference for the leg/journey. One code may apply to several consecutive journey legs.	Text Company's own format.
E	Client(Optional)	Name or reference to client for whom the goods are being carried	Text
F	Date	Date of journey START	Date dd-mmm-yy
G	Day of the Week	Three letter format (Mon, Tue, Wed etc.) of journey START <i>Provides a cross-check on dates in data</i>	Text – 3 Char ddd format (Mon, Tue etc.)
H	Company Trailer ID	Company normal trailer ID (T146, ET4076 etc.). <i>Allows easy reference to trailer - VIN/TIN matching in DSF sheet</i>	Text – as used by company
<b>JOURNEY INFORMATION FOR EVERY POINT TO POINT LEG.</b>			
I	Origin Location	Town (and Postcode ) of Origin	None – free text
J	Depart	Time of departure from origin 24hr Format hh:mm	Automatic – time
K	Arrive	Time of arrival at destination Format hh:mm	Automatic – time
L	Dest'n Location	Town (and postcode) of Destination	None – free text
M	Journey Leg Type	Special set of journey descriptions, based on the likely market uses for LSTs from the trial feasibility and impact report	Text from Valid Options as in Table 2
N	Distance (mile) (Optional)	Distance travelled in miles if that is your raw data format. If you enter data here it will be converted to km in column O.	Number – Zero Decimal Places (can be integer)
O	Distance (km)	Distance travelled in km. If you enter data here it will override (permanently) the conversion from miles of data in column N. <b>This is the only distance unit used in summary and analysis</b>	Number – Zero Decimal Places (can be integer)
P	Incidents	If any reportable incident occurs during the journey then record YES or company assigned incident references <i>Allows later matching of incident data to journey information</i>	Text Default / Empty is <b>blank</b> (not zero)
<b>CARGO AND LOADING INFORMATION</b>			
Q	Type of Goods	Not the standard DfT commodity list – a special shortened set of options for this trial	Text from Valid Options as in Table 2
R	MOA	Mode of Appearance - the way the goods are present and loaded	
S	MOA Quantity (Optional)	Number of units of the Mode (Pallets etc). For Bulk goods or Livestock use 1. For Empties, use 0 (Automated in LOG File)	Automatic – Zero or Positive whole number.
T	Goods Weight	The weight of goods loaded in kg. (i.e. If from weighbridge data, need to remove weight of tractor unit and trailer)	Kg Numeric – no decimals
U	(Estimated) Volume Utilised	From data, central estimate (based on knowledge of load and trailer, or driver best estimate – selected form bands OR (from v2-3 onwards) as actual % values	List of bands (overleaf) or Excel % format
V	(Estimate) Deck Space Utilised	From data (e.g. pallet count if all one size), central estimate or driver best estimate – selected from bands (Empty, 0-25% etc). OR (from v2-3 onwards) as actual % values	List of bands (overleaf) or Excel % format
W	Load Limited By Wt	Was trailer less than 100% loaded due to 44t or trailer load limit	Text - 'Yes' or 'No'
X	Multi-Stop	Multi-drop/pickup journeys with 5 or more stops, can be recorded on a single row. Simply enter number of drop/pickup stops here.	Integer. Default=1 - Any value >=5 then valid.

### Special Trial 'Valid Options' Lists

Some of the data to be collected for the trial is likely to be part of the normal information gathered by companies and is similar to that required by DfT when operators contribute to the Continuing Survey of Road Goods Transport. However, this trial differs from regular data gathering because it needs to:

- a. Gather data about TRAILERS, rather than whole vehicles or tractor units
- b. Gather data in order to verify specific claims / forecasts that have been made in regard to the costs and benefits of permitting LSTs in the UK

Four of the data fields requested therefore have bespoke lists of response options shown in Table 22. Validation in the log will ensure only these are used.

#### Note to IT/Data Analysts Creating Data from Corporate Systems

For these fields the LOG file requires the full option text. However, the DATA SUBMISSION FILE will accept just the number of the option to generate the results in the Summary worksheet. (I.e. Journey Type '4' DC to DC' can be coded simply as '4', 90=76-90%' as '90'). Hence when generating this bespoke data from existing systems or to insert into such data, only the numeric code from the option need be created if this is easier.

**Table 22: Valid options for special trial data fields**

JOURNEY LEG TYPE (Column M)	TYPE OF GOODS (Column Q)
1) EMPTY FROM DEPOT TO JOB 2) EMPTY BETWEEN JOBS 3) SUPPLIER TO DIST CENTRE 4) DC TO DC 5) To/from RETAIL SITE 6) To/from INDUSTRIAL SITE 7) PALLETISED TRUNKING 8) EMPTY BACK TO DEPOT 9) OTHER LEG TYPE	0) NO CARGO 1) EMPTIES / WASTE PACKING 2) FMCG (MIXED PRODUCTS) 3) FMCG (SINGLE PRODUCT) 4) RAW MATERIAL/SUPPLIES 5) INDUSTRIAL PRODUCTS 6) BIOMASS / FUEL 7) MAIL / PARCELS 8) OTHER - RETAIL 9) OTHER - NON-RETAIL 10) PALLETS - MIXED/UNKNOWN
MODE OF APPEARANCE (Column R)	VOLUME % (Column U) & DECK % (Column V)
0) NONE 1) EMPTIES / WASTE PACKING 2) STD PALLETS 3) STD ROLLER CAGES 4) OTHER PALLETS / CAGES 5) PRE-SLUNG GOODS 6) LIVESTOCK 7) LOOSE / BULK 8) MIXED M.O.A 9) INTERMODAL UNIT / ISO	0=EMPTY 25=BELOW 25% 50=26-50% 75=51-75% 90=76-90% 100=91%- FULL

## A5 Trailer reference information

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- 5-1 Number of Trailers
- 5-2 Changes in Trailer Status (during survey period)  
No Change / New Entry / Sold / Scrapped / Out of Service  
Ownership (New in 2014)
- 5-3 Basic Body Construction  
FLATBED  
BOX  
CURTAIN SIDED  
CURTAIN WITH RETENTION  
SWAP-BODY  
CONTAINER CARRIER  
TANKER / BULK  
OTHER
- 5-4a Other Features  
Refrigerated / Top / Roof Loading / Tail Lift / Self-Loading (Montrecon, Crane, etc.) /  
Walking Floor / Similar / Additional safety features (sensors, cameras, driver aids)
- 5-4b If Additional Safety Features are present on some trailers, please give an indication of  
the nature of the features and number of trailers fitted.
- 5-5 Decks (Numbers of trailers with each arrangement)  
Single / Fixed Dual – Full / Fixed Dual – Partial / Moving Dual – Full / Moving Dual -  
Partial
- 5-6 Axles Overall Arrangement (Number of trailers with each configuration)  
All Fixed / 1 or 2 Self-Steer / 1 or 2 Command Steer (Passive) / ACTIVE (Any more  
complex)
- 5-7 Axle Structures (Number of trailers with each structure)  
Standard / Wheel Box
- 5-8 Tyres Fitted  
Super Single (All Axles) / Double (All Axles) / Single (All Axles) / Mixed
- 5-9 Individual Axle Load and Lift Design – for each axle:
  - a) Design Max Load: Lowest cited [kg]
  - b) Design Max Load: Highest cited [kg]
  - c) Lift / Retractable:

## A6 Incident log

The incident log fields are based on a selection of the fields used in the national STATS19 database which is completed when the police attend a road incident. Some fields have then been expanded to allow recording of serious incidents on private property, such as in a depot, which would not fit into the normal STATS19 framework.

The fields are listed below. In most cases the user selects their response from a list given in the sheet and based on the STATS19 response options.

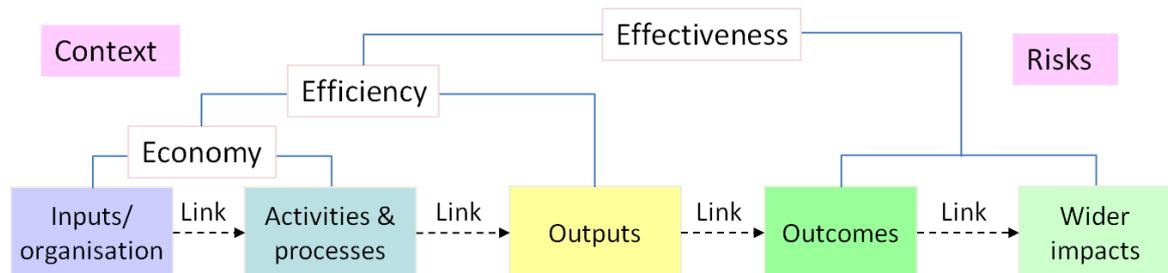
- Date and time of Incident
- Location (Road or nearest road)
- Location Description
- Person Number (if multiple injuries use one row per person)
- STATS19 Injury Level
- Damage to Vehicle and /or Load
- Damage to Property
- Vehicle manoeuvre at time of incident
- Vehicle location at time of incident
- Incident Location - relative to nearest junction
- Any vehicle skidding or overturning?
- Did vehicle hit object on road?
- Did vehicle hit another vehicle?
- Did vehicle leave carriageway?
- First object hit by vehicle off carriageway
- First point of impact on vehicle
- Comments on incidents and near misses (in addition to any comment in Part 3 of the survey)
- [NEW DURING 2013]  
Operator assessment (judgement) of whether the incident was affected by the design being an LST. Judgements made according to a defined scale as shown below.

LST Related?	Judgement Guidance
<b>YES</b>	The fact that the trailer was an LST was the major contributor to either the fact the event occurred or the severity of the outcome.
<b>YES - PARTLY</b>	The fact that the trailer was an LST was only one of the contributors to the event occurring or the severity of the outcome.
<b>MAYBE</b>	It is possible that the fact the trailer was an LST was a factor, but not certain.
<b>NO</b>	The fact the trailer was an LST was not a factor in the event.
<b>UNCLEAR</b>	The information about the event, or the circumstances mean no judgement can be made.  (For example, damage to the trailer discovered on depot 'walk round' – no information of how and when it was sustained)

## APPENDIX B: LST TRIAL EVALUATION LOGIC MODEL

### HMT evaluation principles and the use of logic models

1. The HM Treasury Magenta Book ('Guidance for Evaluation')<sup>31</sup> is " . . . the recommended central government guidance on evaluation that sets out the best practice for departments to follow . . . for all policy makers and analysts".
2. A central element of the guidance in the Magenta Book is the structuring of the policy / initiative objectives and intended outcomes into a 'logic model' as illustrated in Figure 32.



**Figure 32: Generic evaluation Programme Logic Model (PLM)**

(Copy of Figure 1 in main report body)

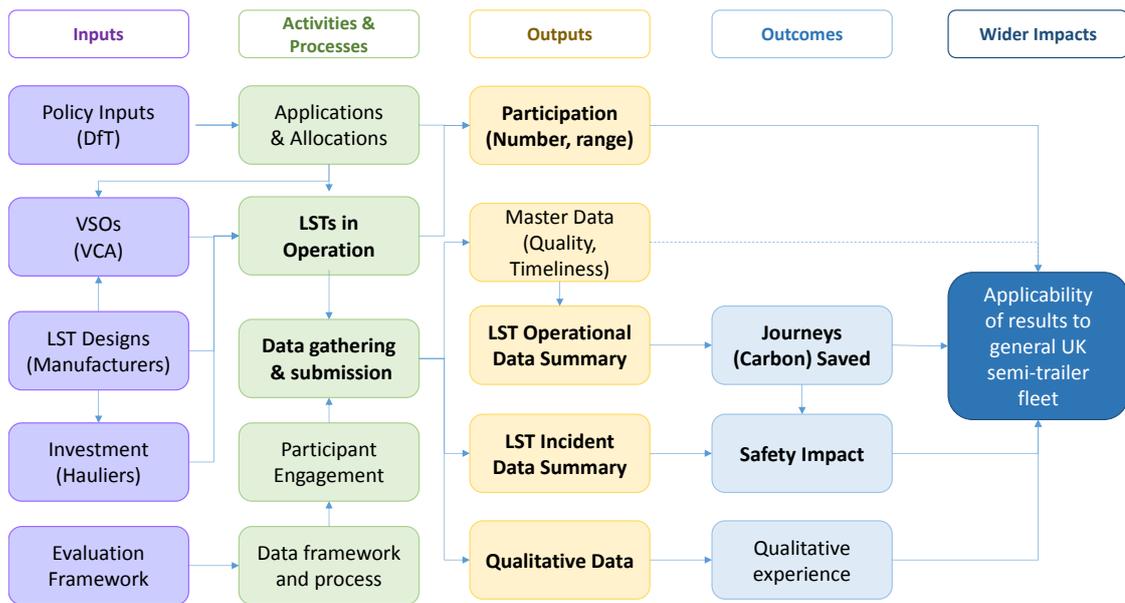
3. The PLM provides a structure for evidence gathering, collation and analysis. It maps, in broad terms, how the inputs, key activities and outputs are used to deliver the desired outcomes of the trial (the delivery chain).
4. The main body of this report has been structured around the PLM elements, which are:
  - **Inputs** include items such as financial inputs, people, data and infrastructure, and organisational structures necessary to allow the trial to proceed. (Section 2)
  - **Activities and processes** use inputs and result in outputs. They are valuable only to the extent that they produce useful outputs. (Section 3)
  - **Outputs** are of value to the extent they are necessary for beneficial outcomes to be achieved or in this case, include the data to demonstrate that this is so. (Section 4)
  - **Outcomes** are the direct end products, in this case being responses to the sorts of questions noted in 1.11 and demonstrated by analysis of the trial outputs. (Sections 5 and 6)
  - **Wider impacts** include indirect impact on wider society or stakeholders and unanticipated impacts, good or bad. (Section 7)
5. Each element of the PLM must be set within the delivery **context** and an understanding of the **risks** to delivery, which will be covered in the text for each section.
6. The **Links** describe how each element is related to the next – for example how an activity leads to the required output. Links can flow 'backwards' on the PLM.

### Initial Logic model for the LST trial evaluation

7. In the case of this work, the focus of the benefits of operating LSTs in terms of efficiency, emissions and safety outcomes, based on the sample of data being produced by the trial. The evaluation must also address the extent to which the trial itself has developed, since this affects the robustness, or otherwise, of the data it has produced.

<sup>31</sup> 'The Magenta Book: Guidance for Evaluation' HM Treasury April 2011 (available from .GOV) See also 'Logic Mapping: hints and tips for better transport evaluations' Tavistock Institute for DfT October 2010

8. The PLM for the LST trial can be represented as shown in Figure 33



**Figure 33: LST Trial Evaluation Programme Logic Model (v1)**

9. Some elements of the model and the progress being made on them can be expressed as a metric (e.g. How many operators have been signed up? How many LSTs are operating compared to the planned total?). Others may only be expressed qualitatively (e.g. Has the trial attracted a range of operator types and sizes as was hoped?) as no numeric or quantified target was set at the start of the trial.
10. Where metrics were explicit in the original formation of the trial (e.g. 1,800 LSTs on the road), they will have been cited in this report and progress against them evaluated as the trial continues.
11. Where no numeric metric can be established, then progress will be reported qualitatively.
12. We expect to develop the logic model further and provide a related summary of metrics in future reports.

## APPENDIX C: SUBMISSION TIMING AND MISSING/LATE DATA PROCESS

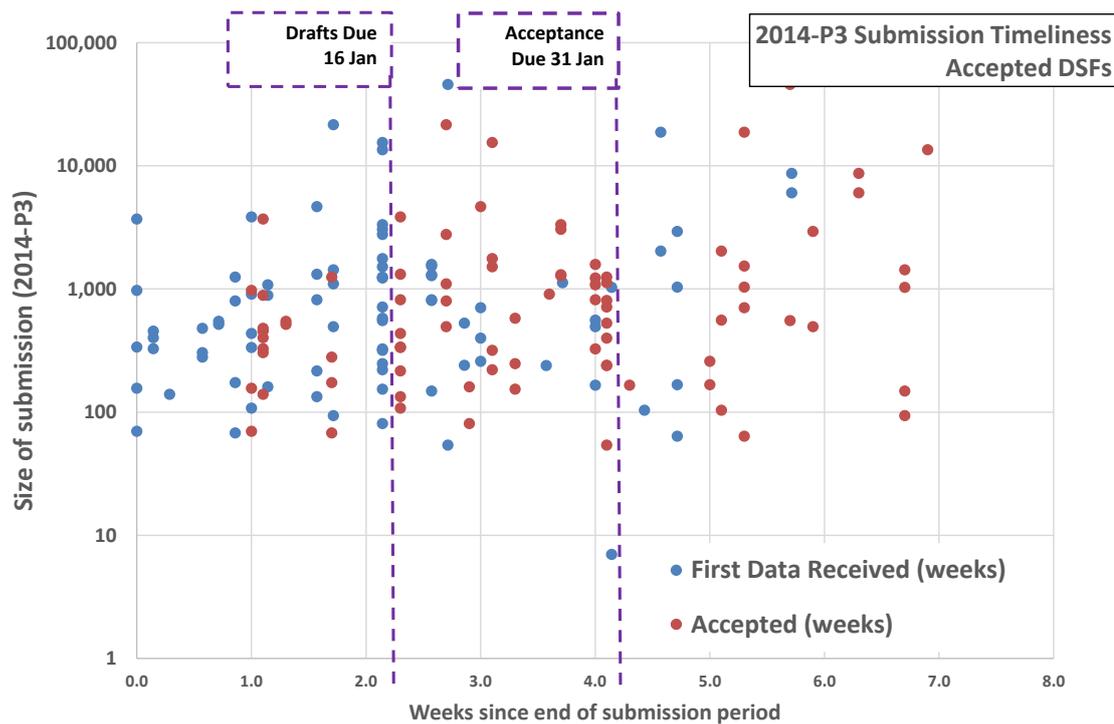
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### Submission timing and deadlines

1. Operators are required to submit draft DSF by the Friday of the second full week after the close of the submission period. Exact dates are publicised widely and repeatedly to the participants.
2. Where files are returned to operators for editing or with questions, our stated aim is to reach a stage where all such revisions are completed by the end of the calendar month following the close of the submission period.
3. We acknowledge that until all the final participants are enrolled on the trial and have refined their data collection systems, these deadlines may not be met by everyone, but they remain the aspiration. They are also the trigger for reviews of missing / late data.
4. Most operators have submitted data in a timely manner. However, in the early reporting periods, a significant number of submissions were arriving very close to the end of month deadline or in the two weeks after then. Once comments were sent back and the data finalised, the process of completing the dataset from all operators was spread out over six weeks or more. This was very inefficient and delayed the provision of period data to DfT.
5. During 2013, a revised process within submission months was adopted. Operators were asked to send in their draft data by the end of the second week of the month and to finalise their data in response to any comments from Risk Solutions by the end of a further two weeks. In last year's annual report we presented data showing that this new emphasis had resulted in some improvement, in particular in reducing the number of excessively late submissions. We also noted that there was no observable pattern of new entrants submitting data later than existing participants.

### Monitoring submission timeliness

6. During 2014, DfT and Risk Solutions continued to refine the process and we are now tracking two dates for each operator to monitor timeliness of submission:
  - First Data Received
  - DSF Accepted
7. Figure 34 shows the outcome for 2014-P3. The vertical axis shows the number of journey legs in their data file as a measure of the size of their LST fleet and the work involved in collating their data. The colour of each data point indicates whether it represents First Data Received or DSF Accepted.
8. Throughout 2014 we have seen a similar pattern in each period, with around 20% of operators failing to reach an 'Accepted' state until two to three weeks after the target deadline. As the figure shows, this does not appear to be a matter of the size of their submission. Our conversations and email communications with these 'late' cases continue to point to one or more of the following factors leading to late submission:
  - Change of staff involved, often exacerbated by poor handover (we have also seen very good handovers) – including changes in the staff who collect data in depots.
  - Continued failure to establish a process that gathers and collates the data on a weekly or monthly basis, resulting in problems because collation begins just before (or after) the due date
  - Failure to record the due dates and plan for submission.



Source: LST trial management data

**Figure 34: 2014-P3 DSF submission timeliness**

### Missing/late data process

9. Since mid-2013, we have made it clear to operators that while Risk Solutions will seek to assist operators with their data processes in whatever way we can, there is a fundamental expectation that as they gain experience in the operation of the trailers and the data gathering process, the level of support needed will reduce. It follows from this that where an operator submits data late, fails to submit data, or submits poor quality data, in more than data period, it must be clear what action follows. This is necessary both to ensure that a recovery plan is put in place but also to demonstrate fairness to other operators, given that all have signed the same undertaking, which includes the requirement to submit good quality data in a timely manner.
10. As reported in 2013, DfT and Risk Solutions agreed a formal escalation process for missing and late data cases.
11. Where an operator submits data late by only a few days or provides a reason in advance explaining why there may be a delay, no action is taken and DfT is not informed.
12. Beyond this, Risk Solutions now draws up a 'Missing or Late' list showing those submissions that are still not finalised at the point the data period summary is sent to DfT, usually around two to three weeks after the period end. The list is sent with the report. DfT contacts operators on the list and asks them to respond regarding when they plan to recover the situation. The 'Missing or Late' list is updated periodically as the picture changes (i.e. as operators respond).
13. Risk Solutions classifies each operator shown on the list into one of five categories, each of which has an associated action outcome, although the specific steps for each case are discussed with DfT rather than following this in detail. The categories and action outcomes are shown in Figure 35

Category	Category Description and Action
1	Missing / late data for 2 or more consecutive periods without communication of reasons. <b>Risk Solutions cease contact, DfT begin escalation to formal action to seek a resolution. Ultimate action would be to remove the operator's VSO.</b>
2	Data missing, late or not finalised for 2 or more periods. Operator still in communication with Risk Solutions but without results. <b>Risk Solutions continue contact, DfT call / written contact.</b>
3	Data missing / late / not finalised but where data is known to exist and communication with operator suggests a reasonable chance of a resolution in a short period of time.
4	Data missing / late for this or earlier periods, but genuine reasons known to exist, communication in progress and action in progress
5	Data for period not technically complete but awaiting a minor clarification.

**Figure 35: Missing/late data escalation categories and actions**

14. At the end of 2014, four operators (out of 123 expected submissions) reached Category 1, compared with one out of 75 for the same period in 2013. Closer examination of the cases shows that two were significant failures that required substantial further effort from DfT and Risk Solutions before they were resolved, one being a company that was also late the previous period. The other two were found to be due to key staff leaving the company months earlier without any obvious effort to pass the process on to their successors.
15. In these cases senior managers took action to reassign priorities for the operational staff or changed the processes involved. In other cases, appearing on the list has empowered operational staff charged with data collection to make the case for a change in priorities or process to ensure the task is completed in a timely manner.
16. The response of most operators, even those finding themselves on the list, has been positive. So far, the approach appears to strike the right balance between emphasising the importance of the undertaking to provide the data as a condition of participating in the trial, and the common interest of ensuring that a sustainable data process is established in the relevant company.
17. Following up missing and late cases takes a disproportionate amount of support time from DfT and Risk Solutions, with some cases absorbing 5 to 10 hours of effort, compared with an average of 1 to 1.5 hours for the majority of operators.
18. Risk Solutions and DfT will continue to monitor the timeliness of submissions and seek further opportunities to guide operators in setting up sustainable and efficient processes for collating data, as indeed the majority are doing. We will also consider whether any further measures need to be taken when operators fail to demonstrate such a process over an extended period.

## APPENDIX D: INCIDENT ANALYSIS – SUPPORTING INFORMATION

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### D1: Fatalities and Weighted Injuries (FWI)

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1. The analysis in chapter 4 includes reference to the measure 'Fatalities and Weighted Injuries'. Although this measure is not one cited in published DfT road safety statistics, it is used in some other GB transport risk analysis, notably in the rail sector and some other industries. The fact that FWI is not cited in GB road safety statistics does not preclude its use in analysis, since the concept of FWI is implicit in the casualty severity ratings in STATS19 and the value of FWI is derived directly and transparently from the casualty severity data.

#### What is FWI

2. Some GB road safety analyses use the measure KSI - 'Killed and Seriously Injured'.
3. KSI is a simple total of the number of casualties in the Fatal and Serious STATS19 categories - in this measure a broken arm 'counts' for the same as a fatality.
4. FWI differs in two ways from KSI:
  - FWI takes Slight injuries into account
  - FWI is weighted measure in which different severities of injury are assigned a proportionate 'value' to the total
$$\text{FWI for a collision} = \text{Fatal} + (n \times \text{Serious}) + (m \times \text{Slight})$$

#### Who is using FWI in evaluation?

5. Use of FWI rather than KSI as a more useful measure has been growing in the safety analysis domain for some years now, for reasons including:
6. FWI has been used by DfT for some time in relation to the Rail Sector and by HSE in relation to hazardous industries
7. The Highways Agency is already moving to use of this measure in a number of their safety analysis activities, influenced by what they have seen in the rail sector. They use it alongside their more traditional monitoring of numbers of collisions and KSI

#### What factors are used in FWI?

8. In the Rail Sector, RSSB (and HSE) use the following values,
 
$$\text{FWI for a collision} = \text{Fatal} + (0.1 \times \text{Serious}) + (0.05 \times \text{Slight})$$
 based on their work published in "Taking Safe Decisions" (2009)<sup>32</sup>. The values, when originally agreed, were pegged to the ratio of value of preventing a casualty which were in that approximate proportions. These values are also cited in the DfT WebTAG data book table 4.1.5<sup>33</sup>.
9. The HA risk model now uses an FWI measure, but in view of the differences between the meaning of the slight injury category (Rail includes verbal abuse) the HA have adopted a value of  $m=0.01$ . i.e.
 
$$\text{FWI for a collision} = \text{Fatal} + (0.1 \times \text{Serious}) + (0.01 \times \text{Slight})$$

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<sup>32</sup> <http://www.rssb.co.uk/Library/risk-analysis-and-safetyreporting/Taking%20Safe%20Decisions%20-%20combined.pdf>

<sup>33</sup> <https://www.gov.uk/government/publications/webtag-tag-data-book>

10. This 1 : to : 10 : to : 100 set of ratios is broadly consistent with the value of preventing a casualty on the roads, cited in the WebTAG data book table 4.1.1.

### Why introduce FWI in this evaluation?

11. The reasons for introducing FWI in analysis are:
  - As safety has improved over time (due to better vehicles, road safety awareness and improvements to the built asset) the sparseness of the KSI data make it a rather blunt a measure for many analyses.
  - FWI introduces a proportionate treatment of difference injury severity levels - which is sensible for impact assessment (whether for commercial or policy appraisals)
  - FWI increases the usable population of data by including the slights.
  - FWI is easily calculated from the existing historic data without further data gathering
  - FWI provides a transparent and direct link to any economic assessment of safety gains, through the "Value of prevention per casualty" (VpC) figures published in WebTAG where the values for preventing serious and slight injuries are given as (roughly) 0.1 and 0.01 of the value for preventing a fatality (VpF).
12. In short, for the evaluation of the safety aspect of the LST trial, we believe using the FWI measure will, once we have more data, provide a more refined basis for analysis that makes use of the larger population of slight injuries.

## D2: Statistical analysis of incidents involving LSTs compared to GB-registered general articulated HGVs

### D2-1: Comparison based on ALL LST incidents

#### COMPARISON OF LST Collision AND CASUALTY (FWI) RATES TO ALL GB-REGISTERED ARTICULATED HGVs

Based on 3 year average figures

Test Name	Incidents Data	Exposure Data	LST Event Count	LST Billion Veh Km	UK Artic Event Count 3yr avg '12-14	UK Artic Billion Veh km 3yr avg '12-14	Difference significant (5%) if <0.05 Test Outcome
		Data Source	LST Trial Data	LST Trial Data	STATS19	DfT Traffic Stats Table TRA3105	
<b>TEST 1: CONSERVATIVE COMPARISON : ALL INJURY INCIDENTS INVOLVING LSTs (INCLUDING PRIVATE LAND)</b>							
<b>1A RT Collisions: Conservative</b>	LST - ALL injury Incidents (inc private land)	All LST Km	10	0.108	2,261	13.3	Poisson Test for Statistical Significance 0.0516 per Billion veh km
	UK Artics - ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All Articulated - All Road Types	<b>LST Rate</b>	92.6	<b>UK Artic Rate</b>	170.0	
			<b>Ratio of LST to UK Artic Rate</b>		<b>54%</b>	Difference in rates not significant at 5% level	
<b>1B Casualties: Conservative</b>	LST - Number of Casualties in these collisions (inc private land)	All LST Km	10	0.108	3,209	13.3	0.001685 per Billion veh km
	UK Artics - Casualties in ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All Articulated - All Road Types	<b>LST Rate</b>	92.6	<b>UK Artic Rate</b>	241.3	
			<b>Ratio of LST to UK Artic Rate</b>		<b>38%</b>	Statistically significant at 5% level	
<b>1C FWI: Conservative</b>	LST - FWI for ALL injury Incidents (inc private land)	All LST Km	0.37	0.108	182	13.3	0.3629 per Billion veh km
	UK Artics - FWI for ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All Articulated - All Road Types	<b>LST Rate</b>	3.426	<b>UK Artic Rate</b>	13.7	
			<b>Ratio of LST to UK Artic Rate</b>		<b>25%</b>	Difference in rates not significant at 5% level	

**Statistical Significance Test:**

The two populations of incidents are assumed to be Poisson distributed and a Chi-squared test was applied to the difference in the mean rates for the two populations (events per million vehicle km). Test results <0.05 confirm that there is less than a 5% chance that the difference in the two mean rates is due to random chance

## D2-2: Comparison based on LST incidents on Public Roads\*

\* Or publically accessible areas such as motorway services or retail sites

### COMPARISON OF LST Collision AND CASUALTY (FWI) RATES TO ALL GB-REGISTERED ARTICULATED HGVs

Based on 3 year average figures

Test Name	Incidents Data	Exposure Data	LST Event Count	LST Billion Veh Km	UK Artic Event Count 3yr avg '12-14	UK Artic Billion Veh km 3yr avg '12-14	Difference significant (5%) if <0.05 Test Outcome	
		Data Source	LST Trial Data	LST Trial Data	STATS19	DfT Traffic Stats Table TRA3105		
<b>TEST 2: REALISTIC COMPARISON: ALL INJURY INCIDENTS ON THE ROAD/IN PUBLIC PLACE INVOLVING LSTs</b>								
2A	<b>Collisions: Most Realistic</b>	LST - ALL injury Incidents (inc private land) UK Artics - ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All Articulated - All Road Types	7	0.108	2,261	13.3	<b>0.0081</b>
				<b>LST Rate</b>	64.8	<b>UK Artic Rate</b>	170.0	
				<b>Ratio of LST to UK Artic Rate</b>	<b>38%</b>	Statistically significant at 5% level		
2B	<b>Casualties: Most Realistic</b>	LST - Number of Casualties in these collisions (inc private land) UK Artics - Casualties in ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All LST Km All Articulated - All Road Types	7	0.108	3,209	13.3	<b>0.0002</b>
				<b>LST Rate</b>	64.8	<b>UK Artic Rate</b>	241.3	
				<b>Ratio of LST to UK Artic Rate</b>	<b>27%</b>	Statistically significant at 5% level		
2C	<b>FWI: Most Realistic</b>	LST - FWI for ALL injury Incidents (inc private land) UK Artics - FWI for ALL Injury Incidents - 3yr avg 2010-2012 (to match the km data)	All LST Km All Articulated - All Road Types	0.34	0.108	182	13.3	<b>0.3500</b>
				<b>LST Rate</b>	3.1481	<b>UK Artic Rate</b>	13.7	
				<b>Ratio of LST to UK Artic Rate</b>	<b>23%</b>	Difference in rates not significant at 5% level		

#### Statistical Significance Test:

The two populations of incidents are assumed to be Poisson distributed and a Chi-squared test was applied to the difference in the mean rates for the two populations (events per million vehicle km). Test results <0.05 confirm that there is less than a 5% chance that the difference in the two mean rates is due to random chance

## APPENDIX E: UTILISATION ANALYSIS CALCULATION ASSUMPTIONS

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1. This analysis was first presented in the 2013 Annual Report, and led to some recommendations for refinements to the data reporting structure. These changes were applied by operators in the latter half of 2014.
2. In the 2013 report we included an extensive exploration of the loading levels split by leg type, MOA and other factors which were produced as background but did not lead directly to any substantial conclusions. The exploration was necessary and useful in the development of the process, but we judged that it was not necessary or informative to replicate that detail in this year's report. The data are available if required by DfT or Risk Solutions for any future analysis.

### Environmental impact

3. One of the purposes of the LST trial is to understand the environmental impact of the longer semi-trailers (LSTs). While there are likely to be some whole-lifecycle impacts related to the slightly larger size (and hence greater material consumption) of the longer trailers, and their slightly increased weight due to additional steering axles, we are not in a position to estimate these from the data captured in the trial itself.
4. The original impact assessment estimated that the largest component of environmental impact would come from savings in carbon dioxide and other harmful emissions resulting from reductions in journeys (and hence vehicle kilometres) due to longer trailers being operated full to capacity<sup>34</sup>. It also estimated a small increase in tailpipe emissions (up to a maximum of 1.8%) due to a small increase in the aerodynamic drag from the vehicle's longer length and to a small increase in the un-laden weight of the vehicle. This was based on tractor units complying with Euro V regulations. While tractor units complying with Euro VI have recently entered the market, these represent a small part of the current tractor fleet and consequently have little impact to date on the overall energy consumption associated with pulling LSTs. As the trial progresses, the impact of an increasing number of EURO VI tractors on emissions may become more significant and is entirely separate from any impact arising from the increased capacity or additional fuel use arising from the trailer design.
5. The trial is not capturing fuel consumption directly, nor is it possible to make a comprehensive estimate of the emissions of environmental pollutants. However we can estimate the reduction in the number of journeys, and hence vehicle kilometres, as a result of the operation of fully laden longer semi-trailers, as a proxy for the reduction in direct environmental impact of their operation.
6. We could apply a simple factor to estimate the carbon dioxide or fuel consumption changes, however these are dependent on a range of factors that are not captured in the survey data, such as vehicle speed, loading, emissions compliance level (EURO IV, V, VI etc.) and so on. Such an estimate would be one step further removed from the data actually captured during the trial, so we have chosen not to provide it at this stage.
7. We have used the 1.8% estimate of tailpipe emissions increases identified in the original impact assessment to estimate the increased direct environmental impacts of the LSTs, using 1.8% of the total vehicle-kilometres operated by all LSTs as a proxy for this increased impact. We consider this estimate to be reasonable on the basis of present knowledge, although a separate study of the actual impacts of LSTs on tractor unit fuel consumption would need to be carried out to investigate this more robustly.<sup>35</sup>

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<sup>34</sup> Longer Semi-trailer Feasibility Study and Impact Assessment Final Summary Report, Department for Transport, December 2010

<sup>35</sup> The LST trial does not capture any data on actual fuel consumption as this would be very difficult to do (fuel use is associated with tractor units rather than trailers) and there are a large number of confounding factors such as loading and traffic conditions which would prevent comparisons from being meaningful. To investigate the actual impact of LSTs on fuel consumption in operation a specific controlled trial would need to be set up, comparing identical tractor units pulling longer and standard semi-trailers over a defined route in the same traffic conditions (i.e. no more than 1 mile apart), capturing fuel consumption via

## Loading levels

8. There are two main categories of semi-trailer operated in the trial, trailers up to 14.6m in length and trailers up to 15.65m in length. Of the trailers put into operation during the trial to date 84% have been 15.65m length, an increase from 79% at the end of 2013.
9. In analysing utilisation, it is important to take into account how 'mode of appearance' affects the actual additional load that is possible, rather than simply calculating on the basis of the available deck space.
10. The 14.6m trailers can carry one additional row of 2 standard pallets, or three standard FMCG cages, while the 15.65m trailers can carry an additional two rows of standard pallets or an extra nine standard FMCG cages over and above the standard 13.6m semi-trailer<sup>36</sup>.
11. We have therefore assumed that a fully laden 14.6m semi-trailer would on average carry a maximum of 7% more goods, and a 15.65m semi-trailer a maximum of 15% more goods except where the MOA is standard cages, where the theoretical maximum additional load is 20%.
12. The more generous assumption for standard cages is considered to be reasonable since it is clear that the gain is significantly different for these two standardised modes of appearance. This arises because the maximum permitted LST length of 15.65m was not selected to optimise the loading of standard carrying units, but simply to fit inside the existing UK maximum vehicle length, defined by an 18.65m drawbar combination. The result is that on a 15.65m trailer with the deck loaded fully with standard pallets, there is a small section of deck which is not used. In contrast, standard cages happen to pack more exactly into the additional 2.05m permitted on the trial than do standard pallets and hence the actual gain in real operations, rather than just measured by deck space, is greater for cages than for pallets.
13. Goods loaded in other MOA may also pack such that the assumption for standard pallets is conservative. Bulk and other modes of appearance would have slightly different mechanisms for filling the additional available space anyway and there are also cases of mixed MOA. For all these cases we have currently applied the factors of 7% and 15% for 14.6 and 15.65m trailers respectively.
14. In the data collected during the trial there are several measurements of how laden each trailer-leg is. We collect data on:
  - percentage of the deck that is covered by goods (deck %),
  - percentage of the volume of the trailer that is filled (volume %),
  - quantity (units) of the goods carried, dependent on mode of appearance, and
  - weight of goods carried.
15. The number of legs that are reported where the load has been limited by weight is 3.1% of the total (2.5% at the end of 2013) – indicating that the vast majority of goods being carried in the longer semi-trailers is predominantly higher volume, lower density. For the purposes of estimating vehicle kilometre (vkm) savings here, we have chosen to use the deck % measure of how full the trailers are. We plan to widen the analysis to look at volume fill issues in a future report.
16. Using this logic, we assume that on average each fully loaded longer trailer is effectively saving a proportion of an additional trip that a standard 13.6m trailer would have had to make to deliver the same quantity of goods.
17. The deck % data is captured either in bands or in actual figures (where available). For the purposes of this analysis we have assumed that the band 91-100% full is typically loaded to the median point, 95.5% full – the load carried by a longer semi-trailer loaded to this level could not have been accommodated in a smaller trailer.

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telematics. To date such a controlled trial has not been conducted, although it has been discussed with a small group of trial participants.

<sup>36</sup> A standard 13.6m semi-trailer carries 26 rows of standard pallets or 45 standard FMCG cages. The additional quantities noted here are a general case. In some designs, the additional load is further restricted by the door pillars at the back of the trailer and the final row of goods is limited to 2 cages instead of 3.

18. Where deck utilisation has been expressed using the bands rather than actual percentages, an analysis of the use of the new bands by operators has been used to determine how their historic 'old band' data is converted to the new values.
19. In the 2013 analysis, a simple definition of 'Fully Loaded Legs' was applied to all trailers. Any legs with goods filling trailers around the 90% level were treated as having the potential to be accommodated in a standard trailer, so no saving would be accrued at such a level.
20. In 2014, we have refined the analysis so that the definition of Fully Loaded Legs, where the load could not have been carried on a 13.6m, trailer, has been adjusted to reflect the difference between 14.6m and 15.65 trailers
21. The assumptions are now:
  - Longer trailers are fully loaded where the deck load is more than could be accommodated by a 13.6m trailer so:
    - 14.6m trailers are fully loaded if deck is more than 91% covered<sup>37</sup>
    - 15.65m trailers are fully loaded if deck is more than 87% covered.
  - 14.6m trailers are assumed to be able to carry a maximum of 7% more goods than a 13.6m trailer if they are 100% loaded. Between 91-100% loading of the LST, the 'extra' goods assumed to be carried over and above a 13.6m trailer has been linearly interpolated.
  - 15.65m trailers are assumed to be able to carry a maximum of 15% more goods than a 13.6m if they are 100% loaded. Between 87-100% loading of the LST, the extra goods assumed to be carried over and above a 13.6m trailer has been linearly interpolated.

### Utilisation by percentage / by band

22. The data framework allows operators to submit their utilisation (deck space covered, volume filled) either as estimates of the percentage of the available space or by selecting a band from a given range.
23. In 2014 we introduced a new '100% Full' top band and amended the lower bands accordingly
24. The data framework allows operators to submit their utilisation (deck space covered, volume filled) either as estimates of the percentage of the available space or by selecting a band from a given range:

<b>OLD BAND</b>	<b>100 = 91-100%</b>	
<b>NEW BANDS</b>	<b>95=91-99%</b>	<b>New mid-2014</b>
	<b>100=100% FULL</b>	<b>New mid-2014</b>

25. The analysis is performed using percentage values, so where operators have provided percentage loadings these have been used for all calculations.
26. Where operators have used utilisation bands, the data is converted into percentages using set rules. The rules now need to address historic data using the old bands as well as 2014 data created using the new bands.

### Old /new band data – conversion to utilisation percentages

27. Older data (before 2014-P2) has a single band of 91-100% full. Newer data (2014-P2 onwards) has this band split into two parts, 91-99% and 100%.
28. Where operators using the new bands (in 2014-P2, P3) have more than 96% of their full data in the 100% full band, we have converted all their historic 91-100% data into 100% full data.
29. For other operators, 91-100% full data has been converted to 91-99% full data.

### Band conversion to percentages for calculation

30. For the 2013 Annual Report, the single band of 91-100% full, which was converted to its mid-point of 95.5%, which was stated as being conservative

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<sup>37</sup> Measurement based on the number of standard pallets that cover the deck space

31. For the 2014 results, the new bands have allowed some of the conservatism to be removed, with band-based utilisation data being converted as follows:
- 91-99% full band = 95%
  - 100% full band = 100%

### Summation of savings

32. In the 2013 analysis, the calculations involved a single 'top band' of utilisation. In this category we conservatively assumed that the trailer was 95% full. The previous analysis also assumed a single, gross saving for the two trailer lengths.
33. For the updated analysis we have used the new bands to remove much of the previous conservatism, and journey savings have been calculated on a 'per leg' basis. In addition, since everything is now expressed as percentages, we have been able to define more accurately the percentage fill as that which exceeds a 13.6m trailer, for each of the two trailer lengths.
34. The calculation assumptions are:
- For each leg, the total distance in km is multiplied by the assumed saving percentage, based on the additional percentage loading achieved on that leg over and above what a 13.6m trailer would have carried.
  - It is assumed that the journeys/ vehicle km saved can be summed over the total volume of data, on the basis that:
  - Operators will aim to operate efficiently, so will aim to consolidate loads as far as possible.
  - Legs not run fully loaded have been excluded from the calculations, so any 'leftover' loads that would not fill a longer trailer to greater than the capacity of a 13.6m trailer have not been counted as part of the potential journey savings.
  - The dataset is large, and the assumptions made do not introduce a bias to the calculation in favour of the journey savings.

### Additional savings for retail site deliveries

35. As in the 2013 Annual Report, an upper bound calculation is generated by changing the assumption for the specific case of legs to retail sites.
36. The retail sector is assumed to operate many legs as full from a distribution centre to a retail site, then empty from the retail site back.
37. **This assumption represents the 'higher bound' of saved vehicle kilometres – for this calculation we double the saved vehicle kilometres associated with fully loaded legs with the leg type 'to/from retail site' only.**