

# REPORT

## Headlamp Aim Research Project

**Report for Cabinet Office Better Regulation Unit**

## **HGV and PSV Headlamp Aim Testing**

A report produced by Testing Standards Policy and Strategy

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## Introduction

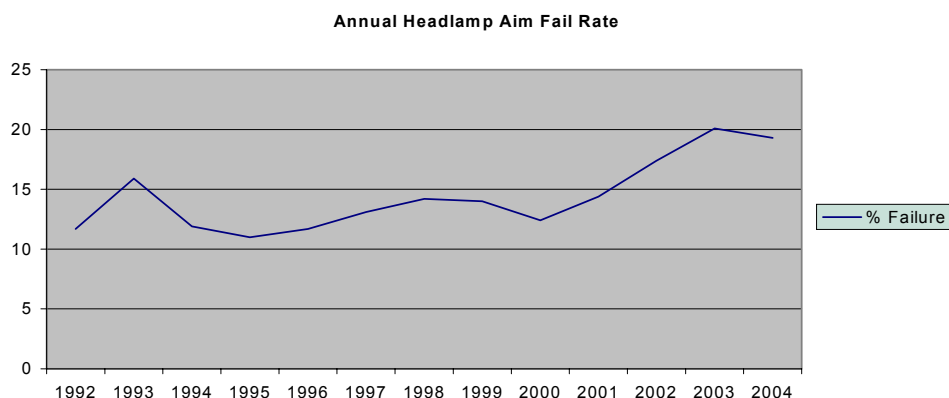
1. Following representations from the truck and bus industry, the Cabinet Office's Better Regulation Team requested that VOSA's Chief Executive investigate the causes of the high headlamp aim failure rate for trucks and buses.
2. This report summarises VOSA's investigations of the issue and explains the factors affecting headlamp aim and issues for further consideration.

## Executive Statement

3. VOSA's investigation shows that there is no single cause of high headlamp aim failure rates. It is a combination of many features and this report highlights those that require action to improve compliance. Most of these actions will require partnership working with a variety of bodies.

## Background

4. In 1989 the Transport and Road Research Laboratory (TRRL) conducted a roadside survey of vehicle lighting (Research Report 290 – J.Cobb B.Sc.). TRRL concluded that as many as 1 in 5 truck drivers would not be able to stop in the distance they could see illuminated ahead. This was because headlamps were aimed too low and/or too far to the left. At that time headlamp aim would only fail at annual test for being high or too far to the right. Consequently, a new headlamp aim standard introduced additional lower and left limits.
5. From 1992 (the earliest headlamp aim data available in VOSA – see table below) the headlamp aim failure rate for trucks has ranged from 11% (1994/95) to 20.1% (2002/03). In 2002/03 and 2003/04 the truck headlamp aim failure rates were 20.1% and 19.3% respectively.



6. The table shows that the headlamp aim failure rate has effectively doubled in the last decade. The failure rate for PSV's over the same period shows a broadly similar trend.
7. In order to address the concern, VOSA has conducted project and survey work looking at vehicle construction features, vehicle loading, fitter & driver competence, tester training, equipment and the test standards.

## **Aim Standards and Legislation**

8. New vehicles are subject to construction standards laid down in various type approval legislation. It is important that a vehicle maintains acceptable headlamp aim so as not to cause dazzle to oncoming traffic while illuminating the road ahead.
9. Once in use on British roads vehicles are required to be maintained in accordance with Construction and Use Regulations (C&U) and Road Vehicle Lighting Regulations (RVLR). The annual test standards are based upon the requirements of RVLR, which in turn are derived from internationally harmonised construction standards.

## **Vehicle Build Issues**

10. To determine the quality and robustness of headlamp units and installations, forty trucks and buses were checked at 3 operator's premises. Each operator maintained a properly equipped workshop for heavy vehicles. Vehicle makes included ERF, LDV, Daf, MAN, Scania, Mercedes, Leyland and Dennis. Each vehicle was checked twice a week for 4 weeks.
11. A number of headlamp units failed to give a clear beam pattern image. Changing headlamp bulbs often corrected this problem and some transport managers will only purchase particular makes of bulb due to variable quality, despite bearing type approval markings. When one particular bulb was changed the aim lowered by 3% without interfering with any of the adjustment mechanism.
12. Concerns about bulb quality have been passed to the Department for Transport who will be reviewing;
  - Construction standards for bulbs;
  - Conformity of production requirements;
  - Inferior products entering the market place.
13. In a survey of 4500 vehicles a significantly wider headlamp aim standard was analysed for impact on failure rates. This was the main thrust of the concern expressed to the Cabinet Office. Vehicle operators contend that the standards are 'too tight' and that they need to be broadened to give their vehicles a chance of remaining compliant throughout the year. Despite introducing this significantly changed trial standard it was established that improvement in headlamp aim pass rates was minimal. Most vehicles were failing by a large margin. This suggests that a change to the standard alone would not deliver any significant

improvement in the truck and bus headlamp aim fail rate, even if it could be demonstrated that any such change would have no impact on road safety.

## **Vehicle Loading**

14. Headlamp aim can be affected by vehicle loading. Many modern vehicles are fitted with manual beam leveling devices to overcome the effect of this, whilst the very latest vehicles are fitted with Xenon type units having automated self-leveling systems.
15. During roadside checks it was found that many drivers are either unaware of the manual leveling device or are unfamiliar with how it works. There is no standardisation of these devices. On some the incremental scale is 2 or 3 notches, but on others there were as many as 9.
16. At the roadside checks a mobile beam tester was used to test 50 vehicles. The annual test standard was not met by 88% of the vehicles checked. Only 12% of vehicles in the total sample were found to have headlamp aim likely to cause dazzle. On almost all of these vehicles the headlamp aim was capable of correction using the in-cab manual leveling system. But drivers could not accurately re-set alignment from their cab, without the use of a beam tester.
17. The Department for Transport will be pursuing this issue with vehicle manufacturers as soon as possible and in the mean time VOSA will review the guidance within the headlamp aim leaflet.

## **Vehicle Fitter Competence**

18. We have established that 20.1% of HGVs and 11.4% of PSVs failed for headlamp at annual test in 2002/03. When we specifically tested headlamp aim at roadside checks we found that the non-compliance rate was 88%. In a survey of 4500 vehicles at annual test those that failed for headlamp aim had headlamps that were significantly misaligned and were often noticeably out of alignment with each other. It would be reasonable to assume that a vehicle that had an attempt made at headlamp aim correction would have both lamps in broadly the same alignment. This was not the case in this sample.
19. VOSA offers a voluntary headlamp aim checking service for all truck and bus operators. Nearly 4000 HGVs and over 9000 PSVs had their headlamp aim tested voluntarily last year. Interestingly, the failure rate for this sample was 2.1% and 1.8% respectively once headlamps have been correctly adjusted at the test station. This is an order of magnitude different to annual test results. Even allowing for possible misreporting by testers this is a remarkable achievement. It highlights the improvements that are possible by having trained fitters prepare vehicles properly and it is here that VOSA believes the most significant improvements in headlamp aim pass rates may be achieved.

## **VOSA Issues**

20. A number of VOSA sites were checked to give a 'snapshot' of site and equipment related issues that may contribute to inconsistent assessment of headlamp aim. This snapshot showed that there were problems with standards of maintenance and calibration to address. Despite having a contract in place the system did not appear to be working as well as it should at some sites.
21. Following on from this concern operational colleagues took our emerging findings and conducted a slightly larger sample of sites and equipment. This showed that the problems identified by our initial work were not properly representative of the estate as a whole and there was no endemic compliance problem for VOSA.
22. As a result of both pieces of commissioned work VOSA has instituted a number of actions. All current equipment has been surveyed and repaired where necessary to further ensure consistency of result. Our maintenance contractor has been spoken to and new systems are in place to ensure that standards do not deteriorate. Our in-house Standards Control team will now routinely include assessment of headlamp aim equipment as part of their visits. We are also evaluating the latest technology to future proof our headlamp aim test equipment to keep pace with lighting developments for road vehicles.
23. We were worried that our own staff competence may be part of the problem. We therefore analysed fail trend data for the South East and then instituted a bespoke training package to all South Eastern VOSA testing stations. Analysis of pre and post training failure rates showed only a marginal improvement in the pass rate, suggesting that by and large our staff were operating to the standards we require. Nevertheless we are considering rolling out the training package to all testing staff as a best practice precaution.

## **Actions to Date**

24. As a result of the emerging findings of our work a number of actions have already taken place:
  - a) Our maintenance contractor has been tasked with ensuring our kit is up to specification at all times
  - b) Our Station Managers and Standards Officer team will evaluate all headlamp aim equipment as part of their scheduled tasks
  - c) In November 2003 VOSA published an educational Headlamp Aim leaflet for the truck and bus industry illustrating how to set headlamp aim
  - d) VOSA is evaluating the latest headlamp aim testing technology with a view to purchase as part of our estate modernisation programme
  - e) VOSA produced a headlamp aim video for cars, trucks and buses.

## Proposed Actions

25. VOSA has an Operational Equipment and Facilities Strategy Board to consider specific site and equipment issues. VOSA's Directors have tasked this Board with producing a Corrective Action Plan to address all issues raised by this report. The Department for Transport has also agreed a number of follow-up actions. Together these actions are:

- a) Investigate all options to update VOSA equipment and make costed recommendations to the main Board;
- b) Roll out the South East training package to all VOSA testing staff;
- c) Consider ways of helping customers present vehicles for test, possibly by introducing a commercial course and amending our Guide to Maintaining Roadworthiness at the next available reprint opportunity;
- d) DfT to review the adequacy of headlamp aim fixings with the Society of Motor Manufacturers and Traders;
- e) DfT to review conformity of headlamp bulbs with Directives/Regulations
- f) DfT to review improving manual/automatic levelling devices.

26. Improvement in headlamp aim pass rates will rely upon a considerable amount of co-operation with industry and other Government partners. Success will be measured by trends showing a fall in failure rates for headlamp aim. The initiatives outlined in this report should achieve this objective in the medium term.

TSPS  
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