Loughborough University

A Review of the Optional Side Marker Down Lighting Systems (OSMDLS)

Extract from Final Report

Transport Safety Research Centre

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Conclusions

The purpose of the report was to determine the overall performance and safety benefits of the OSMDLS system. [redacted]

The overall aim of this study was therefore to evaluate some of the effects of the OSMDLS, especially with regard to safety of other road-users.

[redacted]

A valuable output from this study is the detailed analysis of the natural behaviour of Vulnerable Road Users around buses being operated in London. This type of data is very scarce and is normally only derived in the event of a serious or fatal collision or from smaller scale localised studies. The benefit of this study is that highly detailed scenario data is available to provide a clearer picture of the types and patterns of passing manoeuvres.

This data can be considered the major output from the baseline condition of the analysis. The baseline taken in isolation does not tell us anything about the effects of the OSMDLS however it does provide some insight into what natural behaviour looks like.

From the analysis it is possible to conclude that passing separations are, on average, relatively wide particularly on the offside (1.461m) although space has been found on the nearside of the bus which shows average passing separations of 1.005m. Opportunities to pass the bus on the nearside were observed to be fewer and may also represent a higher risk manoeuvre irrespective of whether cycle facilities are present; this is evidenced by the 84% reduction in passes on the nearside compared to the offside.

Average data for the offside disguises a strong pattern within this value, which indicates that all road users increase separation as they pass from the rear of the bus to a point 6m further along the bus. This is potentially positive behaviour as it shows that road users passing the bus are aware of the risk posed by heavy vehicles and that they are potentially positioning themselves in areas where they can be seen in the offside rear view mirror.

The data for the nearside does not demonstrate the widening pattern. However, this is likely to be a function of the restrictions created by fixed infrastructure along the nearside of the bus. A positive finding for the study is that almost no data exists (n=2) showing nearside passing when the LH indicator is activated; this is a well understood high risk manoeuvre and features heavily in the cyclist fatality data for London.

Overall the data for the baseline condition could be extremely valuable in determining educational or training feedback to Vulnerable Road User groups or for providing detailed test scenarios for future or existing technologies such as camera monitoring systems or other driver assistance technologies.

Key findings on the system benefits assessed through this study

Benefits to bus drivers

Both the bus driver focus group and the interviews recognised the opportunity of the lights to offer greater visibility in all lighting conditions, but specifically in darker situations. This was noted in relation to the approach of all road users, and the view of the bus drivers with experience of the lights was that this is particularly the case for Vulnerable Road Users who might be travelling without their own lights on their vehicle.

In addition to the findings through the interview process, the CCTV data analysis provided some insight into the potential benefits to drivers by offering additional visibility. This data covers events where a bus passes a road user (rather than a road user passing a bus) and demonstrates overall positive driver behaviour. Average passing separations on the nearside to a Vulnerable Road User being overtaken showed stable and repeatable distances of around 1.5m to the centre line of the VRU with very little variance from this measurement. Although this measure cannot be directly attributed to the OSMDLS lighting it suggests that current driver training and recent enforcement campaigns may have had a positive effect on buses passing other road users.

Benefits to Vulnerable Road Users

[redacted] Data from the offside of the bus, particularly the comparison between baseline (no OSMDLS fitted) and static (OSMDLS fitted, fixed light) conditions indicates that the technology does not provide a clear benefit in respect to this claim.

A consistent reduction in passing separation was identified between the baseline and static conditions indicating that road users are more willing to pass closer in the static (OSMDLS activated) condition compared to the baseline (no OSMDLS) condition. The difference within modal groups is not huge, however the pattern does persist across all road user groups identified, from cycles with an average reduction in passing separation of 4cm, right through to 'other' road users with an average reduction in passing separation of 38cm[1].

The data shows a disparity between the offside of the bus and the nearside of the bus with the static conditions passing separations on the nearside showing a noticeable increase in passing separation compared to baseline. Passing separations increased by 20cm for all road users combined, however the picture was mixed for individual road user types as passing separation for PTWs actually reduced in the static condition (this reduction served only to bring PTWs in line with the other static road user separations as the measures recorded in baseline were considerably larger than that seen for other road user groups).

The conclusion for the nearside is contrary to the finding on the offside and care should be taken when interpreting the results. For example, the larger separations seen between conditions is potentially due to vehicle capability and performance in congested road environments. It was noted that PTW riders could exploit the potential for greater speed differentials between the bus and themselves and create better passing opportunities while the bus is moving. Conversely cycles only appeared to be able to exploit passing opportunities when the bus was stopped or very slowly moving where it could potentially be

[1] Very small sample size (n=24) for the other (scooter, skateboard etc.) which could make this finding less robust compared to the primary road user groups of cyclist and PTW user (n=768)

close to a restriction. Section □covers the types of manoeuvre and common locations where nearside passes were possible with large separations.

The duration of the study and therefore the amount of data collected for the nearside did not allow a more thorough analysis of this behaviour but further observational studies may be useful to understand these manoeuvres more completely. Based on these observations it is likely that OSMDLS has a role to play in the effects observed on the nearside of the bus, however there are likely to be stronger drivers of this behavioural change which may be linked to the specific conditions/environments in which these manoeuvres took place.

With the RH indicator activated, the behaviour of all road users between the static and baseline conditions suggests that the OSMDLS lights may be associated with positive safety benefits in conjunction with the use of regulatory direction indicators, (that is, the OSMDLS were not flashing in this phase, only the standard fit direction indicators). However, a clear effect for the OSMDLS in isolation cannot be determined as a pass while the right-hand indicator is activated is a relatively rare event resulting in small sample sizes and mixed effects across road user types. Additionally, the actual passing distances between the static and baseline conditions with the 'RH indicator' condition are broadly similar suggesting that the observed difference between conditions is primarily due to closer overall passing in the static condition rather than an isolated effect of the OSMDLS and indicator use.

The pattern of passing identified in the baseline phase is replicated for the static condition with all road user types passing closer to a bus when it is stopped. This effect maintains the widening pattern of passing behaviour and, likewise, demonstrates closer passing separations for static (lit with OSMDLS) condition compared to baseline (unlit, without OSMDLS) conditions. The measurements of passing separation are typically very consistent across the different conditions suggesting that a moving vs stopped bus is the primary determinant for changes in passing distance and not the effect of OSMDLS lighting.

With the OSMDLS lights in the FLASHING condition (i.e. flashing with the indicator activation) a reduction in road users entering the offside area immediately adjacent to the bus side was seen compared to both the STATIC and BASELINE conditions. Moreover, the reduction in the proportion of road users entering this zone of higher risk was consistently reduced from the baseline condition, through the static condition and into the flashing condition suggesting that the additional lighting provided by the OSMDLS may have some role in deterring road users from close proximity passes when the bus was indicating to turn right.

Not entering the area of high risk (i.e the measurement box area) is not a guarantee that a road user waited behind the bus as a wider pass (i.e. greater than the 2m measurement box width) was also classed as not entering the measurement box. A more detailed analysis on the specifics of each road user behaviour could not be completed due to the available views through the CCTV footage, for example it was not always possible to identify road users who waited behind the bus due to obscuration created by the bus side. The reduction in road users entering areas of high risk across the project conditions should also be balanced by the fact that this manoeuvre type is relatively uncommon within the route 6 sample (9% of the data) so there may be an effect of small samples sizes on the overall result.

Analysis for the flashing conditions on the nearside of the bus was not completed as instances of a bus indicating left while a road user passed along the side of the bus were extremely rare within the Route 6 sample. This may indicate that education initiatives have made Vulnerable Road Users aware of the likely bus manouevre and associated risks and are less likely to undertake this manoeuvre.

Overall the effects seen for the offside and nearside of the bus do not show a consistent or sustained improvement in road user behaviour change with the addition of the OSMDLS. There is some evidence of positive behaviour, such as the increase in separation between baseline and static conditions on the nearside and the larger passing separations observed when the RH indicator is activated. However in these cases, the sample sizes are small and other confounding effects may be evident making robust conclusions on the observed effects problematic.

The natural behaviour observed during this study also identified some positive effects for overall safety outside of the OSMDLS aims of the study, effects such as the substantial reduction in nearside passes compared to offside passes. The almost complete lack of nearside passes when the bus was indicating left and the consistently wide passes buses made on Vulnerable Road Users all demonstrate that current information, training and enforcement campaigns are impacting the general pattern of road user behaviour in a positive way.