Eye on the future

Dr Steve Summerskill and Dr Russell Marshall, of Loughborough University, opened delegates' eyes on the subject of driver visibility. Brian Tinham reports

Blind spots – areas to the sides and in front of trucks not visible to drivers either through windows or via mirrors – are making unwanted headlines. Why? Because, although road traffic accidents have been declining, cyclists are still being killed, and HGVs, particularly construction HGVs, are hugely over-represented in police statistics. The same applies to other vulnerable road users, and the obvious conclusion is that trucks need to improve so that drivers can see.

So the IRTE session on cab designs and those offering best vision, delivered by Dr Steve Summerskill and Dr Russell Marshall – both academics in the Design Ergonomic Group (DEG) at Loughborough University – was timely. Dr Summerskill took the lead, focusing on his research into current designs, and it quickly became clear that operators can reduce blind spots right now, not only through their choice of brand and model, but also detailed truck specifications.

Summerskill pulled no punches. He reminded delegates of the reasons for blind spots, which go back to how the industry accommodated vehicle length legislation. Maximising payload area drove the cab-over-engine formula. "Blind spots are a function of today's cab designs. All their features are essential for structural strength, protecting drivers, etc, but they create blind spots."

DETAILED ANALYSIS

So the aim of his project – sponsored by TfL (Transport for London) and CLOCS (Construction Logistics Cyclist Safety) – was to quantify areas around cabs that are invisible to drivers, either directly through their windows or via the mirrors. Summerskill explained that his researchers took truck manufacturer data, augmented that with their own cab scans (shell, window apertures, and curvature, location and adjustability of mirrors), and then used Loughborough's digital human modelling software, along with a visual projection technique, to reveal the blind spots.

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> **Dr Steve Summerskill**

And his resulting demonstration screen shots were as convincing as they were worrying – particularly the detail. Summerskill confirmed that it was never going to be realistic to examine every truck or configuration. So the team took SMMT (Society of Motor Manufacturers and Traders) registration data and selected top selling Euro 6 models from DAF, MAN, Mercedes-Benz, Scania and Volvo, as well as low-entry cabs from Dennison, Mercedes, Scania and Volvo – 19 in all.

As for cab or, more importantly, drivers' eye heights, Summerskill told delegates: "Given that chassis specs, suspensions settings, tyres, etc, result in a range of 2 metres, it was not possible to model all vehicles. So again we took a pragmatic approach and modelled the most sold configurations of each vehicle." And finally, he said, the team researched driver position and

FACT

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modelled three eye positions for large, medium and small drivers. "We don't account for how drivers might move their heads, but, with this approach, our analysis shows precisely what drivers can see from standard driver postures."

So to the results. By reviewing fatal accident data, the team was able to focus on the key danger locations for cyclists and pedestrians. It was then about simulating both vulnerable groups in three positions – left, right and in front of the cabs – to establish how far away from each they must be before drivers can see them.

"There is considerable variability, in terms of direct vision," said Summerskill, showing projected views for each cab. "I'm not naming and shaming, but we see good results on the nearside for all low-entry cabs and also, for example, the low variant of Scania's P3 distribution truck. But for other cabs cyclists will be obscured from nearside driver vision even 2.5 metres away. That's a big gap: you could hide a car in that."

And he went on to reveal the results for cab frontal and offside driver views – again with low-entry cabs scoring well and the rest increasingly reliant on their Class 6 mirrors.

Turning next to the issue of eye height, Summerskill explained that the team's data demonstrated a full metre of variability, and a clear correlation between eye height and the point at which vulnerable road users are obscured. But there were also nuances, he said, linked to the precise design of the cab window apertures.

"For example, the Scania R and MAN TGX vehicles deliver very similar eye height, but very different distances at which cyclists can be hidden." Why? The team's visual projections plainly revealed that the Scania R's lower bottom window edge contributed enough for drivers to see more of the road, while the MAN TGX design limits direct vision.

Summerskill's bottom line: "We've highlighted that low-entry cabs perform much better in terms of direct vision. We've also shown that Class 6 mirrors should help drivers in higher trucks to see some, but not all, of the area in front of their cabs. The question then is, is it reasonable to expect drivers to scan six mirrors to gain full situational awareness? We are still having accidents.

"Our project data now allows operators to compare vehicle configurations and designs. And if driver vision turns out to be the only criterion that's different, they can pick the best. However, we can also see that far too many vulnerable road users can't be seen even at two metres from a range of trucks, and we can surely do better than that. The CLOCS programme has already put a number of innovative vehicles into London that are lower and have better glazed areas, and these show the way forward."

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Dr Russell Marshall

FUTURE VISION

On that salutary note, Dr Marshall came to the lectern to illustrate the potential benefits of future truck designs resulting from European legislation that allows vehicles to be extended ahead of the front axle. Although the aim is to improve truck aerodynamics, Loughborough contends that it could also enable a sea change in driver vision.

So Marshall explained that his research team took the aerodynamic nose cone design from FKA, in Germany, and developed it with three, increasingly radical iterations, comparing the direct driver vision results against a current DAF XF as the baseline. "The first iteration punched holes in the bodywork to generate more glazed areas," he said. "The second took the concept cab but lowered it by 230mm in line with lowest current chassis height configurations. And for the third we moved the whole driver package to a central position to reduce blind spots on the nearside."

Marshall's team then used the same projection modelling to assess the iterations in terms of driver vision. Those demonstrated conclusively that the FKA concept vehicle improved driver vision, while iteration 1, with the additional glazing, enabled perfect front, central visibility (front left and right pedestrians were still hidden up to 500mm from the cab) and significant improvements on the nearside. Reducing the height increased visibility further, he said, while moving the driver inboard made by far the most difference to direct driver vision.

"There are still problematic areas to the nearside and two front corners of our concept trucks, so more needs to be done," commented Marshall. "But there are two clear messages. The first is that we can do a lot with more glazing in critical areas. The second is we can improve further by reducing vehicle height." ■