No case for UK CONVOYS

Results of the five-year, £8m HelmUK platooning trial on public roads have largely confirmed negative industry views of the practice, according to the official report published in July

First, having a closely packed convoy of heavy vehicles poses a risk to merging vehicles at motorway junctions. That was judged to be such an issue that during the trial the three-vehicle platoon spent nearly as much time broken up (46.5%) as combined.

Rejoining the platoon required trailing vehicles to accelerate, which consumed fuel, and that fuel consumption ate up almost all of the fuel saving of the practice over single-vehicle adaptive cruise control systems. (A thought experiment suggests that in best-case conditions, fuel savings might increase from 2.6% to as much as about 4%, compared to 7% fuel savings found on test track configurations in other studies.)

However, on the positive side, the project validated the safety of a prototype control system developed by truck OEM DAF, which may have applications in future driver assistance systems or for autonomous vehicles. That consists of four key technologies: cooperative adaptive cruise control, used to maintain vehicle distance or headway with vehicle-to-vehicle communication; brake performance estimator, which calculates braking distances based on vehicle weight; cooperative collision avoidance, which coordinates automatic emergency braking; and lane keeping assistance. The system was found to keep good control of the vehicles, be fail-safe, and the collaborative collision avoidance worked to protect the platoon (although in a very few cases it might have posed a risk to following drivers). Also found to be a success was radar detection of cars and larger vehicles cutting into the platoon. During the trial, no motorcycles were found to cut into the platoon.

HOW IT WORKED

The trials involved three HGVs (pictured) travelling on the M5 and M6 motorways between Avonmouth and Stafford, a round trip of 218mi, with a lead vehicle carrying 22t payload, a middle vehicle with 9.2t payload and a following vehicle with no payload (this configuration allowed the shortest following distances). The trial clocked up 12,000 miles over 58 days of on-road trials. The lead driver was in control of acceleration, braking and steering; following drivers had control of steering. No roundabouts were included in the route.

The initial phases of the project involved development and validation of the DAF platooning system and development of a safety case by TRL for trials. Driver tests, simulator studies and track testing was also carried out. In phase 2, DAF UK drivers, under trial management by TRL, validated the route, which led to it approving the system for customer field trial use.

During platooning, the vehicles were kept 0.8 seconds apart, less than half of the Highway Code recommendation of 2sec. In fact the study had intended to reduce headway further to 0.5sec, but variability in brake performance raised distances slightly.

The platoons were only ever driven in the left-hand lane. Problems at junctions related to traffic merging from slip roads. A special TRL analysis of the junctions considered factors such as whether (or not) the merge was simple to navigate, whether there was a clear line of sight between the main carriageway and the slip lane, and whether the road lane length allows merging vehicles to accelerate sufficiently. Safety requirements forced the platoon to disband at nine out of every 10 junctions; only six junctions were actually deemed safe to platoon through.

IMPLICATIONS

The study also raised hurdles for the idea of mixed-fleet platoons. Not only does no inter-brand platooning software currently exist, but also there are almost no fuel benefits for the lead vehicle. And the order of vehicles by weight affects the minimum achievable headway. The authors say: "Economic analysis showed that a positive business case is likely to be made only for a very small number of

operators with quite specific favourable circumstances. It would be necessary for such an operator to undertake regular long-distance trunk haulage trips between fixed locations located close to a motorway, and where vehicles can be relatively easily grouped without significant rescheduling being required."

The authors reason that another way to increase platooning's fuel savings benefit would be to increase the size of the platoon. However, based on this particular test route, the most favourable junction would only allow a maximum length of four vehicles in a platoon.

Looking forward, the trial has demonstrated the worth of vehicle-to-vehicle communication systems such as cooperative adaptive cruise and cooperative collision avoidance on real roads, even for vehicles that are not platooning. The authors say: "These systems offer safety benefits over existing systems. HelmUK has proven this functionality using DAF vehicles and the European ENSEMBLE project has proven this functionality across multiple manufacturers. These systems could be deployed in the near term when sufficiently developed."

If used at regular road intervals (not less than 1.6 to 1.4sec), the safety systems have the additional benefit of requiring no additional regulation nor increasing risk at junctions. However, such benefits depend on the popularity of such systems on the open market, they point out.

In conclusion, the authors offer three potential scenarios for the development of platooning in the UK. One option is not to regulate platooning. That would leave it up to drivers in platoons or the platooning vehicles themselves to manage risks at junctions, which they do not recommend: "HelmUK's Safety Case judged that by the time the platooning drivers were able to decide to increase headway at junctions, it was likely to be too late for the vehicles to reach safe headways for most junctions." Another possibility is regulating platooning by only allowing platooning on motorways, and disallowing vehicles to pass through junctions at headways of less than 1.4sec, a typical adaptive cruise control setting. That option would preserve road safety, allow the tech to be used for driver assistance and not rule out future development. The third option would be to regulate and support platooning by further evaluating or improving junctions to facilitate platooning. They added: "A practical step would be to apply HelmUK's junction assessment criteria to English motorways (or roads built to these standards) to determine which junctions are likely to be safe for platooning. This could be developed further to build a case for platooning through junctions under other conditions such as night-time operation."

The project was sponsored by DfT and National Highways and consisted of project lead TRL and project partners Apollo Vehicle Safety, Connected Places Catapult, Costain, DAF Trucks, DHL, fka, Fusion Processing, Ricardo, UTAC, TNO, TransportPR, VisionTrack and ZF.