Truck brain SEES THE WAY

Automated systems that alert a driver to hazards, and if necessary prevent an accident, are known collectively as advanced driver assistance systems (ADAS). They have been around for a while – Volvo introduced a lane departure warning system in 2007 – but there is still confusion about what the various systems do. Toby Clark surveys the principal product offerings

EU legislation now requires trucks over 8t gvw to have autonomous emergency braking systems (AEBS) and lane departure warning systems (LDWS). That rule is part of the General Safety Regulation applicable to new types since 2016 and to all new N2 and N3 vehicles, other than those specifically exempted, from November this year.

AEBS is typically combined with a collision warning, which alerts the driver before the AEBS activates; Volvo's version includes a heads-up light display visible in the windscreen. This gives the driver a chance to react, but tests show that very few drivers use maximum brake pressure at this point, whereas AEBS applies full brake force. Scania's system, pictured p30, combines short-range cameras with longer-range radar.

Lane departure warning systems (LDWS) use a camera to detect the vehicle's position in relation to the road markings, and generally only work on multi-lane roads above a certain speed. If they detect a drift towards the other lane, without any indicating, they emit a visible and audible warning, escalating to a haptic (touch-based) warning such as a vibration through the steering wheel. Some systems go beyond warnings: Ford's Lane-Keeping Aid, available on its Transit van as well as cars, loads the steering torque one way while making it ultra-light in the other, 'nudging' the driver to correct the drift.

Lane changing support systems, such as Volvo's LCS, take the next step: when the driver indicates to change lane, it monitors the blind spot with radar, giving audible and visual warnings in case of danger. Daimler's Sideguard Assist operates at lower speeds, warning if the driver is about to turn into an object (or a cyclist) on the blind side – however, as yet it is only available in LHD markets (but see p23 for an IAA launch).

Driver monitoring systems go by many names, such as Driver Attention Monitoring or Driver Drowsiness Detection System. They use a combination of technologies to check for driver fatigue; when they find it, they provide prompts to pull over for a rest. Some monitor steering input while others check lane position; some use cameras or infrared sensors to check for eye movement and blink rates. In future, such systems may be used to assess whether a driver is sufficiently alert to stand by while an autonomous system is in control.

These major safety systems can be broadly described as 'driver assistance' or ADAS systems. They are joined by intelligent cruise control, speed limit sensing, traffic sign recognition, intersection assistance, automatic headlight dip and many more. GPS is a vital part of systems such as intelligent automated gearshifting, which uses map data to shift down a gear in readiness for a steeper gradient, or to hold on to a gear at the top of a hill, as the best drivers would. DAF's Predictive Cruise Control 'reads' the road ahead for 1-2km,

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allowing the truck to slow at the brow of a hill, then permitting a slight overspeed downhill where appropriate.

Other systems are designed specifically for low-speed operation: the Mercedes-Benz Actros offers 'Proximity Control Assist with stop-and-go function'. This maintains a safe distance from the vehicle in front and brings the truck to a halt in stop-and-go traffic. Once traffic begins to flow again, the truck starts up again. Mercedes coaches, meanwhile, can be specified with the continuous braking limiter (DBL) which limits downhill speed to the speed limit automatically, by braking, even if the driver accidentally presses the clutch.

MAKING CONNECTIONS

When Mercedes first demonstrated platooning in 1999, with trucks following in close formation to save fuel (as shown p29), the system used cameras to 'read' the range, relative speed and angle of the trailer ahead. The system also used a vehicle-to-vehicle radio system to communicate when and how strongly the brakes were being applied, effectively eliminating 'thinking time'.

Such communication protocols will give vehicles a much fuller picture of the world around them than sensors alone can provide. A European standard for intelligent transport systems has been established (Directive 2010/40/EU), and there is a similar move in the US. Obviously, any system has to be extremely robust and resistant to electronic noise and deliberate interference; a clear area of the radio spectrum is ideal, but there is competition for bandwidth from other industries.

Back to the vehicle itself, ADAS sensors and cameras are to a certain extent self-calibrating, but their alignment is critical. Windscreen replacement firms are now offering ADAS calibration services, including static calibration (aiming at a suitable target in a prepared workshop) and dynamic checking on the road.

Insurance companies have been surprisingly quiet about the impact of ADAS, partly because of a lack of knowledge about which of the many systems is fitted to a new vehicle – there are calls for an industry-wide database. One industry white paper acknowledges that ADAS should reduce insurance claims, but suggests that this has been offset by the extra cost of replacement sensors!

Similarly, driver training is hampered by the confusing variety of systems available; at the very least, drivers need to be given proper handover training in the systems on a particular truck.

ADAS systems are clearly a step toward fully autonomous driving; most ADAS systems represent Level 1 or 2 autonomy, on the scale which has Level 5 as a fully autonomous vehicle. However, there may not be a straightforward progression from one to the other – for instance, IBM is looking at a system it calls a 'third intelligence' to arbitrate between human and automated input. So the judgement of a trained driver is likely to be the most important factor in vehicle safety for a while yet. TE

JARGON BUSTER

AEBS: Autonomous emergency braking system
LDWS: Lane departure warning system
LIDAR: Light detection and ranging. It and laser scanning use a beam to illuminate the target, with a sensor reading the beam's reflections. Like radar and ultrasonic systems, it can determine the speed, position and direction of a target with appropriate computer processing.
MACHINE VISION (MV): This system uses cameras and an image processing computer to analyse the shape, size and position of objects.
ITS: Intelligent transport systems and **CVT** (connected vehicle technology) generally describe systems by which vehicles can communicate with each other and with other devices, to get a better picture of the environment around them. For example:
V2V: Vehicle-to-vehicle is a wireless, radio-based network which allows vehicles to communicate, transmitting information such as speed and acceleration, direction, brake application, lane changes and other warnings.
V2X: Vehicle-to-everything or **V2I** (vehicle-to-infrastructure) networks allow vehicles to interact with roadside beacons that might give speed limits, location, warnings of specific hazards ahead and other traffic information.
CAV: Connected and autonomous vehicles is a catch-all term used by Highways England to describe a range of vehicles with V2V/V2X or some self-driving capability. Other terms used within the industry include **IVC** (inter-vehicle communication), **VANETs** (vehicular ad-hoc networks) and **RSUs** (roadside units).