



Vehicle engineering concepts that explore the edge are always interesting. Some may come to be seen as follies, but others will change the world. Ian Norwell reports from Berlin and Daimler Trucks' vision for its newly unveiled Future Truck 2025



A driver relaxes as the future truck takes control on a 'busy' stretch of the A14 motorway near Magdeburg, Germany

To those of a certain age, the world of *The Eagle's* hero Dan Dare seems to creep ever closer, with technological advances in every walk of life. For the gritty, down-to-earth service it provides, transport engineering punches well above its weight in this respect. Twenty years ago, any notion of trucks being able to stop themselves in an emergency, or 'see' over the hills ahead and adapt their gear-shifting strategies, would have been deemed fanciful. But they're part of the here and now, and for Daimler Trucks, they've evidently been stepping stones towards another altogether more tantalising concept – a truck that drives itself.

In a world première this summer, with the stage set in Berlin, Daimler wheeled out an impressive array of engineers, executives, politicians and academics. Their subject: the autonomous driving (AD) truck – Daimler's Future Truck 2025 – revealed in action on a long stretch of the newly-completed A14 motorway near Magdeburg, Germany, reserved for the occasion.

"The truck of the future is a Mercedes-Benz that drives itself," declared Dr Wolfgang Bernhard, Daimler's board member responsible for trucks and buses. And the afternoon demonstration vindicated his statement. With around 40 vehicles in a traffic flow, the automated Actros truck, equipped with Mercedes' so-called Highway Pilot, maintained position in the middle of the pack.

Driving, but not as we know it

Its driver was on board and in his seat, but rotated through 45°, attending to paperwork. The truck autonomously managed any required changes in speed and direction. And get this: it was the first to react to a blue light vehicle approaching from the rear, which it had detected electronically.

Not only is the technology clever, but it is also pragmatic. A close alternative, platooning (road trains), in which vehicles automatically follow a lead unit driven by a professional driver, are fraught with infrastructure issues, and concerns over compatibility with other road users. All these have been neatly



Reality

sidestepped by Daimler in favour of a fully autonomous truck that is 'aware' of other vehicles, obstacles and infrastructure around it.

Using established technology, but also some novel implementations, Future Truck 2025 sets out to show what can be done if public opinion and the legislators come to the party. Pressure groups' concerns around safety – and those of fleet engineers and drivers, too – may well present stumbling blocks. However, the regulatory framework is already creeping in the right direction, according to Sven Ennerst, head of truck product engineering and global procurement for Daimler Trucks.

"Legislation needs to be adapted to this new dimension in driving," he agrees. "But a further development of the 1968 Vienna Convention on Road Traffic, which almost all European countries have signed and implemented, is already underway." How so? Unsurprisingly, its core principle – that the driver must have control of the vehicle at all times –

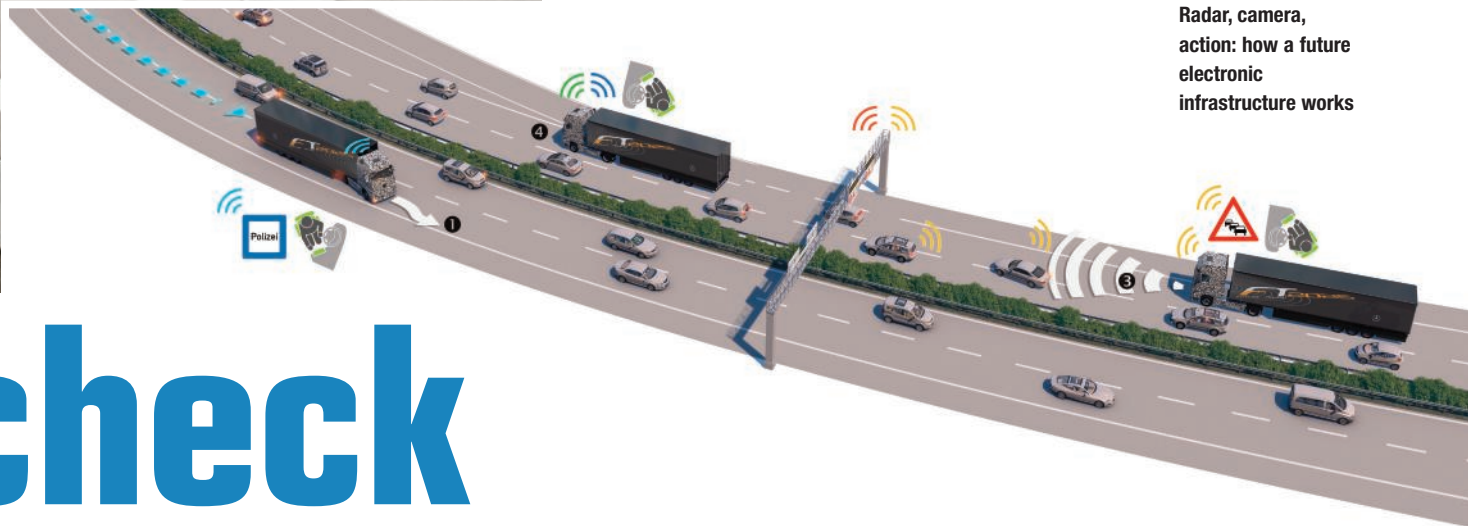


current conventional road space. This is an alternative to laying more, or specialised, blacktop. Prof Dr Uwe Clausen is director of the Institute for Transport Logistics at TU Dortmund University, and he sees AD as the simplest route to efficient use of resources. "Logistics systems need to embrace an international standard of cyber-physical information, like the internet," he says. Humble freight containers need to get smarter and transmit real-time data on their position, contents, temperature, etc, so joining an automated freight network, driven by AD trucks.

Ulrich Bastert, head of marketing and sales at Mercedes-Benz Trucks, agrees. "Systems like [autonomous emergency braking, AEB] could eventually become redundant, as data sharing between AD trucks and other vehicles would design out emergencies," he asserts.

To avoid a tabloid headline shocker and public outcry, seat occupation detection, belt engagement

Radar, camera, action: how a future electronic infrastructure works



check

is at odds with automatic steering. But modifications have been, and continue to be made, to this legislation. UN/ECE Regulation R 79 for steering systems made space for park assist systems, but limiting the speeds to 10kph.

Legislative landscape

So Ennerst believes the legislative door is ajar. He also points out that the Vienna Convention came about at a time when AD was still science fiction. Usefully, the USA was never a signatory, so several American states have been able to progress to trial operations of autonomous vehicles on public roads. It works. "Drivers like and trust the current range of assist systems, and autopilots have been used in aviation and shipping for years. We need to catch up," says Ennerst.

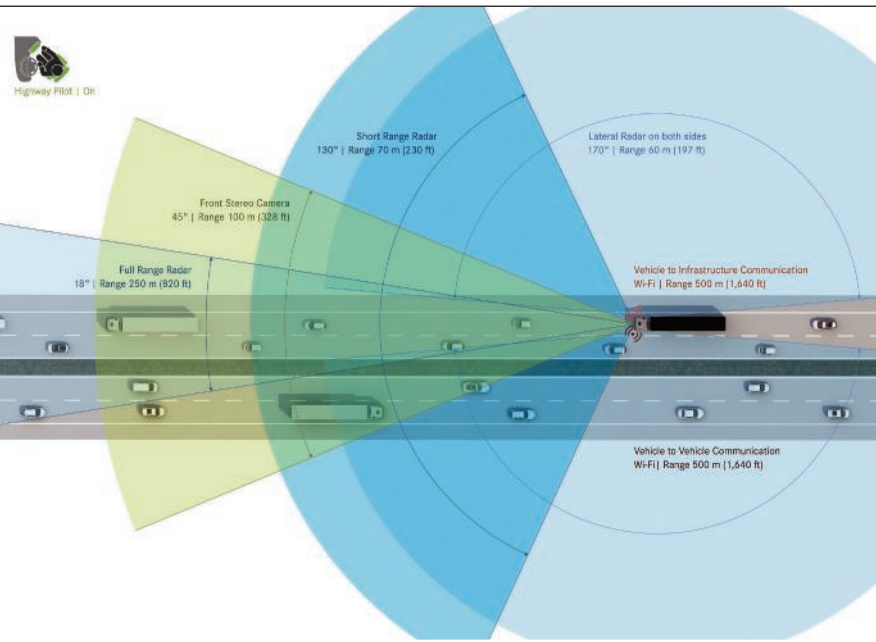
Why do it? Increased productivity – even compliance and safety – are the goals, but Daimler's developments also pursue the more efficient use of

and scanned eyes would together ensure that a driver hadn't gone the whole hog and climbed into the bunk. And, as for improving road capacity, with a growing population of AD vehicles, average distances between them would shrink, making better use of the existing road space, insists Clausen.

What of the underpinning technology? The entire system relies on an advanced connectivity and, in the event of a system crash, fail-safety. Prof Dr Sabina Jeschke, from the mechanical engineering faculty at Aachen University, believes we are ready and that this is the dawn of a fourth industrial revolution. Mechanical production, centralised electric power and digital computing gave rise to the first three. The information revolution, where everyone and everything is networked, is the fourth.

"We are entering a new era in artificial intelligence, namely mass networking," says Jeschke.

"It means an expansion of the internet where the participants are no longer just people, but also



Driving change with a combination of short- and long-range radar, stereo vision and Wi-Fi data sources

things, such as the sensor systems in a truck.”

And so to Daimler’s prototype AD truck. A mix of cameras and radar sensors keeps it on course. While existing PPC (predictive powertrain control) looks ahead 3km and manages the transmission, a radar sensor in the grille scans the road immediately ahead. This has a range of 250m, scanning an 18° segment, with an additional short-range sensor covering 70m and a 130° view. This radar sensor is already used in proximity control and AEB (EBA,

emergency brake assist, in Mercedes-Benz parlance).

But the road is also scanned by a stereo camera (developed from the mono version in lane assist) with a range of 100m, and a scope of 45° horizontal and 27° vertical. It identifies lanes, pedestrians, moving and stationary objects, the condition of the road surface and information on traffic signs. Meanwhile, data from side sensors is fused to present a complete picture, which can also be shared with other AD vehicles.

Stage is set

The full technical specification is long, and the complete story will be unveiled at the Hanover IAA commercial vehicle show (25 September to 2 October). Daimler’s demonstration was impressive, and certainly good theatre. It shows that for AD trucks to be successful, they need networked sensors and intelligence capable of interacting across vehicles, which can also co-exist safely with conventional traffic.

In the sci-fi movie Terminator 2, the intelligent machines become self-aware and take over the world. Their hapless human creators panic, and try to pull the plug, but it’s already too late. It’s complete fiction, of course... **TE**

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