

Legislation, cost cutting and even tails wagging dogs are among the headaches for vehicle constructors in the fire and ambulance sectors.

Brian Tingham reports

RAPID

The overriding priority for the emergency services – particularly ambulance and fire and rescue crews – is saving lives. So that primary function should drive every aspect of vehicle specification, build and maintenance. Obvious? Yes, of course. Yet, a combination of custom and practice, cost cutting and, ironically, even legislation and advancing technology, are in some instances getting in the way.

How? Because they're conspiring on the one hand to squeeze engineering innovation and competition, and, on the other, to hinder these vehicles' driving progress. No doubt both are unintended consequences, but they're happening nonetheless. So why?

Gary Stephenson, special vehicles engineering manager at Cartwright, has

a wealth of experience in blues and twos, including formerly with O&H Vehicle Conversions and Alexander Dennis on its fire side. He gives the example of specifications for ambulances apparently written less by fleet engineers and more by paramedics and administrators. These may not only turn out to be unrealistic, but can also sap engineering attention and cost.

"Ambulances need to run at 3.5 tonnes gvw so that trusts don't fall under the O licensing regime," he explains. "But adequate base vans start at 2.24 tonnes. So, by the time you get the conversions robust enough for the duty, and then accommodate their growing on-board equipment wish lists, there may be less than 100kg left for a patient. That's not enough."

And there's more. Given the lack of

vehicle standards across regional ambulance services, many projects are individual, which adds to administration, engineering and test effort. "Even trivial differences – such as locations of grab handles – have their type approval implications, and hence additional time and cost."

Stephenson is not denying there needs to be a range of vehicle specs and associated equipment to suit regional differences, in terms of fleet make-up, geographical coverage and their mix of rural, urban and city operations. However, bowing to local whim, rather than policy-driven norms, has driven many converters out of the sector and forced others solely into reactive mode. "Too many spend their engineering hours just meeting what [the ambulance services] say they want,

Electronic stability control

ESP (electronic stability programme), mandatory on all new CVs since 2014, can be construed as both a blessing and a curse. Whereas EBS (electronic braking system) and traction control enabled vehicles to be driven faster, ESP slows them down. And for fire appliances, that is bad news.

"In EFAD mode, drivers encountering sharp bends and roundabouts are likely to initiate ESP," observes Scania's David Pinner. ESP kicks in when it detects that the vehicle is not going in the same direction as the steering. It does so by monitoring vehicle yaw (chassis roll sensor) and steering angle (steering column encoder).

"First it reduces the engine torque and then it brakes individual wheels to regain stability," he says. Clearly, the result is vehicle velocities reduce just when drivers are

demanding the opposite. "ESP has a dramatic effect on their ability to drive as aggressively as they would like and has been the subject of considerable debate."

The point: given that fire service vehicles are not bound by WVTA, so are exempt from ESP regulations, they aren't mandated to install it. "So our approach is that we will build fire chassis without AEB, ESP or LDW if brigades wish, but we require an authorised signatory to a legal disclaimer."

But last September, Scania hired the outer handling circuit at Millbrook to train brigade drivers and senior instructors in EFAD driving with ESP, using fully freighted, Euro 6 donor fire appliances. It was a proactive stance for safety – and, since the event, ESP has been unanimously approved by the Chief Fire Officers Association for all fire and rescue vehicles.

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RESPONSE



Body conversion business Pickup Systems has developed a compact fire-fighting vehicle based on the Mercedes-Benz Sprinter chassis. The vehicle is based on the 5-tonne 519 CDI, powered by a 190bhp Euro 6 engine, driving through an automatic or six-speed manual transmission. It has a factory-built steel crew cab with seating for up to five. The body is constructed from high-strength polypropylene and includes lockers and drawers to carry tools and equipment, as well as an 800-litre water tank and Godiva KP2 PTO-powered pump. A nine-metre ladder is stowed on the roof.

“We believe there’s a growing need for a smaller, lighter, more efficient vehicle, one that provides a high level of firefighting ability but with much lower running costs,” says Pickup’s managing director John McGauley. “Our Mercedes-Benz Sprinter conversion meets this requirement perfectly.”

rather than coming up with better solutions. Most just can’t free think.”

FIRE SERVICE

David Pinner, sales manager for Scania specialist vehicles, sees similarities in the way fire and rescue vehicles are specified. It’s the result, he’s sure, of a desire to put lives before cost savings – and hence fire officers ahead of fleet engineers. Laudable, certainly, but he also observes anomalies around vehicle compliance, and ultimately performance and potentially even safety.

He points to the demands of EFAD (emergency fire appliance driving) and the EN 1846-3:2013 directive ‘Fire fighting and rescue service vehicles,

permanently installed equipment, safety and performance’. Together these rightly dictate that vehicles must be capable of safely handling and withstanding fast and aggressive driving. From a design perspective, that means, for example, at least 10% greater tolerances on axle loadings, etc, than in general haulage.

Yet, while these vehicles are also subject to C&U (construction and use) regulations, they do not fall under the strictures of WVTA (whole vehicle type approval). Furthermore, although vehicle technology is constantly evolving, EN 1846-3 is getting long in the tooth. “As a result, some [but not all] brigades buying new specification vehicles may put their first unit through VCA [Vehicle

Certification Agency] testing to record a level of safety compliance,” observes Pinner. “However, there’s no requirement, and many might wonder whether that’s good enough practice?”

Scania’s (albeit partial) solution is its modular approach, which sees fire appliances and support vehicles configured from the same components and assemblies as chassis cabs for other duties. Indeed, even its crew cab is factory fitted, not a conversion job. Clearly, certainty of integrity and compliance at the chassis cab stage cannot take account of the body, as determined by WVTA, but it’s a strong foundation.

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more than 100 years so we’ve done a lot to adapt our factory-fit standards for fire services’ and bodybuilders’ wishes,” comments Pinner. And he explains that adaptations range from building-in crew cab anchor points for breathing apparatus, to uprating front axles – typically from 6.3 to 7.5 tonnes (and tyres from 275/70 to 315/70) – and relocating AdBlue tanks within chassis frames. The latter enables bodybuilders to maximise all-important side locker space for stowage on pumping appliances.

Equally, Scania has fire-specific CANbus software that caters, for example, for the integration required between air suspension (where fitted), pumping equipment, PTOs (power takeoffs) and foundation brakes. “We also offer bodybuilders a range of adjustable parameters... And we have four centres of emergency service excellence which specialise in prepping vehicles for bodybuilders. That way, they can check equipment for correct functioning before they send finished vehicles to PDI [pre-delivery inspection].”

AMBULANCE SERVICES

Returning to ambulances, Cartwright’s Stephenson again laments the lack of novel engineering, pointing to work by the Royal College of Art back in 2007–2010 as the last serious attempt at design development. “The industry needs innovation, but it’s not happening. Equipment suppliers are down to the same few – and not many even think, for example, about weight reduction. Meanwhile, equipment lists are growing, base vehicle weights are rising [because of Euro 6], and people are getting heavier, with bariatric care at the extreme. Converters can only do so much without solid R&D.”

You feel his pain. He points to the fact that the services mostly specify van conversions, rather than chassis cabs with bespoke bodies, because of



inevitably higher costs with the latter. Yet vans are increasingly subject to lightweighting, to maximise payload and minimise fuel consumption. “Think about crash testing legislation. Ambulances need to accommodate wheelchair patients who might weigh up to 200kg. So floor structures that have been pared

back by the OEMs to reduce weight, must be beefed up again to ensure vehicle integrity. It’s Catch 22.”

Stephenson applauds trusts that are actively reviewing vehicle and equipment policies and specifications. Some, he says, are now accepting near-universal ambulances may no longer be





Clockwise from top left: A&E ambulance developed by Iveco and Cartwright, based on a Daily 50C17 chassis with Cartwright body harnessing high-strength FRP (fibre-reinforced plastic) laminates and VEKA aluminium extrusions; Scania fire appliances; Terberg's Mercedes-Benz Sprinter-based Telstar unit; and a Volvo pumping appliance

for example, we're also looking at high-tensile steels, not just aluminium, for bodywork. We're revamping the face of van-derived ambulances - and the next project will be to revisit modular bodies on chassis cabs."

Expect something like Fiat Ducato front ends bolted to AL-KO ladder-frame chassis with VB rear air suspension, mounted with modular fibreglass box bodies. Obvious advantages are bound to include the inherently beneficial clinical aspects of GRP - corners and joining surfaces minimised, etc - as well as increased space, and improved control over weight and its distribution.

Getting it right, though, isn't going to be a five-minute job. Quite apart from the requirements of WVTA and CEM (crash energy management) testing, one aspect still to nail will be rollover protection. "That's already built into vans, but few converters - other than those in the bus market - consider rollovers on GRP-bodied vehicles. So we're investing in designs and engineered polymers that will enable our new system to pass."

An expensive business for just one market? It would be, but Cartwright's new GRP pods will be multi-purpose. Beyond ambulance builds, other sectors in its sights include small distribution rigids, home goods delivery vehicles, fire and rescue support units, welfare vehicles, and others for the police and military. [TE](#)

viable. Given an overarching need to keep vehicles available while also respecting budgetary constraints, a mix of general front-line units plus others designed for specialist roles probably makes most sense.

Back to basics though, and, for converters, building to requirement starts with selecting the right vans. Stephenson says they're much of a muchness, although he favours the Peugeot Boxer and Fiat Ducato. "They're easier to work on: easier datum points, reinforcements for anchor points in the right places... Iveco is looking good, too, with the truck-style ladder chassis construction on its New Daily."

Other key considerations include the location of cant rails and the floor architecture and underside detail. "What will it take to make that floor flat? Is the structure strong enough? Will centre

tracking fixings interfere with brake lines, fuel pipes, hand brake cable, etc, underneath? And will we need to drop the exhaust? Customers are unlikely to want to pay for any of that."

NOISY INNOVATION

He also draws attention to issues ranging from the usual clinical anti-bacterial and washdown surface standards to an increasing requirement for ambient internal noise reduction - with a design goal now of 60dBA. "We can't just use rockwool to achieve that, so we're looking at everything from door fittings to deadening pads and systems to reduce the noise frequencies."

Smacks of engineering innovation? Stephenson smiles: "Cartwright is a big organisation, so there's a huge development budget compared to most converters. That's why I moved here. So,