Fleet & Safety

Sponsored by VOLVO

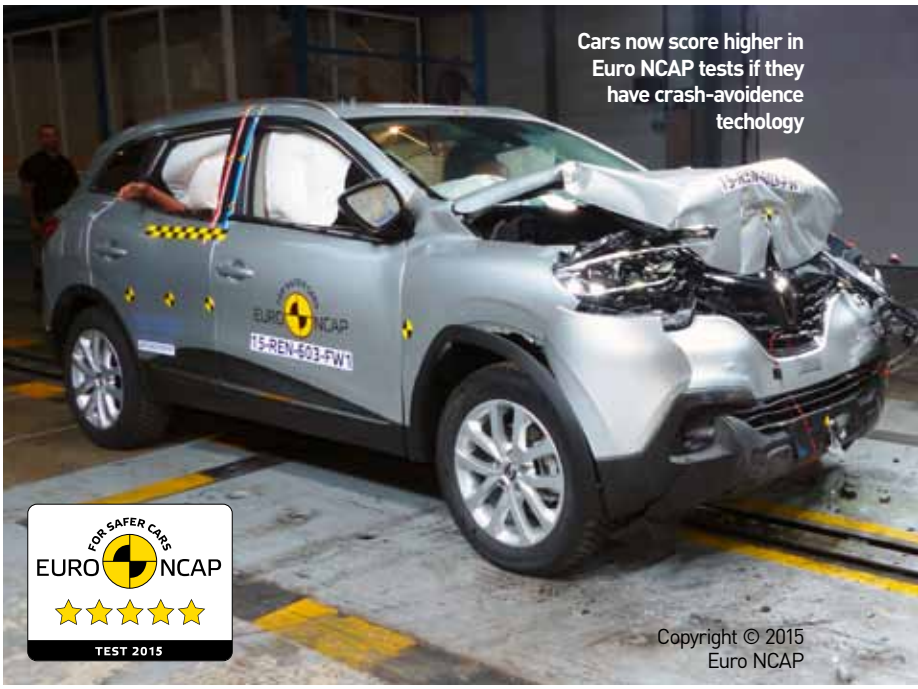
INSIDE

What makes a car a five-star safety winner?

Many fleets use the Euro NCAP star rating system to influence their choice of company cars. *Christopher Smith* investigates how it works – and how changing technology has shaped the testing procedure

NEED TO KNOW

- Star ratings replaced by percentage scores
- Autonomous emergency braking added to test last year
- Report now 10 pages long – up from one-page in 1997



Cars now score higher in Euro NCAP tests if they have crash-avoidence techology

It's generally accepted that the more stars from Euro NCAP a car achieves, the safer it is.

To an extent, that's true – but a five-star car tested today is in no way comparable to the first car to achieve a five-star rating, the Renault Laguna, in 2001.

Launched in 1997, off the back of a UK Department for Transport pilot test with six superminis, Euro NCAP has now tested more than 500 cars. The programme is operated independently from Brussels, with a number of partner members made up of governments, research bodies and automotive associations.

There are six test facilities across Europe, including Thatcham Research in the UK.

Each partner member funds the testing of at least one model per year, although car manufacturers can sponsor their own cars. The process is the same, regardless of funding, and the process remains independent from manufacturers. Once a model has been chosen for testing, Euro NCAP will look at manufacturer data on the best-selling variants across Europe, to select one particular variant for testing.

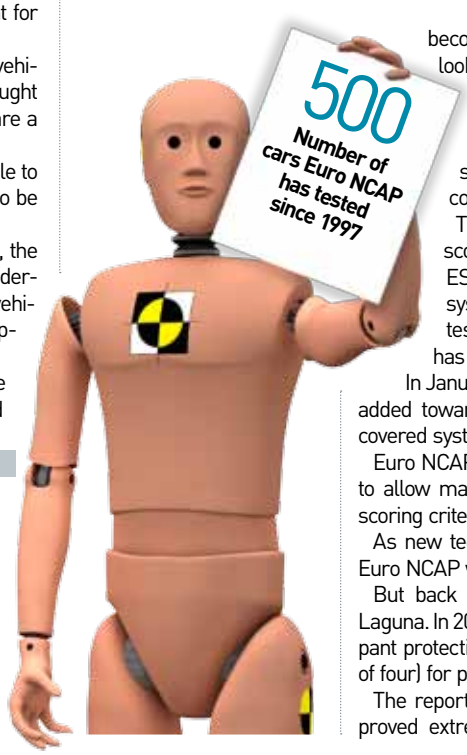
Euro NCAP testing generally makes use of up to four vehicles, which, if the vehicle is already on sale, will be bought anonymously from dealerships to ensure the results are a fair sample of production vehicles.

Vehicles have to be fully type approved, legally saleable to the general public and from the main production run to be tested under the scheme.

As vehicle safety and the scheme itself have evolved, the number of areas tested in a vehicle has changed considerably. Euro NCAP recommends that, when comparing vehicles, the full score is taken into account, not just the top-level star rating.

Euro NCAP has a history of adding new criteria to the test, and today, as safety technologies develop and become more mainstream in the market, the body looks to integrate them within the assessment process, so that they can count towards overall scores.

"As new technologies grow and develop, it's certain that Euro NCAP will update its testing procedures to follow"



Points for driver assistance technologies, such as the presence of electronic stability control (ESC), were introduced in 2009.

Three years later, ESC testing was added to the scoring process. No longer was the presence of ESC adequate to achieve the score – the ESC system had to perform well in a robot-controlled test. However, now that ESC is a mandatory fit, it has been removed from the test.

In January 2014, autonomous emergency braking was added towards the overall star rating. The addition also covered systems including lane departure warnings.

Euro NCAP began testing in 2013, ahead of the inclusion, to allow manufacturers and industry to understand their scoring criteria, and to provide a baseline level.

As new technologies grow and develop, it's certain that Euro NCAP will update its testing procedures to follow.

But back to the first five-star car for a moment: the Laguna. In 2001, it achieved its five-star rating for adult occupant protection, yet only a two-star rating (out of four) for pedestrian protection.

The report at the time said: "The car body proved extremely stable and provided good

HOW DOES EURO NCAP DESCRIBE ITS STAR RATINGS?

The scores from all four assessment areas are aggregated, to award a headline star rating – allowing an easy level of understanding at a glance.

★★★★★ **Overall good performance in crash protection. Well equipped with robust crash avoidance technology**

★★★★☆ **Overall good performance in crash protection; additional crash avoidance technology may be present**

★★★☆☆ **Average to good occupant protection but lacking crash avoidance technology**

★★☆☆☆ **Nominal crash protection but lacking crash avoidance technology**

★☆☆☆☆ **Marginal crash protection**

WHAT THE ASSESSMENT AREAS TEST

Several tests take place for each rating area. The overall score for each area is then converted to a percentage, and the percentage scores for each area contribute to the star rating.

Adult occupant protection

These tests are typically the type you would associate with a 'crash test'. Two frontal impact tests take place. The first test, at 40mph, involves 40% of the front of the car making impact with a deformable barrier, which Euro NCAP says is consistent with most head-on collisions. This type of incident is responsible for more deaths or serious injuries than any other type of accident.

New for 2015 is a 31mph impact into a full width, rigid barrier. As cars have become stiffer, this test looks at deceleration after impact, to ensure the seatbelts and other restraints are actively protecting vulnerable passengers from severe injuries.

In addition, there are side tests: one where the car impacts a pole at 20mph, and the other where a side barrier impacts the car at 30mph.

This assessment area also looks at the effectiveness of city autonomous emergency braking, while seats and head restraints are tested for protection against whiplash.

Child occupant protection

The child occupant protection assessment area investigates the performance of child restraint systems and car seats in both the front and side impact tests used by the adult occupant assessments. A range of car seats and child restraints are tested, in a number of positions throughout the vehicle. Points are also given for use of Isofix fixings for child seats, clear labelling for front airbag deactivation and ease of seat installation.

Pedestrian protection

Pedestrian protection assessment area looks at three points of impact – the head, upper leg and lower leg. Tests assess the potential risk to injury from the front of the vehicle, including bumpers, bonnet, and windscreens. Pedestrians are involved in 14% of all road casualties.

Safety assist

The safety assist assessment area looks at the most important technologies that help avoid accidents and reduce injuries.

Interurban autonomous emergency braking is investigated – it operates at higher speeds than the city braking systems tested under the adult occupant strand. Three scenarios are tested, and the automatic brake and collision warning notifications are assessed.

Euro NCAP says the seatbelt remains the single most effective item of safety equipment in cars, so this element of testing also assesses the volume and duration of reminder alerts.

The fitment of speed assistance systems, that notifies drivers of speed limits on the road the car is driving on, or when the car exceeds a preset threshold, is positively rewarded, while lane departure warning and lane keep support also receive credit.

SPONSOR'S COMMENT

Selwyn Cooper, head of business sales, Volvo Car UK

Volvo Car's philosophy has always been to put people first: to pioneer innovations for a safer, cleaner, more enjoyable future. What will people need? How will they drive? To answer these questions, it's sometimes necessary to challenge convention, to find a new path.

■ **Reclaim your time.** In a self-driving Volvo car you will be able to spend the time on your commute as you want. With the average commute taking about 50 minutes, this will have a huge impact on our lives.

■ **Save fuel.** A self-driving car is likely to use less fuel. It will know where it is and what's ahead, and be able to optimise the behaviour of the brakes, powertrain and transmission to make progress as smooth and efficient as possible.

■ **Safer journeys.** Fully autonomous cars will be even better at avoiding potential collisions than today's Volvos. Almost all road accidents are caused by human error, so journeys will be safer for everyone.

■ **Sit back and relax.** In an autonomous car you'll be able to truly relax. Your car will be able to drive the most boring parts of your commute for you and long journeys will be effortless, so you will always arrive fresh at your destination.

■ **Always find a parking space.** In the future, you'll be able to let your car park itself, while you get on with other things. Autonomous cars will be able to find and park in a space, and even drop you off where you want to go first.

■ **Lower insurance premiums.** Insurance premiums for self-driving cars could be much lower in the future. Autonomous technology won't get tired or distracted, greatly reducing the chance of a costly collision.

Autonomous technology is changing the way we travel, and the world, for good. And with Volvo Cars stating it will take full liability when the car is in autonomous mode, we are sure to see much debate in the coming years.

Find out more at: volvocars.co.uk/business or call the Volvo Car Business Centre on 0345 600


Renault Laguna 2001: the first model to achieve five stars for the Euro NCAP standard

protection for occupants." The car also included side-curtain airbags, contributing to its high score. When it came to pedestrian protection, however, the report said "the front of the car is unforgiving".

Fast-forward to 2015, and the 2001 single-page report has given way to a comprehensive 10-page document. The Renault Kadjar, which could be seen as the Laguna's equivalent in the present day Renault line-up, has just been awarded an overall five-star rating.

The stars have given way in assessment areas for percentage scores – they allow much more precise variation in the awards given.

For example, the Kadjar receives an adult occupant score of 89%, and a pedestrian protection score of 74%.

Like the Laguna, the passenger compartment remained stable, but the vehicle was tested in many more areas in far more detail.

On the Kadjar, "the driver dummy scores maximum points".

Fourteen years after the original test, the Kadjar's bumper fared well, providing "good protection for pedestrians' legs and scoring maximum points".

Not present in the 2001 report were the assessment areas for child occupant protection, and safety assist systems.

In the Kadjar's case, autonomous emergency braking isn't standard and isn't expected to be fitted to most cars, so it wasn't tested.

However, lane departure warning and speed assistance systems were optional, but likely to be fitted to most models, so they made the cut.

Discovering how much damage a car would cause to the limbs of a human, in cold, technical language can make grim reading, but the essential testing Euro NCAP facilitates is making death and serious injury from collisions much less likely than it would have been in the past.

For a full table of Euro NCAP results and video footage, go to: fleetnews.co.uk/cars/euro-ncap

FIVE OF THE BEST: EURO NCAP'S SAFEST CARS OF 2015

VOLVO XC90

97% Adult occupant protection

Euro NCAP said the XC90 offered good protection for adult occupants, with the passenger compartment remaining stable throughout impact. Autonomous emergency braking is standard, to help reduce whiplash, and it activated before collision in all of Euro NCAP's tests.

87% Child occupant

Child dummies were mounted using easily installed fixings in both second and third row seats, with good protection of the body.

72% Pedestrian

The bumper was said to protect pedestrian legs well, and the bonnet offered good or adequate head protection. Euro NCAP praised the autonomous braking system's pedestrian detection, but added that the pedestrian detection system had not become part of testing at the time it took place.

100% Safety assist

The car achieved a full score in this category because all the systems assessed by NCAP are standard fit across the XC90 range. The car's systems managed to avoid collisions at all speeds and in all scenarios tested.

TOYOTA AVENSIS

Adult occupant	93%
Child occupant	85%
Pedestrian	78%
Safety assist	81%

HONDA JAZZ

Adult occupant	93%
Child occupant	85%
Pedestrian	73%
Safety assist	71%

AUDI Q7

Adult occupant	94%
Child occupant	88%
Pedestrian	70%
Safety assist	76%

SUZUKI VITARA

Adult occupant	89%
Child occupant	85%
Pedestrian	76%
Safety assist	75%

FLEET CASE STUDY: IAM

The Institute of Advanced Motorists (IAM) operates a fleet with a minimum five-star NCAP rating policy.

Vehicles joining the choice list (made up of eight different makes and models) must have achieved the rating.

Lesley Upham, commercial director at IAM (and a former commercial director at Thatcham Research), feels the standard is essential. "We do believe it's best practice," she says. "One of the things we're looking to ensure with our internal staff is that every aspect of our their journey is covered. We're very keen on driver training and journey planning, as you'd expect, but a big part of safety comes down to the vehicle.

"It's making certain that they are in a vehicle that offers them the best opportunity for safety. If you think about the NCAP safety system, it's not just about the driver, it looks at pedestrians.

"Our staff also drive those vehicles when they have their families with them, so the child protection element is important to us."

"A big part of safety comes down to the vehicle"

Lesley Upham, IAM


VOLVO
CONFIDENCE COMES FROM WITHIN.
THE ALL-NEW VOLVO XC90.
Leading a business takes confidence. And that, in turn, requires a little room to reflect. That's why the all-new Volvo XC90 is designed to provide the perfect environment for contemplation. Its intuitive communications technology keeps you connected to your professional world, while its effortless drive connects you to the road ahead; an intelligent blend of human and machine combines to deliver you to your destination assured, composed and inspired.
SEARCH ALL-NEW XC90
OR CALL THE VOLVO CAR BUSINESS CENTRE
ON 0345 600 4027
Auto EXPRESS
NEW CAR AWARDS
WINNER
2015
Official fuel consumption for the all-new Volvo XC90 in MPG (l/100km) ranges from: Urban 28.8 (9.8) – 45.6 (6.2), Extra Urban 40.4 (7.9) – 52.3 (5.4), Combined 35.3 (8.0) – 134.5 (2.1). CO_2 emissions 186 – 49g/km. MPG figures are obtained from laboratory testing intended for comparisons between vehicles and may not reflect real driving results.

Removing the risk of hands-free phones

Although legal, hands-free phones carry the same driving risks as handheld counterparts, leading some fleets to ban their use entirely. *Andrew Ryan* reports

NEED TO KNOW

- **Convictions for mobile use while driving halved since 2009**
- **Fears police manpower cuts mean lack of enforcement**
- **Fines can reach £2,500 for use in commercial vehicles**

Drivers breaking the law by using handheld mobile phones have been a constant fixture in the headlines since the practice was banned in 2003.

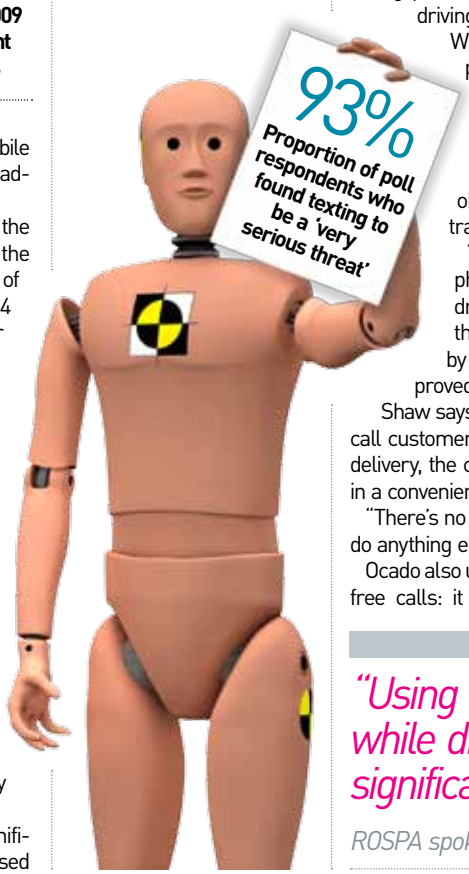
Research by the RAC recently highlighted the scale of the problem while also suggesting the situation was improving. Its figures show the number of people convicted for the offence between 2009 and 2014 almost halved from 32,751 to 17,141. In addition, fewer drivers have been fined at the roadside for the offence.

However, the organisation claims both reductions are partly due to the police being forced to turn a blind eye because of a shortage of manpower.

Meanwhile, research by the Institute of Advanced Motorists (IAM) found motorists are now more worried about the dangers of distraction posed by technology and social media than drink-driving. Its Safety Culture Index report found text messaging and social media are the two biggest factors threatening drivers' personal safety, with more than 90% claiming these to be a 'very or somewhat serious' threat.

The risks of distraction caused by mobile phones is not constrained purely to handheld phones, however, and road safety organisations Brake and the Royal Society of the Prevention of Accidents (ROSPA) are both calling for the use of hands-free devices – currently permitted – to be made illegal.

"Using a hands-free phone while driving does not significantly reduce the risks, because the problems are caused mainly by the mental distraction and divided attention of taking part in a phone conversation at the same time as driving," says a ROSPA spokesman.



While it is not illegal to use hands-free mobile phones while behind the wheel, a number of fleets have voluntarily introduced blanket bans on drivers using mobiles to reduce risk, including online grocer Ocado.

"Using handheld phones while driving is obviously illegal," says Neil Shaw, head of training and development at Ocado.

"We've also banned the use of hands-free phones because they are a distraction: if the driver is involved in a serious or fatal collision then they could be prosecuted for causing death by careless driving or another charge if they are proved to be using hands-free."

Shaw says that while Ocado's drivers need to be able to call customers if they are running late for their scheduled delivery, the company tells them to pull off the road safely in a convenient place before using their phone.

"There's no pressure from the business for employees to do anything else," he says.

Ocado also uses technology to stop drivers making hands-free calls: it uses mobile phones without the Bluetooth

> *"Using a hands-free phone while driving does not significantly reduce the risks"*
>
> *ROSPA spokesman*

facility to connect to a vehicle. "We don't issue smartphones to our drivers, we issue Nokia 'dumbphones' simply because we don't want people texting, tweeting or emailing while driving, so we remove that temptation," says Shaw.

However, for many fleets opting for a 'dumbphone' is not feasible, as some drivers need the extra functions available through smartphones for their work. This is the case for company car drivers employed by Post Office, which introduced a blanket ban on drivers using hands-free mobile phones around four months ago as just one part of a programme of measures to keep its drivers safe on the road.

Fleet manager Gillian Joyce says drivers' smartphones – Nokia Lumias, which are currently being rolled out across the fleet – allow them to use 'driving mode' which means the handset can be set up not to receive phone calls or texts. "This automatically sends a text message to the person who has tried to call or text our employees to say they are driving and they'll get back to you as soon as they can," she says.

Not all smartphones have this facility, but technology company Romex offers a mobile driver distraction prevention module for its employee management product, which automatically disables employees' mobile phones while they are driving by using GPS to detect movement.

It allows Bluetooth use of the phone to be enabled, depending on individual company policy, but any interaction with the handset is blocked. This means email, text or other notifications are suppressed until the driver is stationary, thus removing the temptation to take their eyes off the road.

Both Ocado and Post Office communicate their policies to drivers, educating them about the risks involved in using hands-free phones.

Enforcement is also important, to ensure the success of the policies, with any employee found breaching the ban at either organisation facing disciplinary action. Punishment at Ocado is anything up to and including dismissal.

"There's no point in having a policy and a process if you don't enforce it," says Shaw.

Ocado also uses technology to police the ban. Its delivery vehicles are fitted with Smart Drive camera systems, which record both what has happened in front of the vehicle and inside the cabin if a G-force sensor detects an event, such as a collision or harsh braking, has taken place.

This function is something Shaw finds particularly useful. "Using this, if something happens we can see if the driver is on a phone," he says.

WHAT IS THE LAW?

The Road Vehicles (Construction and Use) (Amendment) (No. 4) Regulations 2003 prohibit drivers from using a handheld mobile phone, or similar device, while driving. The penalties are a fixed penalty of £60 and three penalty points, or a fine of up to £1,000 if the offender goes to court (£2,500 for drivers of goods vehicles or passenger carrying vehicles with nine or more passenger seats).

WHAT ARE THE RISKS?

The Royal Society for the Prevention of Accidents says drivers who use a mobile phone, whether handheld or hands-free:

- **Are much less aware of what's happening on the road around them.**
- **Fail to maintain proper lane position and steady speed and fail to see road signs.**
- **Are more likely to 'tailgate' the vehicle in front.**
- **React more slowly, take longer to brake and longer to stop.**
- **Are more likely to enter unsafe gaps in traffic.**
- **Feel more stressed and frustrated.**

Meanwhile, tests by the Transport Research Laboratory showed drivers on handheld mobiles had slower reaction times than those under the infuence of alcohol.

17,141

Number of people convicted of driving while using a mobile device in 2014

WHEN IT COMES TO SAFETY, WE'RE AN ALL-STAR TEAM.

Volvo has always been committed to safety. Here's what that means on a day-to-day basis.

How many car manufacturers would employ a team of people to visit every road accident involving one of its models within a 60-mile radius of its headquarters?

The answer is only one: Volvo Cars. As a result, the company remains at the forefront of pioneering vehicle safety that is saving lives around the world.

If that sounds too bold a claim, consider this. By 2020, it is Volvo Car's ambition that no one will be killed or seriously injured while travelling in one of its new cars.

That is a significant target, and the company is well on the way to reaching it. This is reflected in its Euro NCAP results, where every Volvo car tested since 2009 has achieved the top five-star rating.

The most recent Volvo car to be tested by Euro NCAP is the all-new XC90. As part of a stunning performance overall, the car scored 100 per cent in the recently-introduced Autonomous Emergency Braking (AEB) test thanks to its use of City Safety.

City Safety is standard across the range, and helps drivers avoid low-speed collisions. It uses a sensor to monitor the road ahead. When a crash looks likely, the brakes are pre-charged to work more effectively if the driver applies them in a hurry. But if the driver doesn't intervene, City Safety applies the brakes anyway. At speeds of less than 31 mph, this brings the car to a stop and prevents the accident. When travelling at higher speeds, it significantly reduces the force of the impact.

How does Volvo know features like City Safety will be successful when they finally make it onto production cars? The answer lies in the work carried out at its extensive crash-test laboratory in Gothenburg, Sweden. Here, people like crash-tester Anders Kling, Senior Engineer - Volvo Cars Safety Centre, spend their lives assessing the safety credentials of Volvo cars old and new, and coming up with ideas for new life-saving features.

"We carry out one or two crash tests in our facility each day," he reports. "These involve lots of different types of cars. We use some of our older models, to see how they fare in an accident once they've been on the road for a while. We also regularly examine our very latest models, and invest a great deal in testing cars that are not yet in full production, to be certain they are at the cutting edge of safety when they make it out on the road."

This rigorous approach underscores Volvo's track record in vehicle safety. By monitoring more than 100 different aspects of a vehicle's response to a crash, its technicians are able constantly to improve standards, creating cars that are even safer than their predecessors in the Volvo car line-up.

Moreover, the company doesn't just rely on its own simulated crash results in the quest for ever-higher standards of safety. It also learns a great deal from its unique team of accident investigators who travel far and wide to undertake first-hand analysis of real-world crashes.

Over the last 40 years, the Accident Research Team has visited more than 40,000 incidents involving Volvo cars in an effort to learn from them. When an accident happens, the specialist investigators are called on an official emergency hotline and the police try not to move any of the vehicles involved until they arrive.

After examining the scene and interviewing police, witnesses and (if possible) the people involved in the accident, investigators take the crashed car back to HQ for further testing. The result is a much deeper understanding of the vehicle's performance in a collision, and valuable lessons for the development of future models.

This is quite some commitment, but Anders Kling says it is well worth the effort: "We can save lives by fully understanding how our cars perform in the event of a crash. So while our work may be painstaking and demanding, it is making a real difference to road safety around the world. That's the Volvo way, and we're proud to be a part of it."

Road designs for life

Advanced vehicle technologies may grab the headlines when talking about reducing accidents, but low-cost improvements to the road network can have dramatic benefits. *Andrew Ryan* reports

NEED TO KNOW

- Cuts in fatalities achieved from road design changes
- Euro RAP scheme to rate roads for safety
- Road marking improvements needed to match technology

Half of all road deaths in the UK take place on just 10% of the country's main road network.

The majority of these incidents are at junctions, with roadside objects or head-on collisions, and occur just outside major towns and cities at speeds where safety equipment such as airbags and crumple zones cannot provide enough protection to the vehicle's occupants.

It means road design has a vital role to play in reducing the number of casualties on UK roads; so much so that international best practice sees the driver, vehicle and road treated as one combined entity when it comes to protecting road users from serious harm.

It also means that targeting problem areas with a range of safety measures – often low-cost – can have a dramatic impact. For example, between 2007 and 2009, there were 12 fatal and serious crashes on the A404 between Amersham and junction 18 of the M25.

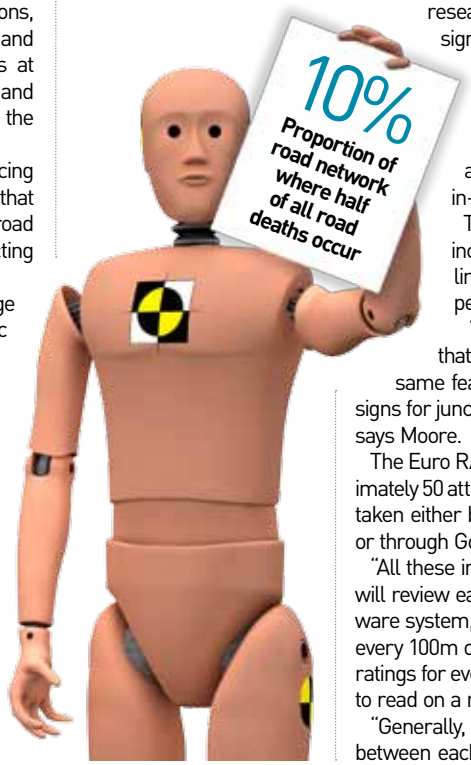
After working with the Road Safety Foundation (RSF), Buckinghamshire and Hertfordshire County Councils introduced a range of measures such as resurfacing, improved road markings, lowering the speed limit and improving crossings on a stretch where pedestrians were especially vulnerable.

These changes led to just one fatal or serious crash taking place on the six-mile stretch of road between 2010 and 2012. "The measures that worked were both low-cost and straightforward," says Caroline Moore, senior research analyst at RSF.

"Our research shows that improving road safety is not down to just one factor, but needs to be treated as a combination of vehicle safety, driver behaviour and road design. There is an element of drivers behaving poorly, but there are also a lot of drivers who just make simple mistakes and, unfortunately, some make mistakes where there's a tree right next to the road, which can lead to serious injuries.

"If that tree was a little further away, or had a barrier in front of it, the outcome of that crash would be very different.

"Also, was it a narrow road? Were the road markings up to scratch? These are some of the things we look at in our research. Not all countermeasures that make a significant difference have to be expensive."



RSF is a founder member of the Euro RAP scheme, which rates the in-built safety of motorways and the A-road network outside urban centres using a five-star ranking, just as the Euro NCAP star rating system rates the in-built safety of vehicles (see page 40).

This covers all aspects of a road's design, including surface and markings, signage, speed limits and traffic calming measures, such as pedestrian crossings and roundabouts.

"If you look at all the single-carriageway roads that aren't medium risk or higher, you see all the same features: wide roads, paved shoulders, warning signs for junctions and T-junctions that have a merge lane," says Moore.

The Euro RAP ratings are calculated by analysing approximately 50 attributes every 100 metres of road, using images taken either by using cars fitted with 360-degree cameras or through Google Streetview.

"All these images go to an office where a team of coders will review each of them and that data gets fed into a software system," says Moore. "This generates star ratings for every 100m of road, but we present our results as average ratings for every three kilometres so it's easier to read on a map.

"Generally, we say that if you improve between each star rating, you will see a 50%

reduction in fatalities, and that's based purely on how well the road is protecting the vehicle if it has a collision and how likely it is that the vehicle will have a crash."

RSF uses its research to support its campaign to improve the safety of existing roads, as well as influence the design of new roads.

It wants all roads to gain a minimum of three stars, an ambition shared by Highways England for its 4,300 miles of motorways and major A-roads.

Highways England aims to ensure that more than 90% of travel on its network is on roads with a safety rating equivalent to three stars by 2020.

This is part of its ambition to reduce the number of people killed or seriously injured on its network by 40% by the end of 2020, with its aim to get as close as possible to zero by 2040.

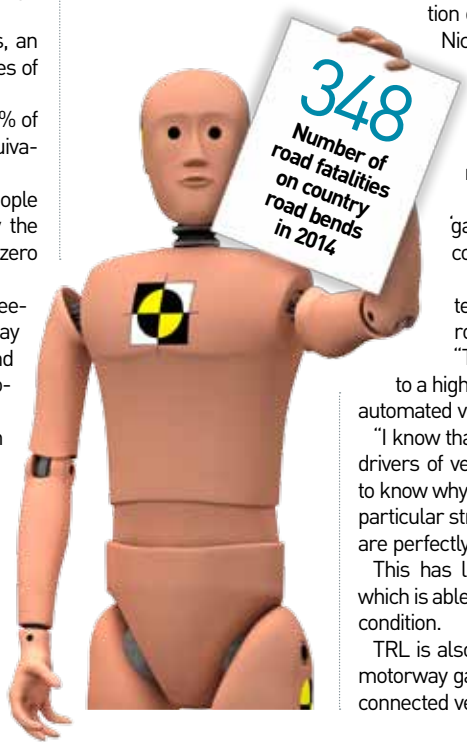
At the moment, 50% of its motorways are rated three-star with the remainder four-star; 78% of dual carriageway A-roads are three-star (four-star 20%, two star 2%); and 35% of single carriageway A-roads are three-star (two-star 62%, with less than 1% one-star).

"While we cannot eliminate risk on our network or in the things that we do, we can recognise it, assess it correctly and take steps to manage or mitigate the dangers," says a spokesman.

"We also aim to improve our information to road users to ensure they better understand how to use our roads, for example the signs they will see on a smart motorway and the variable speed limit signs that help manage traffic flows."

The Transport Research Laboratory (TRL) has been instrumental in the development and introduction of 'smart' motorways, and has also carried out work in other areas of safe road design. This includes psychological traffic calming, which is used to slow traffic down when entering 30mph zones.

"By painting lines on the road to make it feel narrower or the turns feel sharper, you can increase the driver's perception of risk without increasing the actual risk," says Nick Reed, academy director at TRL.



"This encourages the driver to adopt slower speeds and that was shown to be successful in both the simulator and in real life testing, so this is a low-cost way to reduce speeds."

Other psychological measures include creating 'gateways' into villages and using different coloured road surfaces.

Reed says the development of new vehicle technologies has increased the need to focus on road and lane markings.

"There is a need now for lines to be maintained to a higher standard to enable the current generation of automated vehicles to follow those for guidance," he says.

"I know that Highways England receives complaints from drivers of vehicles with lane guidance systems, who want to know why they weren't able to use their driver aid on that particular stretch of the motorway despite the fact the lines are perfectly appropriate for a human driver."

This has led it to develop the MarkingCollector device which is able to monitor a road marking's reflectiveness and condition.

TRL is also looking at how the information presented on motorway gantries can be presented inside a vehicle using connected vehicle technology.

"This would give the driver very specific information about their particular journey, what the current speed limit is and what lanes are appropriate for their travel," says Reed.

While Highways England's road network accounts for only 2% of the country's roads, it carries a third of all national traffic, with four million people driving on it every day.

Despite this volume of traffic, Department for Transport (DfT) statistics showed the Highways England network accounted for 10% of reported casualties in 2013: 47% were on local minor roads and 43% on local major roads.

DfT figures released last month showed that country roads are the deadliest, with an average of three people dying on them every day last year.

In total, 1,040 people were killed and 9,051 seriously injured on country roads in 2014, with a third (348) of fatalities occurring on a bend.

"Sometimes we will flag up a poor performing single carriageway, and the relevant authority will say it will carry out an education campaign for motorcyclists, or it's trying to tackle speeding with cameras, but we come from the angle that it could do more with the road design," says Moore.

Prototype MarkingCollector device mounted on a survey vehicle

"Road safety is not down to just one factor, but needs to be treated as a combination of vehicle safety, driver behaviour and road design"

Caroline Moore, RSF

ESTIMATED COSTS FOR REDUCING HEAD-ON CRASHES

Countermeasure	Casualty reduction	Cost
Delineation	10-25%	Low
Central hatching	10-25%	Low
Rumble strips	10-25%	Low
Shoulder sealing	25-40%	Medium
Lane widening	25-40%	Medium-high
Median barrier	>60%	High
Additional lane	25-40%	High
Realignment	10-40%	High
Dualling	25-40%	High

ESTIMATED COSTS FOR REDUCING JUNCTION CRASHES

Countermeasure	Casualty reduction	Cost
Delineation	10-25%	Low
Turn lane	10-25%	Low-medium
Skid resistance	25-40%	Low-medium
Signalisation	25-40%	Medium
Speed management	>60%	Medium-high
Grade Separation	25-40%	High

Source: Road Safety Foundation

New crash-test simulator raises bar for road safety

Millbrook Proving Ground's servo sled will provide vital data to help build safer vehicles. *Gareth Roberts* reports

NEED TO KNOW

- **Euro NCAP has influenced crash-test methods**
- **Fleets using minimum safety requirements when buying**
- **Split-second collisions analysed in slow-motion**

Hidden away from view in a nondescript building in the Bedfordshire countryside is the latest weapon in the war on road safety.

A crash test simulator, it uses compressed air under extreme pressures – up to 3,000psi – to recreate the forces experienced in a collision, and is the first of its kind in the UK.

It is the latest addition to the custom-built facilities at Millbrook Proving Ground – one of Europe's leading independent technology centres and home to *Fleet News*'s Company Car in Action event.

Called a servo sled, it simulates a crash so that the effects on its occupants can be measured via sensors fitted to crash test dummies. It recreates frontal, off-set and side impacts, providing vital data to highly-skilled engineers, whose ultimate aim is to improve driver safety.

Leading the charge to improve vehicle safety is Matt Hillam, head of crash test engineering at Millbrook. "There's an awful lot going on to improve driver safety," he says. "Organisations such as Euro NCAP have pushed the bar higher. You only have to look at early NCAP footage to see how much has changed."

Legislation has helped drive the majority of improvements to vehicle safety, but there has also been a recognition of the value of road safety ratings by consumers, including company car and van drivers, and fleets.

"More manufacturers are choosing to use the safety rating in their marketing material and fleets are beginning to use a minimum requirement for their choice lists," explains Hillam. "People are becoming more interested in the relative safety of a particular vehicle."

Millbrook works across the transport sector, testing parts for the automotive, rail and aerospace industries. It has a range of crash test facilities at its disposal, including a drop tower, a pendulum rig for instrument and panel testing, a pedestrian test facility and a recently updated seatbelt anchorage rig.

However, it is the new servo sled, installed earlier this year, that is revolutionising the way its engineers work by improving the accuracy, repeatability and correlation of test pulses – those different forces at play – to a real crash. "We were starting to get a lot of queries about being able to deliver an acceleration pulse that far better matches a full-scale crash pulse," says Hillam.

The new equipment replaces an older simulator, known as a HyGe sled, and has a maximum velocity of 56mph and a peak acceleration in excess of 80g.

It uses a servo-actuated braking system to control crash pulse correlations which have been captured by accelerometers fitted to a vehicle during a full-scale crash test.

"It's a way of capturing how the vehicle is deforming and crushing," explains Hillam. "Most manufacturers are trying to make that a relatively long, gentler, low level [process], but most people don't want a vehicle with a bonnet which is 12 feet long.

"At the moment, style dictates that it's relatively short and usually there's a powertrain in there of some kind, so you're trying to make all that structure that has a technical function crush correctly during impact."

With just a few key strokes, the computer-controlled crash pulse can be changed on the upgraded sled, unlike the old simulator, which was commissioned in 1970 and required partial dismantling to change a metering pin.

Thanks also to the expansion of the test preparation areas, the new servo sled system can achieve much faster turnaround times. Previously, it could take up to an hour-and-a-half to charge the HyGe sled with compressed air, now it can charged in around a minute, meaning customers can be offered more tests per day to complete their test programmes in less time.

"We test all sorts," says Hillam. "We're working for automotive, rail, aerospace and heathcare with wheelchair accessible vehicles, as well as airbag and seating suppliers.

"We even do weird and wonderful things like testing taxi cab signs that sit on the top of a taxi.

"Not all tests are equal – some tests are small and some are big."

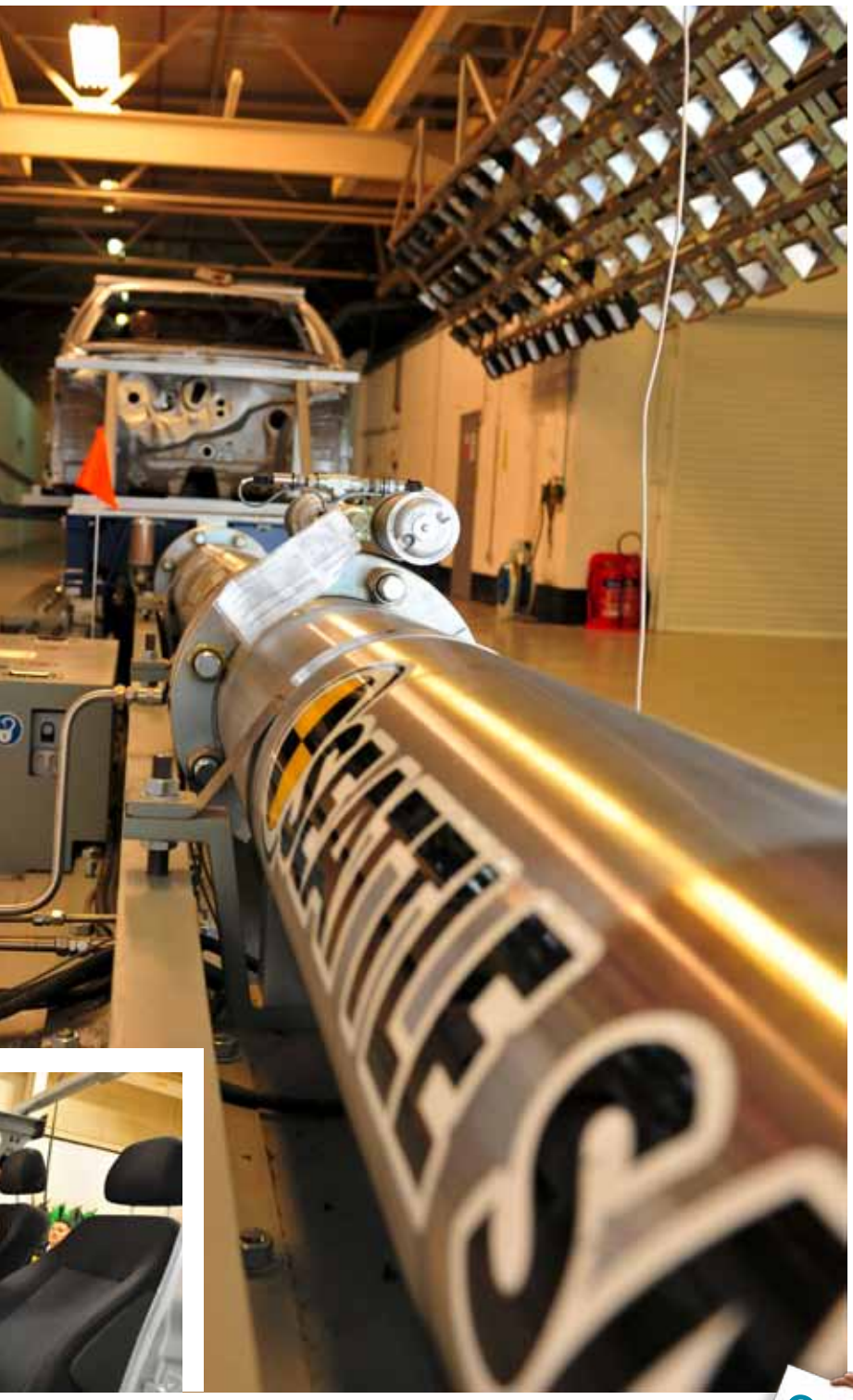
To complement the new sled, Millbrook has also invested in the latest high-speed, high-definition camera equipment

A technology upgrade replaces equipment that dated from the 1970s

Sensors are attached to dummies to measure effects

"People are becoming more interested in the relative safety of a particular vehicle"

Matt Hillam, Millbrook



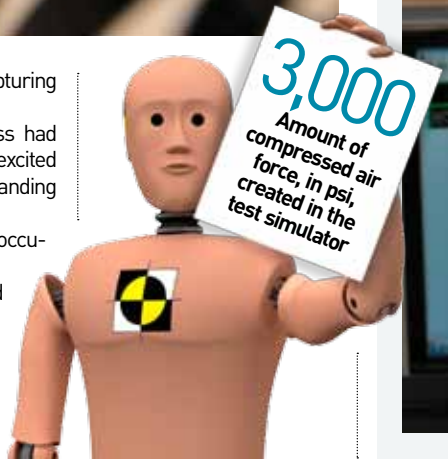
to improve the quality of the images taken when capturing test results.

Hillam would not divulge how much the business had invested in the new crash test facilities. But he is excited about how much they will improve engineers' understanding and road safety.

So does he think there will come a time when the occupants of a vehicle will be completely safe? Perhaps.

"We're moving towards a time with increased autonomy where vehicles will have a degree of self-learning and a level of artificial intelligence that stops them having the accident in the first place," says Hillam.

However, he adds: "I'm an engineer; I could never guarantee safety."



VIEW FROM THE TEST CHAMBER

The skeleton of the front half of a car sits on a set of rails which stretch one way down the length of an industrial warehouse.

Running in the other direction is a heavy duty industrial pipe, the type you may expect to find at a major oil refinery. It comprises two lengths which are bolted together, with the section closest to the vehicle body housing a piston. It is here where the compressed air is first stored and then released to propel the piston and sled, recreating the forces involved in a collision from the point of impact.

Two engineers are busy lowering a crash test dummy into the frame of car, while checking a series of sensors and recording equipment.

Either side stand two steel frames housing a wall of high-powered lights to help illuminate any one of the 16 high-definition cameras available, which can record at 1,000 frames per second.

A high pitch beep sounds signalling the start of the test and the need to evacuate the test chamber. Doors are locked and double-checked before a whoosh of banked air starts charging the system.

The pressure can be increased to a maximum of 3,000psi, but our test is at 2,060psi, recreating a 35mph frontal collision.

Peering through a reinforced glass window at one end of the test chamber, the engineer in charge issues a 'firing' warning. The sled is now illuminated by a wall of light and a loud siren sounds as the countdown commences.

It's all over in the blink of the eye.

The compressed air is released, allowing the forces at play in a real-life collision to be recreated through a sophisticated braking system hidden within the sled. It's only when you watch the high definition footage back in slow motion the different forces can be properly observed and understood.

■ To see crash-test footage, visit: fleetnews.co.uk/millbrook-crash-test

Dummy run: the test is all over in 'the blink of an eye'