

# Safety for motorcyclists

*The casualty figures for motorcyclist are so terrible that a sensible view is that you should never, ever, travel on a motorbike, writes David Milne. But the reality is that motorcycle use is rising. David examines the statistics and considers the contribution a more forgiving roadside can make to reducing fatalities.*

Road Casualties Great Britain 2007 gives 'Killed and Seriously Injured' casualty rates between 1997 and 2004 for a billion passenger kilometres of 29 for cars and 1332 for motorcycles. A journey by motorcycle is about 45 times more dangerous than a similar journey by car. To express it differently if a motorcyclist were to travel 10,000 km/year (a modest figure for a car) over a 40 years riding life he would travel 400,000 km and would have more than a 50% chance of being killed or seriously injured on the road.

Motorcycle fatalities are important in any attempt to reduce road casualties as they now form a significant and growing proportion of the overall total. If we look at deaths for various user groups in Figure 1 we can see 20% of UK road deaths are to motorcycle users in 2008.

However the appeal of motorbikes,

risky to life and limb as they are, has never been higher. Their hugely exhilarating and seductive performance appeals to men (only 34 out of the 588 m/cycle user deaths in 2008 were female). Motorcycles have the ability to cut through our increasingly congested traffic making journeys quicker, more reliable and possible in peak hours. They are relatively economical, far more reliable than they used to be and are usually free to park. They are also relatively immune to speed cameras. Clearly safety considerations have not stemmed the growing popularity of motorbikes in recent years.

Big efforts have been made to improve rider safety with compulsory training and test regimes. Moves have also been made to educate other road users to 'think bike' and look out for motorcyclist at junctions.

Such efforts are to be applauded as are also the post test courses designed

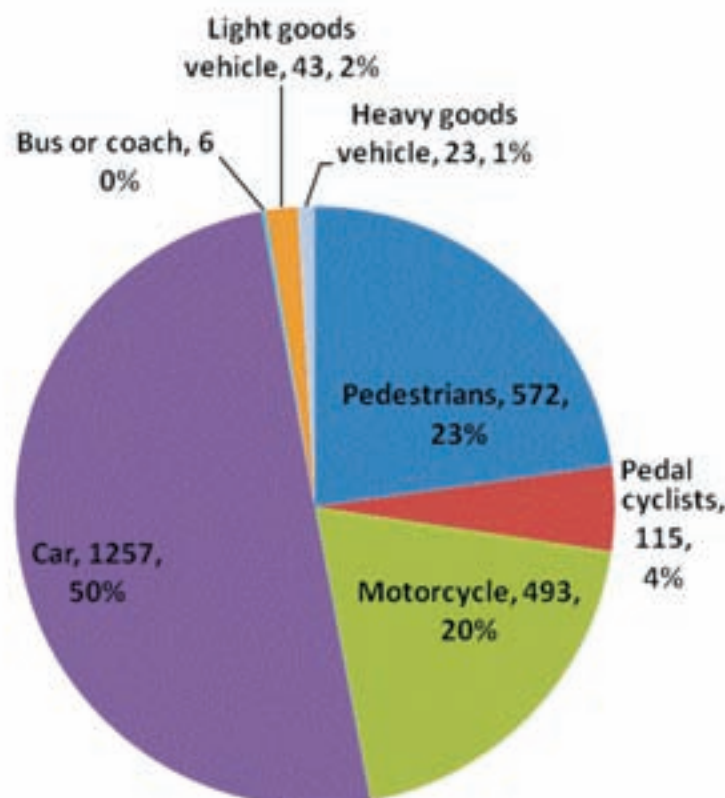
to improve riders' appreciation and responses to the dangers of motorcycling. Such training can only improve the riders' life expectancy where learning from experience is so exceptionally dangerous.

While motorcycle fatalities fell in 2008 relative to 2007 the number of fatalities remains well above the 1994-98 average reflecting rising motorcycle use and their continued vulnerability (see Figures 2 and 3).

## WHY ARE MOTORCYCLE CASUALTIES SO HIGH?

Reasons for motorcycle accidents include:

- a) The temptation to use the stunning performance potential of motorbikes (approaching that of a Formula 1 racing car for some sports bikes).
- b) The predominantly adventurous males who ride motorbikes for the challenge. motorcyclist tend to be relatively inexperienced in that many stop when family responsibilities kick in so their riding careers are short or they are born again bikers taking up motorcycling in mid life giving a new wave of casualties. Deaths are highest for motorcyclist in their 30's and 40's as Figure 4 demonstrates.
- c) Motorbikes 'fall over' if they lose grip on ice, diesel slicks or indeed any slippery surface. Unlike a car, they need road grip just to stay upright. A skid is dangerous on a motorbike as it often deposits the rider skidding or tumbling at high speed in a straight line often into a vehicle or a roadside object. In winter road salting can be central to motorcycle safety.
- d) Loss of control especially on bends.
- e) Potholes and road debris can also cause loss of control. Motorcycles need a better standard of road maintenance
- f) Other road users can often fail to see a motorcyclist at junctions or in their wing mirrors as they are



**Figure 1:**  
Fatalities 2008 by mode  
of transport.

# — what can be done?

looking out for a larger vehicle. A vehicle pulling out in front of a motorcyclist who is on the through road is a major problem.

- g)** More skill is needed to ride a motorbike and they are more limited in their ability to suddenly change line or brake in a corner
- h)** Alcohol and drugs

It may well be motorcycles are driven with more care than cars – the core problem is they are so unforgiving when things go wrong. What makes the motorcycle casualty figures so terrible is the vulnerability of a motorcyclist in an impact. A damage-only accident to a car would often result in serious injury or death to a motorcyclist.

The human body evolved with a top speed of about 15 mph and unprotected impacts at these speeds are rarely serious. Games of rugby, football or hockey may result in the odd broken limb but rarely fatal injuries.

Recreational skiing speeds are faster, say 25 mph to 40 mph. Impacts with other skiers and trees can now be fatal although this is still rare and would be much rarer were helmets to be regularly worn. Broken limbs are however not uncommon. If we look at downhill racing giant slalom speeds can get up to 70 mph and more but we now find clear courses devoid of solid obstacles and catch netting for skiers who leave the course. As a consequence, while dramatic ski racing accidents are not uncommon, fatalities are thankfully rare.

But for motorbikes, speeds of 70 mph are routine and higher and illegal speeds are common. If a human body hits a solid object more than a glancing blow at these speeds head and torso will suffer unsustainably high acceleration forces causing physical damage which typically proves fatal.

A car in an impact offers hugely better protection assisted by seat belts, air bags, crush zones and the strength of the body shell that a motorbike cannot hope to begin to emulate and this is largely responsible for the disproportionate casualty rates.

An area of motorcycle safety which has largely escaped attention is that changes can be made to the roadside

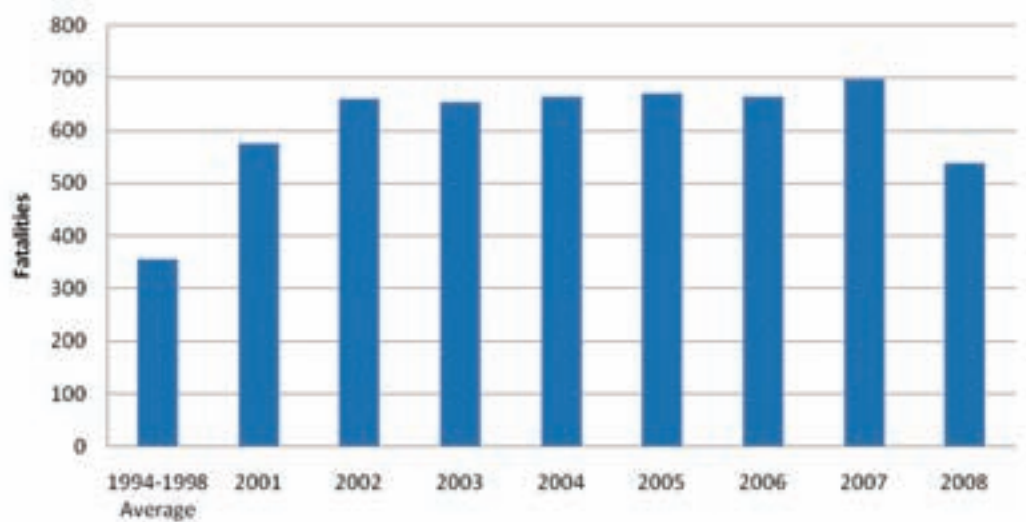


Figure 2: Motorcycle user fatalities.

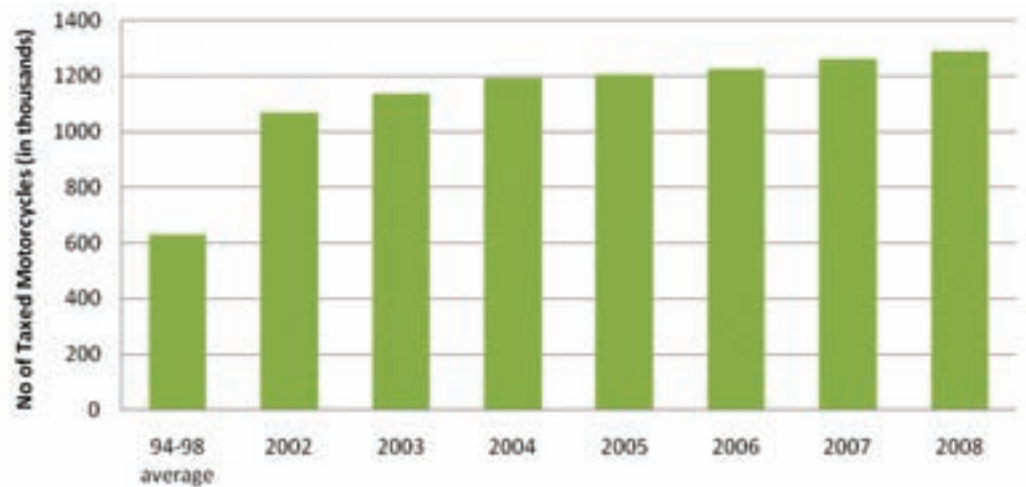


Figure 3: Number of taxed motorcycles.

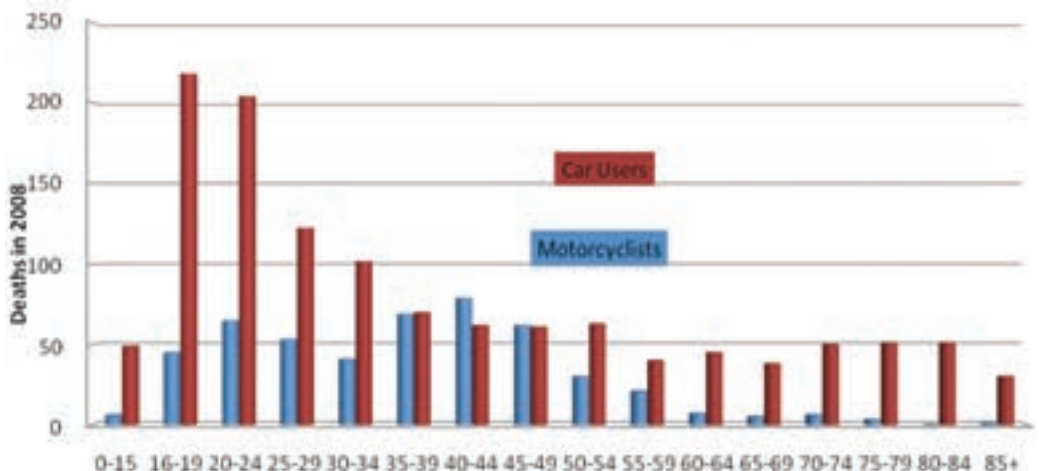


Figure 4: Motorcyclist and car user fatalities by age.

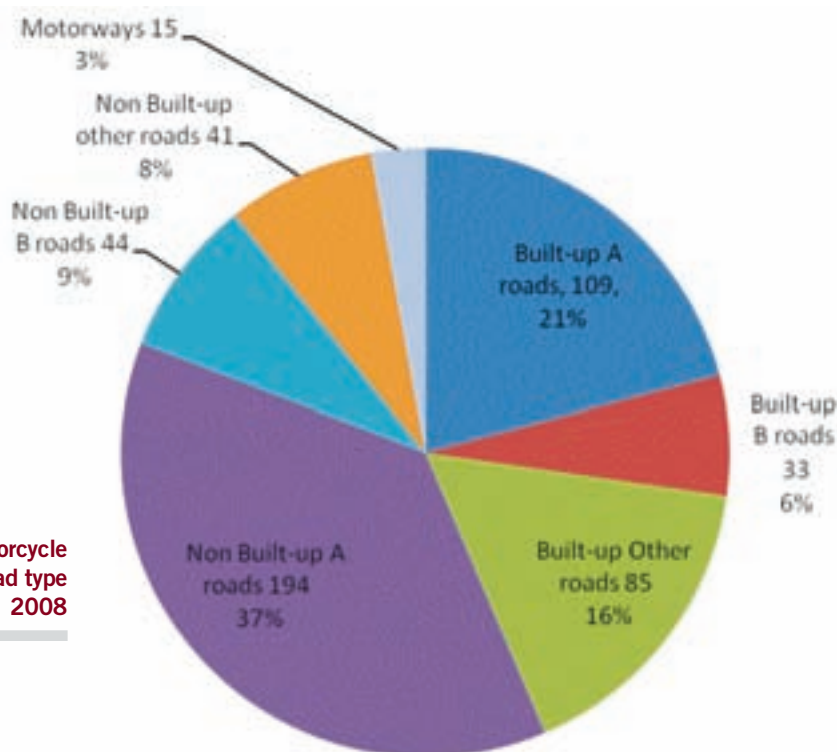


Figure 5: Motorcycle fatalities by road type 2008

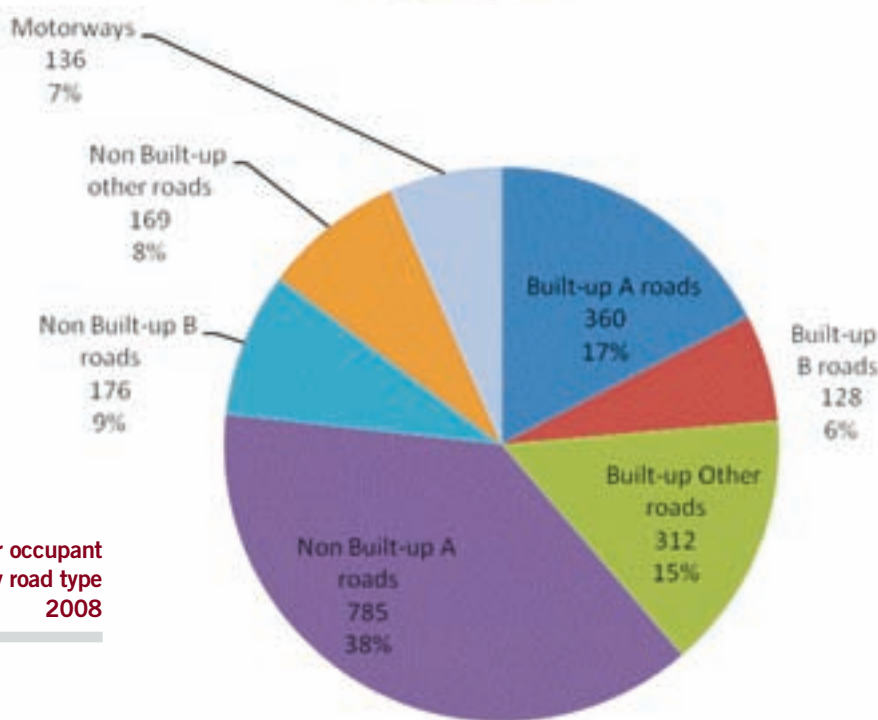


Figure 6: Car occupant fatalities by road type 2008

environment to make roads safer for motorcyclist. That this is an important consideration is clearly illustrated if we look at motorcycle racing history.

If we contrast the motorcycle racing deaths arising from Moto Grand Prix racing on dedicated race tracks with the Isle of Man TT races conducted on the island's public rural roads we find huge differences in safety. In the last ten years there have been 27 deaths in Isle of Man TT

races and practice sessions in what is a yearly race meeting. In Moto Grand Prix races there has been only one fatality in the same time. There are 17 rounds each year to the GP races (with 4 classes) and the bikes race together and are not started individually as on the Isle of Man. Racing on dedicated circuits is perhaps two orders of magnitude safer than racing on the Isle of Man. The TT races are deadly because the roadside infrastructure of walls, trees, ditches, sign-

posts and telegraph poles is so unforgiving to a rider in an impact and this is exacerbated because the roads are relatively narrow. The smallest misjudgment can result in a rider leaving the road and hitting a roadside object. Dedicated motorcycle racing circuits have wide tracks with wide run off areas totally devoid of obstacles. It is typically not the falling off and tumbling or skidding down the road at high speed that kills riders but hitting a hard solid object.

Single vehicle fatalities for cars and motorcycles are compared in Table 1 with figures supplied by DfT. It can be seen that roadside furniture is disproportionately dangerous for motorcycles especially when allowances are made for the very low levels of total motorcycle mileage.

Looking in more detail into the figures in Table 1 we can see:

- a) Centre reserve crash barriers are especially dangerous to motorcycles with more motorcyclist killed hitting them than car users. Steel crash barriers inflict serious injuries to motorcyclist who slide along the ground in an accident or otherwise catch their bodies on the steel posts with deadly results. It will be interesting to see if the current move to concrete central reserve barrier on dual trunk roads improves the situation for motorcyclist.
- b) Near and Offside Crash Barrier is especially dangerous for cars as they have ramped ends which tend to launch vehicles on impact. Such impacts will hopefully decrease with the increasing specification of energy absorbing terminals. The lower figures for motorcycles presumably reflect the shorter overall length compared to central reserve barriers and possibly their greater distance from the carriageway on motorways where there is a hard shoulder. Short lengths of safety fences are used to shield large sign posts on trunk roads. Passively safe signposts without barrier will almost always be a safer and more economical option for cars and motorcyclist at these locations. A motorcyclist will find the continuous posts of a 40 metre barrier difficult to miss but a signpost is a much smaller obstruction and is further from the carriageway giving a much bigger chance of avoiding an impact.
- c) Sign posts, traffic signals, lighting columns trees and ditches are dangerous to motorcycles. Unfor-

tunately passively safe signposts and lighting columns which are starting to make roadsides safer for car users are still too hard and unyielding to cushion the blow to a human body and prevent serious injury.

- d) Trees are relatively less dangerous to motorcycles than other roadside furniture perhaps because they are found often in hedges which may arrest a motorcyclist before he reaches the tree and also perhaps because they are usually further from the carriageway. A heavier car would probably not be significantly slowed by the hedge or travel across the verge.
- e) Providing a clear zone next to the carriageway devoid of roadside street furniture or other clutter would certainly reduce motorcycle (and all vehicle) casualties.
- f) While only about 1 in 4 motorcycle deaths result from single vehicle accidents the roadside environment is an area where positive steps can be taken to reduce the toll.
- g) Motorbikes are far safer for pedestrians than cars. No pedestrians were killed by motorbikes in 2008 but 240 pedestrians were killed by cars.

Where do the motorcycle accidents happen and is the pattern of

	M/bikes	Cars
<b>Pedestrians killed by motorbikes or cars</b>	<b>0</b>	<b>240</b>
None (note pedestrian casualties are excluded)	27	53
Road Sign/Traffic Signal	12	18
Lamp Post	21	36
Telegraph/Electricity pole	3	9
Tree	14	158
Bus Stop/Bus Shelter	0	2
Central Crash Barrier	12	5
Near/Offside Crash Barrier	4	21
Submerged In Water	0	3
Entered Ditch	8	27
Other Permanent Object	18	101
<b>Total (excludes pedestrians)</b>	<b>119</b>	<b>433</b>

fatal accidents different for motorcycles than it is for cars?

If we look at the numbers of deaths for motorcyclist and car users on the different road types in Figures 5 and 6 we find the distribution of casualties is remarkably similar. Motorcycles have relatively fewer fatal accidents on motorways and marginally more on built-up A roads than cars but in general the spread of fatalities across the types of roads is amazingly simi-

lar. The relatively low percentage of motorbike fatalities on motorways possibly demonstrates the benefit fewer and better junctions and lack of street furniture confers on motorcycle safety but may reflect lower use of motorcycles on long motorway journeys.

What is clear is that motorcyclist are high risk but the problem is not solely rider behaviour. A safer roadside environment will pay dividends.

**Table 1:**  
Single vehicle accident fatalities for cars and m/cycles in 2008

## UPDATED PASSIVE REVOLUTION GUIDELINES TO BE PUBLISHED NEXT YEAR

In April this year The Passive Revolution Guidelines were published as a draft for comment. This was a private sector initiative aimed, it was said at the time, to fill a gaping hole in guidance coming from central government to local authorities.

The Guidelines were published by The Passive Revolution and were widely distributed with many people picking up the document at Traffex. The consultation period is now closed and the current plan is to launch a revised document either at a national event, probably late April or early May 2010 or at a series of regional seminars.

The background to the guidelines is that the Highways Agency has directed its research and standard development towards the trunk road network and it is here that the passive safety message has made a real impact. However, the reality is that urban and rural A roads suffer a very large proportion of the UK's serious casualties and fatalities in single vehicle run-off accidents. The use of passively safe street furniture has the potential to greatly reduce the accident rates on what are our most dangerous roads. Surprisingly, urban A roads have more killed and seriously injured single vehicle accidents for each kilometre than rural A roads, in spite of their lower speed limits.

The Guidelines aim to provide highway authorities and their agents with all the information they need to develop a policy for the specification and deployment of passively safe street furniture (signposts, traffic lights and lighting columns in particular) on their roads. The document explores the excellent safety record of passively safe street furniture on trunk roads and the numbers of injuries and deaths sustained from conventional signposts and lighting columns on local authority highways and advises on selecting those roads where passive safety has the most to offer.

The Guidelines were drawn up by David Milne who will be familiar to TEC readers as a passionate advocate of passive safety. Not only was David responsible, when at the Highways Agency, for developing Advice Note TA89/04 Use of Passively Safe Signposts to BSEN 12767 which kick started the passive safety revolution, but he is also editor of *Designing Safer Roadsides – A Handbook for Highway Engineers*.

David says that the consultation period has been very useful and says he is very grateful to everyone that has contributed comments and for the very positive response that has been generated. He is hopeful that when published next year, the Guidelines will provide local authorities with a document which will provide practical assistance to anyone wishing to build and implement a passive safety policy.

Andy Pledge of The Passive Revolution endorses these comments. 'One of the things we are looking at for next year is the possibility of providing a service to local authorities to help them translate all this good practice guidance into a sustainable local strategy. The Guidelines are central to this – people want to know what works where – it is as simple as that.'

Steve Proctor, Director of TMS Consultancy welcomed the guidelines too. 'We meet a lot of people on our courses, and through our safety audit work throughout the UK and Ireland. Designers ask us two things – how can I evaluate off road collision risk on a particular route, and how should I prioritise action to improve safety across my network? These guidelines will help answer both questions, and the seminars we are planning for next year will give further guidance in this important area of network safety.'

TEC will announce the dates and locations of the seminars as soon as information becomes available.

# Reducing casualties and creating a safer environment

*As casualty rates fall for other road users highway authorities will increasingly need to address motorcycle casualties as they seek to improve their figures. David Milne looks at some of the products which have been developed to make the roadside environment more forgiving for motorcyclist.*

**E**uroRAP , the European Road Assessment Program, led by European Programme Director, Dr Joanne Hill with a panel of experts from across Europe, published a review of motor cycle safety *Barriers to change: designing safe roads for motorcyclist* in January 2008. It can be read on [http://www.euro-rap.org/library/pdfs/20081202\\_Bikers.PDF](http://www.euro-rap.org/library/pdfs/20081202_Bikers.PDF). It especially identifies the need to improve conventional safety barrier at locations where motorcyclist are most at risk to make them more motorcycle friendly (as Bikeguard and Biker-Safe examples below). Anybody involved with safety barriers should read this document. EuroRAP and FEMA (the Federation of European motorcyclist Associations) are actively pressing CEN for the European standard for

safety barriers EN 1217 to be modified and contain crash testing requirements for motorcycle friendly barriers.

Defensive riding (or even better using a car and only riding a motorbike on track days or for motocross or trials but never on the road) may be a motorcyclist's best hope for a long and trauma free life. For those who must ride on the road there are many advanced courses to improve skills including the well regarded 'Bike Safe' one-day courses run by the police across the country (<http://www.bikesafe.co.uk>). There are fears, however, that while such courses improve riding skills they may not be reaching higher risk sports bike riders and could be counterproductive if improved skills are used to ride faster on public roads.

As casualty rates fall for other road users highway authorities will increasingly need to address motorcycle casualties as they seek to improve their figures. The measures discussed above will hopefully offer some avenues to explore but improving motorcycle safety will always be a challenge.

Those of us who are car drivers need to always look twice for motorcyclist and make sure we give them room whatever they are doing – they are just so vulnerable.

In the meantime there are a number of initiatives and products relevant to creating a safer roadside environment for motorcycles:

- a)** Honda have developed an airbag mounted on their fuel tanks for their Gull Wing motorcycle

**Below: Highway Care's BikeGuard retrofitted to existing barriers on the A57 Snake Pass in the Peak District after a history of serious motorcycle accidents**

**Below right: 'Biker Safe' from SignPost Solutions installed at a site in Durham named Killhope**



- b) Airbag/blow-up jackets have been developed for motorcyclist
- c) Highway Care market a lower rail system BikeGuard that can be fastened to existing safety fence posts so a sliding motorcyclist cannot hit the posts. Such systems have been successfully used on the sharp curves of motorway slip roads and at other locations where there has been a history of motorcycle barrier accidents.
- d) Signpost Solutions offer Biker-Safe a similar system for shielding safety barrier posts but their system uses a strong tough fabric to divert a motorcyclist from hitting the posts.
- e) Light flexible plastic chevron signs (and light plastic retro-reflective bollards) can be used to delineate bends and roundabouts. These are much safer for motorcyclist and depending on type can bounce back after an impact. Such signs are invaluable in preventing motorcyclist misjudging corners by helping riders pick up the line of the road in advance of the corner and of course are far safer to hit. motorcyclist especially need to see the line of the road through a bend as their path tends to follow their line of sight (WYLLI-WYG – where you look is where you go). Marking the edge of the road through a bend can be a valuable safety measure.
- f) EuroRoadSafety and Signpost Solutions together have developed a collar 'Biker-Mate' which can be used to safeguard motorcyclist from hitting signposts, traffic signal poles, utility poles and lighting columns. A thick plastic molding with carefully engineered crush characteristics is used to shield signposts, lighting columns or utility poles from direct impact by absorbing the kinetic energy in a relatively gradual and controlled deformation. EuroRoadSafety believe they can greatly improve the chances of survival and reduce severe injuries in medium and slow speed impacts which are currently so

often currently fatal or serious for motorcyclist. It is early days but such products could in theory be used to shield many roadside obstructions. There is a great need to quantify the safety benefits of such products and to develop a suitable test for their evaluation as was done for EN 12767 and passively safe street furniture. The ideal safety solution for cars and motorcycles would be a collar around a passively safe post to EN 12767. The product has been impact tested using the methodology for motorcycle helmet tests and has demonstrated the potential to greatly reduce head injuries in any impact.

- g) Allowing motorcycle use of bus lanes in London is a new Transport for London initiative and should hopefully demonstrate the benefits of segregating motorcycles from the main traffic stream and could spark similar schemes elsewhere if it is a success.



**Biker Mate energy absorbent cushion**  
(Photograph courtesy of Durham County Council)

# BikeGuard

*Award winning, proven performance, used extensively throughout the UK*

*Highways Agency approved for attachment to OBB and TCB safety barrier systems*

*Simple & speedy installation, no need for drilling of barrier beams or posts*

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