

Mirrors, Blind 'Spots' & Peripheral Vision



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Driving is a complex task and one that demands the driver's full concentration, anticipation, planning and constant awareness. By awareness we mean 'situational awareness' - knowing what is happening around your vehicle at all times. Sometimes drivers say you 'should have eyes in the back of your head'. Safe driving requires proper and effective use of all mirrors and the use of peripheral vision checks when necessary. This article deals with effective mirror use, the understanding of blind areas (spots) around your vehicle and what steps you can take to eliminate them by using mirrors, shoulder checks and peripheral vision. Drivers should remember, there is quite a difference between full shoulder checks before moving off and peripheral shoulder checks whilst on the move. Understanding and applying the above three areas should keep you and your vehicle safe when driving on busy highways.

Mirrors, Blind ‘Spots’ & Peripheral Vision

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Introduction

This writer has always referred to areas around his vehicle which cannot be seen in the mirrors as blind areas as opposed to blind ‘spots’. However, it is understood that when driver trainers and drivers refer to blind spots, they really mean blind areas, areas that cannot be seen in the mirrors and can be quite significant. Also, parts of the car’s bodywork that can create blind spots. To this writer, the expression blind spots conjure up the vision of spots such as these.... So, for convenience, throughout this article, blind areas will be referred to as blind ‘spots’. At the outset, it’s important to discern between full shoulder checks when stationary and peripheral shoulder checks whilst moving. Full shoulder checks are taken just before moving off, whereas peripheral checks are normally taken whilst on the move. Part of safe driving is fully understanding the situation of the road around you and knowing where other drivers/road users are. In a car, it can be very easy to assume that everything you need to pay attention to is either out the front windscreen, the rear window or the rear-view mirrors, but this overlooks critical areas around your vehicle that cannot be seen. In every car, there are blind spots which are essential to be aware of. The blind spots are the parts of the road, footpath, driveways, other traffic etc. that cannot be seen through the rear-view mirrors. For this reason, the blind spots can present visual problems which can be dangerous and every driver needs to be aware where they are and how and when to check them. Awareness of everything around you when driving is critical for safety. Using your eyes to effectively look ahead is important but the proper use of mirrors is also critical to stay aware of what’s going on behind. Being aware of everything around you while driving is called ‘situational awareness’. This is a term first used to describe a fighter pilot’s ability to be aware of everything that is going around him in three dimensions. Drivers are equally concerned with the space around their vehicle and not only what’s going on in front but also to be aware of what’s going on to the sides and behind them. It’s like having ‘*eyes in the back of your head*’.¹ Knowing how close the driver behind is following will have an effect on your braking and following distance from the car in front.

¹ To be exceptionally alert to what’s happening all around you. This expression dates from Roman times appearing in Plautus’s play *Aulularia* (c.a.210 b.c.) as cited by Erasmus in his collection of adages. Put slightly differently, it appeared in John Still’s play *Grammer Gurton’s Needle* c.a. (1565): “*Take heed of Sim Glovers wife, she hath an eie behind her?!*”

Vehicles to the rear in other lanes may be preparing to overtake or may be in the way if you are changing lanes. And then, there are some drivers who take for granted the notion those other drivers can always see us in their mirrors.

Situational Awareness

As already mentioned above, being aware of everything around you while driving is called 'situational awareness'. This is a term first used to describe a fighter pilot's ability to be aware of everything that is going around him in three dimensions. Although the term situational awareness is fairly recent, the concept itself has its roots in military history e.g. situational awareness was recognised as a crucial commodity for crews of military aircraft as far back as WW1. The term situational awareness was adopted to describe the process of attention; perception and decision making that together formed a pilot's mental mode of the current situation. Good situational awareness is a learned skill. Lacking or inadequate situational awareness has been identified as one of the primary factors in accidents attributed to human error. Also, lack of situational awareness can result in error in problem detection, error in problem diagnosis and error in action planning and execution. Therefore, to be fully aware of your surroundings when driving, always look well ahead – avoid fixed attention and keep your eyes ranging from the far, middle and immediate distance. Keep your head on a swivel and keep your vision 'loose' then, you should be able to pick up any activity or danger around your vehicle. Practising prediction of the traffic around you will also help.

Mirrors Really Important

As your link with all the outside world lies behind your peripheral vision, mirrors are really important. The driving mirrors are extremely important aids, and their use is vital for safe driving. The purpose of the driving mirrors is to let you know what is happening behind. Because, as previously mentioned, it's just as important to know what's happening behind as to what is in front. The interior mirror is made of flat glass and gives a true picture of the following traffic. It gives a broad field of vision preferably right up to the blind areas spots, framed by the rear quarter panels between the rear window and side windows and is essential you have a clear view of what is happening behind. Car design has progressed sufficiently for most modern cars to have good interior mirrors, but if your vehicle is of an older make, and has an inadequate mirror, then it would be wise to purchase, from an accessory shop, a larger mirror which can be attached to the standard existing one.

Most exterior mirrors are made with convex (curved) glass and make following traffic smaller and even further away than it really is. You can see this effect from the driving seat when parked at the roadside. Choose an object or a moving vehicle behind that you can see in the interior mirror. Then compare this view with the view in the exterior mirrors. Practice the habit of using the interior mirror and exterior mirrors together. Although convex glass (same as external mirrors) provides a wider field of vision, a larger area of plain glass is preferable because a distortion image gives a false impression of distance. In recent years, it has become almost universal practice for car manufacturers to fit exterior mirrors on the frame of the doors, rather on their traditional position on the cars wings. Many drivers are inclined to adjust the side mirrors too far inwards, allowing drivers to see quite a lot of the side of their own vehicle while exacerbating blind spots in the process. This overcompensation is entirely unnecessary and creates an overlap between mirrors where a slightly different arrangement would lead to a more seamless rear view panorama.

(Remember back in the 60s (for those of you who are old enough to remember) when fitting exterior wing mirrors - to avoid damaging the paintwork, a washer was taped to the wing to ensure the drill didn't slip and only drilled in the exact location. Ed.)

Peripheral Vision

Peripheral vision accompanies central vision. However, it is not as sharp as central vision, but is more sensitive to light and motion and helps us detect events to the side when we're not looking in that direction. While central vision covers about three degrees of the visual field straight ahead of us, peripheral, or side vision, covers the rest. Peripheral vision allows you to see objects all around you without turning your head or moving your eyes. It helps us to sense motion and walk without crashing into things. It's what you use to see something out of the corner of your eye. We have blind spots in a vehicle because we have limited peripheral vision in our eyes, and our view is obstructed either by the vehicle's pillars or if you are riding a motorbike, the helmet. Our field of view is almost 200 degrees, but on the edges we see very little detail. We can swivel each eye around 90 degrees and that gives us a horizontal field of view that in some cases can be almost 200 degrees. Therefore, before moving away from rest, we do full mirror checks and look back over both shoulders to check our blind spots, but when driving, we only do a peripheral check when necessary.

If a full shoulder check was given whilst moving, it could result in the driver pulling the steering wheel in the direction he was looking and result in the loss of control of his vehicle. Don't move your body – only your head. The Road Safety Authority (RSA) and the Driver and Vehicle Licensing Agency (DVLA) have certain medical requirements that drivers need to be able to meet. In terms of vision requirements, the DVSA requires you to pass the number plate test at the start of your driving test. Also, they have certain medical requirements that drivers need to be able to meet. Under new requirements, you need to have a peripheral field of vision of 120 degrees of the central fixation point. If your loss of peripheral vision in both eyes is less than 120 degrees, you can be fined up to £1,000 if you do not inform the DVSA and they later determine that your loss of peripheral vision makes you unsafe to drive. Whereas, the RSA require all applicants for a learner permit to have an eye examination by their doctor or optician before it is granted, this examination will pick up any defects which can be rectified before a driver takes to the road. It should be noted that nearly 840,000 blind spot accidents occur each year in the US, resulting in 300 fatalities.

Where are the Blind Areas (Spots)?

One of the challenges of being fully aware of what's going on to the rear is the blind spots problem. What are blind areas spots and where are they located? Blind spots in a vehicle are the areas around the vehicle that cannot be directly observed by the driver while sitting in the driving position. The most common ones are to the rear and sides in the lanes on either side. Blind spots are also found directly in front of your vehicle where you cannot see over the bonnet. This area is particularly large in vehicles with high and long bonnets. There are also blind spots to the front that are created by the pillars that frame the windshield and support the roof. The A-pillar is the term used to describe the area dividing the windscreen from the side windows. The A-pillars create blind spots and restrict your view to scan the road ahead properly. It's vital to check that nothing is hidden from view by the A-pillar before making a manoeuvre. Pedestrians, cyclists and motorcyclists are easy to lose in the space behind the A-pillars. Larger vehicles without rear windows have large blind spots directly to the rear. Even large vehicle mirrors can also create blind spots. The blind areas are generally to the rear right and left sides of your vehicle that are not covered by internal and external mirrors.

The biggest blind area is over the driver's right shoulder, between the edge of where the peripheral vision ends and the area up to the rear of the car that isn't seen in the side mirror. The nearside blind area is somewhat smaller, but still an important area that needs to be checked. Blind spots vary in size depending the size and height of the vehicle but they are generally dealt with in the same manner. It has been acknowledged that large vehicles have blind spots around them which the driver is unable to see and that this has the potential to contribute to the cause of accidents. In order to reduce the risk of accidents involving blind spots, the European Union (EU) implemented Directive 2003/97/EC which substantially increased the field of view available from the mirrors of new trucks and buses sold in the EU from January 2007. These included requirements that certain vehicles be fitted with mirrors to cover the blind spot at the front of the vehicle and on the passenger side of the vehicle. These mirrors are referred to as 'Cyclops' mirrors. Be particularly aware of motorcyclists as they can be difficult to see due to their narrow profile and may be travelling at high speeds. In busy traffic they may filter between lanes, therefore, being aware of blind your spots are essential. Motorcyclists call these checks the 'lifesaver glance' before making and change in speed or direction. As today's roads are getting busier, looking around to checking blind spots on the move can be dangerous, especially at speed. Every time you look to check your blind spot, you are averting your eyes from your forward vision. Ensure that the situation in front is safe before conducting a blind spot check. In GB, the number of crashes caused by blind spots has risen by almost 50pc according to Road Safety GB. An analysis of 50,000 crashes by Accident Exchange – a crash management company – has uncovered a 48pc rise between 2009 and 2011. ²

Checking the Blind Areas (Spots)

The blind areas full shoulder checks should always be carried out before moving off from a stationary position for example, before moving away from the kerb, commencing the turnabout, hill start, moving off at an angle, even reversing etc. All drivers should check these areas by turning their heads physically and looking back to see them and ensure they are clear before moving. The importance of checking blind spot cannot be stressed enough while driving. When driving, there will be many occasions when a blind area (spot) check will be necessary.

² Road Safety GB. roadsafetygb.org.uk

These blind areas (spots) will be to either side and shouldn't require you to look around (full shoulder check), but rather a quick 90 degree sideways check/glance. Turn your head, not your whole body. Looking right around to check blind spots on the move is unnecessary and dangerous, especially when driving at high speeds; in the time it takes, you could lose touch with what's happening in front. Recognise where other driver's blind areas are and avoid remaining in them longer than necessary. This is particularly important when overtaking LGVs and PSVs. If you are training drivers especially learner drivers it's imperative that they are fully aware of blind areas (spots) and how to deal with them effectively and safely whenever a manoeuvre is about to be completed.

Reducing Blind Areas (Spots)

You can partially reduce blind spot areas (spots) by the use of fisheye mirrors. These small mirrors can be bought quite cheaply and are attached to the side mirrors. These mirrors give a fish eye effect, thus showing more of the roadway than regular mirrors. Drivers who utilize these blind area (spot) mirrors will often still rely on the peripheral checks to double check the blind areas (spots). Some cars side view mirrors house a separate smaller mirror in an upper corner. It's a slightly domed square that provides a wide angle view like the fisheye lens. They are smaller than ones you can buy at accessory shops and adhere to regular mirrors. If you check your blind spots before moving off, you're ensuring that your car is not a danger to other road users. Check your blind areas by doing the following: whilst parked look in your centre and side mirrors. Make a note of what you can see, and then look over your right and left shoulders and you will see quite large areas completely invisible until you carry out a full shoulder checks. Once you realize this – what you can't see in the mirrors – it should help you to always check the blind spots before you move off. In a car there are two door pillars that are significant blind spots. These pillars can impede a driver when doing a shoulder check before moving off therefore; check in front and behind the pillars to ensure that you have not missed anything that could affect you. And there are two quite large blind spots on either side of the rear window. One way to help reduce blind spots to the rear is to correctly adjust your mirrors. Many drivers adjust the side or 'wing' mirrors so that they can see mostly what's behind them and much of the mirror view is taken up with the side of the vehicle. Whereas, we don't need to see all of the side(s) of the vehicle in the mirrors, we need enough to be able to judge our vehicle in relation to other vehicles or objects.

To adjust your side mirrors, it is also suggested that if you sit in your vehicle and place your head against the window, adjust the right side mirror, so that only a very small part of the vehicle's right side is shown. Then lean to the centre above the centre console, and adjust the left side mirror, so only a small part of the left side of the car is shown.

Danger of Blind Areas (Spots)

Some of the dangers associated blind spots are: there could be a hazard (another vehicle) there that you're not aware of when you move your vehicle, especially when you change lanes. Also, you could be in another driver's blind spot when they move their vehicle e.g. changing lanes. An increase in motorway lanes coupled with congestion has led to more 'undertaking', so drivers need to expect the unexpected and look out for 'undertakers'. To minimize blind spot dangers keep your mirrors properly adjusted and clean. Adjust your side mirrors so that you should just see the side of your vehicle when you turn your head. This position reduces the size of the blind spots to your left and right sides. Centre your rear view mirror in the centre of the rear window. Remember that other drivers may not have the same level of care that you have and could easily think their blind spot is clear. Many large vehicles display stickers that say: *If you can't see me in my mirrors, I can't see you* or *"If you can't see my mirrors, I can't see you"*. The bigger the trailer on a truck, the further back you have to be in order for the driver to see you in their mirrors. The peripheral shoulder check involves briefly turning your head 90 degrees to the right or left looking into your blind spots. Peripheral shoulder checks should be sufficient to see what cannot be seen in the mirrors. Traffic experts recommend setting the side mirrors out approximately 15 degrees to reduce the blind spots and glare from headlights from the rear.

'Second Set of Eyes'

The blind spot warning system serves as a 'second set of eyes' and this feature can detect a vehicle in any one of your blind spots and provides an audible or visual alert, most often displayed in your side mirrors. With certain car models, a more urgent warning is provided if you indicate to change lanes when a vehicle is in your blind spot. Volvo introduced BLIS – Blind Spot Information System – back in 2004 which used cameras beneath the side mirrors to detect the presence of vehicles in either blind spot.

A light flashed in the mirrors to warn drivers that it was not safe to change lanes. Audi's Side Assist performs a similar function, but uses radar sensors in the rear bumpers to monitor traffic in the driver's blind spots, so when a vehicle approaches from behind, the LED warning signal lights up.³ While blind spot detection systems aren't foolproof, a peripheral check should be considered where necessary. As crossover vehicles are continually growing in popularity in Ireland, these features would prove useful for those getting accustomed to driving a larger vehicle.⁴

The 'Lurker' in the 'Overtaking Lane

You must always allow for blind spots when checking your mirrors. The advanced driver uses his mirrors as required so that he is always aware of the position and speed of following traffic and will know when a vehicle is momentarily hidden in his blind spots. To ensure that you never miss a car or motorbike hidden in your blind spot and are about to overtake, cast a quick look over your right shoulder provided all is safe ahead. This is especially good practice when changing lanes on a motorway or dual-carriageway, joining the flow of traffic from a slip road or changing lanes in a one-way system. You need to be particularly vigilant of the 'lurker' in your blind spot when changing from lane two to lane three or lane three to four on a motorway, especially if the lane of traffic on your right is flowing only slightly faster than in your lane, a car could be concealed in your blind spot for some time. Motorway crashes are often caused by a driver changing lanes without properly checking all his mirrors and without carrying out necessary peripheral shoulder checks. While some cars demand too much head movement and re-focusing of the eyes, properly adjusted door mirrors can help complete the view which is not visible in the interior mirror and are particularly valuable on dual-carriageways and motorways. Older cars and cars of a more basic specification may have only one mirror on the driver's side, or in some cases no exterior mirrors at all, so it is worth considering fitting one or both of the many types available on the market.

Conclusion

Mirrors, blind spots and peripheral vision all go hand in hand. It's all front, rear and side observation which is essential for safe driving.

³ RAC Top 10 safety features modern cars should have as standard. rac.co.uk

⁴ New car safety features to look out for. Google.com

Many drivers generally will check mirrors but rarely if ever check their blind spots either before moving away from rest or make peripheral checks whilst moving. The driving mirrors are extremely important aids, and their use is vital for safe driving. The purpose of the driving mirrors is to let you know what is happening behind. Because, as previously mentioned, it's just as important to know what's happening behind as to what is in front. The interior mirror is made of flat glass and gives a true picture of the following traffic. It gives a broad field of vision preferably right up to the blind areas spots, framed by the rear quarter panels between the rear window and side windows and is essential you have a clear view of what is happening behind. However, the side mirrors are made of curved glass (convex) and improving your view behind but also make following traffic appear further away. Check between the interior mirror and the side mirrors and compare the two so you'll understand the different images of following traffic. Even though mirror checks will cover most of what's happening behind your vehicle, the need to check blind spots is vital when carrying out a manoeuvre. This is done by taking a quick sideways 90 degree glance (peripheral check) over the shoulder in the direction you are about to move. Equally important are blind spots found directly in front of your vehicle where you cannot see over the bonnet. This area is particularly large in vehicles with high and long bonnets. There are also blind spots to the front that are created by the pillars that frame the windshield and support the roof. The A-pillars creates blinds spots and restricts your view to scan the road ahead properly. It's vital to check that nothing is hidden from view by the A-pillar before making a manoeuvre. In a car, it can be very easy to assume that everything you need to pay attention to is either out the front windscreen, or the rear-view mirrors, but this overlooks critical blind spot areas around your vehicle that cannot be seen. To overcome blind spots (behind) we need to do peripheral shoulder checks or move our head (vision) left or right to see what's hidden by the A-pillars. Peripheral vision allows you to see objects all around you without turning your head or moving your eyes. It helps us to sense motion and walk without crashing into things; it's what you use to see something out of the corner of your eye. In conjunction with effective mirror checks, full shoulder checks are necessary before moving away from rest. Also, proper peripheral vision checks are vitally important when changing lanes in a one-way system or especially on motorways or dual carriageways. Finally, good situational awareness is a learned skill. Lacking or inadequate situational awareness has been identified as one of the primary factors in accidents attributed to human error.

Also, lack of situational awareness can result in error in problem detection, error in problem diagnosis and error in action planning and execution. However, the future introduction of autonomous vehicles (AVs) may well have the potential to reduce the number of traffic crashes by incorporating 'seeing eyes' that give good situational awareness. But until then, driver's vigilance and to be 'in the loop' is a key component in the visual awareness of their surroundings. There is a close relationship between automated driving and situational awareness. Drivers gaze when involved in highly automated driving is less frequent than when in manual control, which therefore could result in lower workload, but also poor situational awareness. So, finally, when driving and to remain safe, keep your head on a swivel and keep your vision 'loose' and 'have eyes in the back of your head' to be aware of your total surroundings, then, you may escape danger from the many other road users who are not as alert and safety conscious as you are whilst comfortably ensconced in your 'metal cage'.