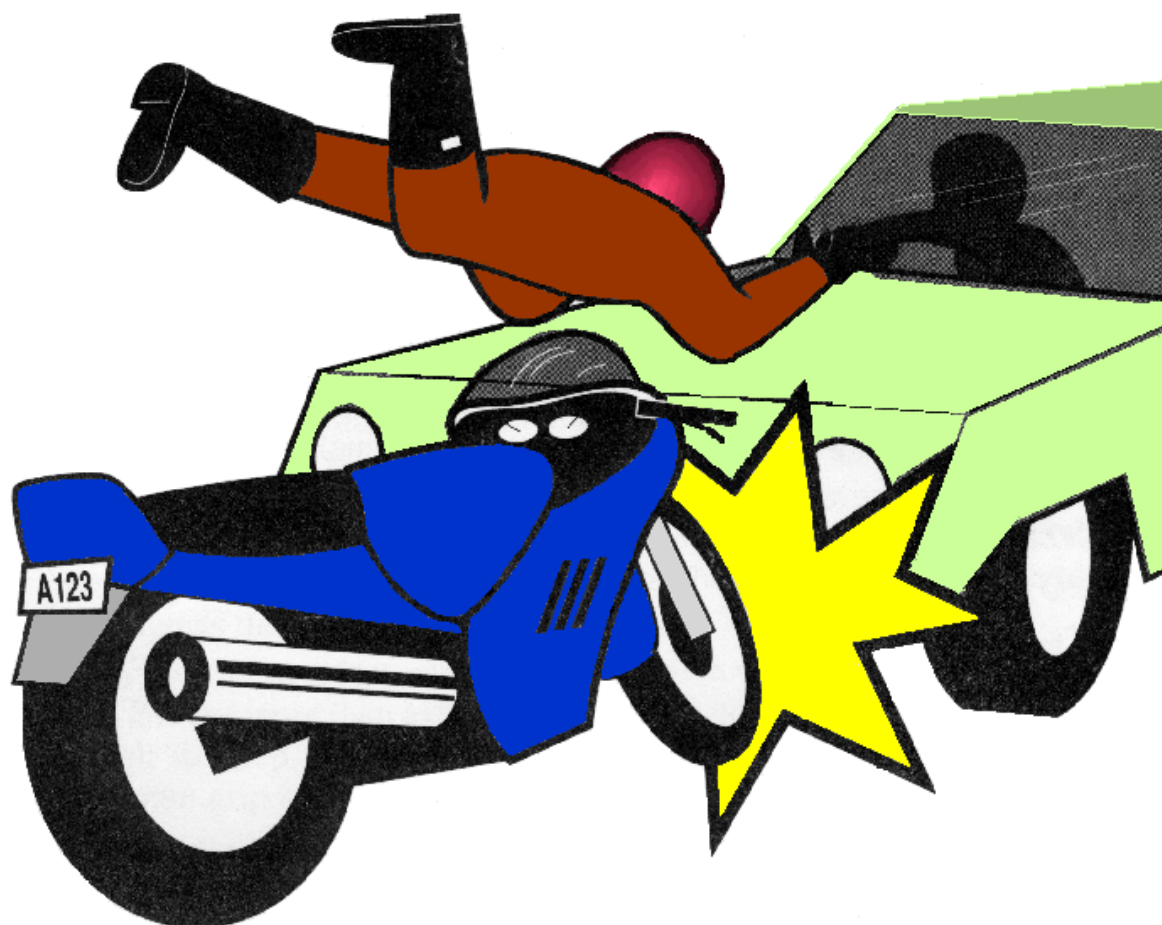


FOR WHEN THE CHIPS ARE DOWN

# THE NZMSC **Crash Survival System**



AN NZMSC PUBLICATION



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# The NZMSC Crash Survival System

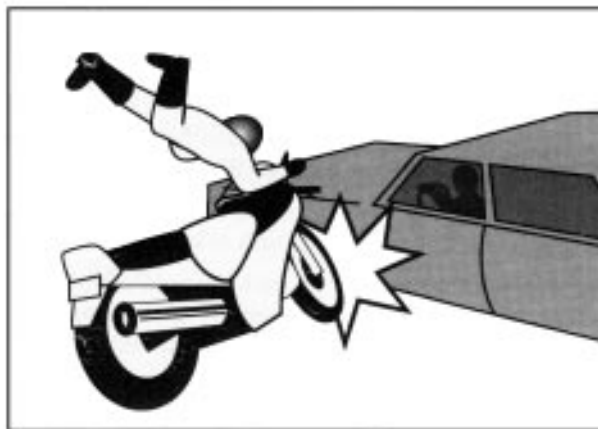
*As taught to pupils at NZMSC Riding Courses since 1982*

Motorcyclists are vulnerable on their machine. A motorcycle has no protective metal cage to protect the rider, and any strong impact in a crash is likely to cause severe injury - or even death.

Add to this fact that motorcyclists are often at the mercy of poorly-skilled drivers, especially at intersections, and you can see why New Zealand Motorcycle Safety Consultants has developed an accident survival system aimed at reducing the rider sustaining a severe injury in any of the common motorcycle crashes.

This Accident Survival System has been taught to pupils at NZMSC Riding Courses, and if the feedback from past pupils - who often gratefully proclaim "you saved my life" - is any indication, the System works, and works well.

This booklet explains the basis of the System, and enables the motorcyclist to develop the system further to suit their riding style, experience and circumstances.



## **IMPORTANT NOTE:**

This system has been developed taking into account as many different crash situations and scenarios as possible.

We CANNOT say that it will always work for you and that this system is infallible.

YOU are the one in control of your motorcycle.

WE cannot ride your bike for YOU.

No system will compensate for stupidity or carelessness. It is up to you to ride your bike carefully and with skill and the best way to avoid a crash is to anticipate crash situations well in advance and take the appropriate riding actions to minimise them.



# THE NZMSC CRASH SURVIVAL SYSTEM

*- for when the chips are down -*

*By Allan R Kirk  
of the **New Zealand Motorcycle Safety Consultants***

**S**ooner or later, if you ride a motorcycle on the road, a driver of a large lump of sheetmetal is going to wait until you are too near to stop, then drive that obstacle out into your path when, legally, you have right-of-way.

What you will do then will be one of several things.

According to Harry Hurt, the respected - and by now internationally famous - American motorcycle safety researcher, there is about a 30% likelihood that you will do nothing at all, not even go for the brakes. You will just sit there on what used to be a motorcycle, but has suddenly become an unguided missile, and will be propelled into a short, sharp and violent collision.

On the other hand, you could be one of the large percentage who have enough presence of mind to go for the brakes - only to lock the front wheel and have the bike slide out from under them. This then both reduces the deceleration of the bike (rubber footgrips and plastic handgrips don't give the same sort of braking action offered by even the most nasty of road tyres) and leaves the unfortunate rider faced with sliding at a faster speed than necessary into the errant car then becoming the human meat in the accident sandwich as the sliding motorcycle joins the 'fun'.

It's only a few riders who, in a collision situation, have the presence of mind and the more than average skill level required to use the brakes hard enough to keep the tyres on the right side of that fine line between maximum grip and skidding.

In most cases, these riders scrub off enough speed to bring their bike to a stop inches from the driver's door of the offending vehicle. They then have the

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*(Please note that for convenience we have used the masculine gender when describing a motorcyclist throughout this booklet. The many female motorcyclists will no doubt change 'he' for "she" etc. Female motorcyclists are not immune from the threat of careless drivers).*

luxury of being able to climb off their motorcycle and give the shaken car driver a piece of their minds.

But, even if you aren't a highly skilled rider, there are ways you can increase your chances of turning a crash situation into a near-miss situation. The New Zealand Motorcycle Safety Consultants, after a lot of study, has developed a Crash Survival System. Because it has the potential to save your life, we'd like to share it with you as much as we can in this booklet.

### **PRE-PLANNING YOUR CRASH**

One of the most important things when considering what you'd do in a crash situation is to remember that, on average, in an crash situation a rider has only 1.8 seconds to decide what to do and then do it.

Given the stress that the rider is under in that situation and the way his concentration is divided between the consequences of the crash and what he should do to avoid it, crash statistics seem to indicate that even an above-average rider has neither the ability nor the time to go through the required thought processes and make the appropriate, correct decision just before the crash happens. Instead, as Keith Code of the California Super-bike School says, "you will only do what you know will work." In other words, you will only do what you already have lodged in your brain as the best course of action.

If you have no pre-planned reaction for the situation, you are most likely to do absolutely nothing to avoid the crash, not even brake!

This is one reason our instructors wince whenever they hear self-confident riders loudly proclaim that small bikes can often be dangerous "because they haven't got the power to get you out of trouble". This often indicates that this rider has a firmly established belief that applying a large glob of power is the answer to an crash situation.

**The most effective way of surviving a motorcycle crash is to scrub off speed using high level braking skills.**

If that's the case, the most likely result will be that, sooner or later, that particular rider will hurtle, at full throttle, into a collision.

In order to react correctly in an crash situation a rider has to have a pre-planned course of action in his brain ready for retrieval and acting on.

This is the classic Kenny Roberts 'little packets' idea, where the rider has a mental packet of actions stored away for use at the appropriate time and place.

For example, when the bike slides out on a corner and the rider knows that he's lost control, he doesn't need to try to decide what to do and how to do it in the split second before the bike and he hit the ground. He simply reaches into his brain, extracts the little 'dropping the bike' packet which tells him, amongst other things:

- to kick away from the bike,
- to slide and not tumble (because the 'extremities' - arms and legs to you) tend to fling and get broken and, as well, a tumbling rider can't see where he's heading),
- to try to guide and slow himself by digging his hands and feet into the road surface,
- not to get up until he is sure he has stopped sliding and has counted to five, is uninjured and knows which way to move (getting up unhurt to stagger into the path of an oncoming car is not a good move...).

If he has this sort of packet available to him, the rider will never need to try to achieve the impossibility of making complex crash avoidance decisions while staring pain, suffering and possibly death straight in the grill.

These mental packets can be developed for almost any situation, including car/motorcycle collision situations where you are the poor mug on the motorcycle. All that is needed is some basic knowledge of what you can do, what your bike can do and what happens in these crashes.

### **The Golden Rules of Survival**

1. Look where you want to go
2. Learn high level braking until the skills are instinctive.
3. Look for the gap.
4. If they are blind, the best way to be seen is to be heard.
5. Pre-plan your crash situation responses.

## TYPES OF CRASHES

Those who plough into the side of the offending vehicle at any speed above walking pace usually find that the speed of collision is sufficient to forcefully separate the rider and his machine.

What happens then, according to research done at the Heidelberg University Hospital in Germany, is one of three things.

### *Ejected Crashes*

The 'lucky' ones hit the car at a low point and have what is known as an 'Ejected' crash. At the moment of collision, the rider is ejected upwards in a smooth arc. Canadian reports have indicated that, depending upon the speed at impact, the rider can fly as high as the top of a street light before coming down to earth with a thump.

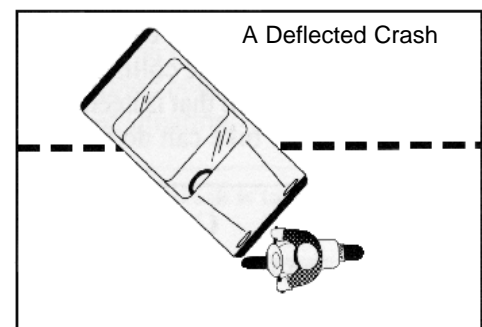
Given that the rider is wearing a crash helmet, thus avoiding fatal head injuries when he hits the ground, he often gets up and limps away - unless yet another lousy driver runs him over during the time he lies on the ground regaining his composure!

The sketch on Page Three is an example of a slow speed ejected crash. Here the rider is ejected onto the bonnet of the car and, as long as his legs don't impact too hard against the side of the car, the injuries should be fairly light.

### *Deflected Crashes*

Slightly less lucky riders have the second type of crash - the deflected crash.

In this type of crash, the rider either glances off the car or the car glances off the motorcyclist. In other words, the hapless rider just about makes it around the car but not quite. In this case, the injuries may involve nasty things like broken or shattered legs or, given a low handlebar height, an inability to make rude hand signals for some weeks or months. On the brighter side, if the rider is wearing a crash helmet, the risk of death is not high.



### ***Non-Ejected Crashes***

The really nasty type of crash, the one in which all bets are off in the life/death stakes, is the non-ejected crash.

This type of crash usually involves the rider ploughing into the side of the car's passenger compartment, an area usually specially strengthened to protect the inhabitants of modern cars. Worse, the rider usually hits the car with his head or chest at gutter-rail level, a particularly strong area just above the car's doors.

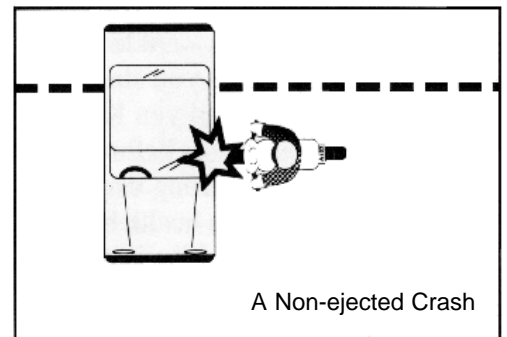
Picture it. The bike T-bones into one of the car's doors. The bike's forks collapse and the back of the bike rears up. The rider is propelled upwards and forwards. On early model bikes, he tends to slide forward over the tank with a lower projectory, but on late model bikes, where most of the fuel tanks are now shaped to give a 'ramp' at the front of the seat, the rider tends to slide up it and be ejected higher.

However, whatever the configuration of the bike, if the rider is holding onto the handlebars with a deathly grip, as he flies forwards the bars often bend forward in his grip. (Other reshaping of the handlebars can come per courtesy of the rider's upper leg/s hitting the handlebars as he ejects forwards and upwards.)

If the rider does hang up on the handlebars, his takeoff tends to be slowed somewhat, something not in the rider's best interests, as you will see shortly.

Given this ejection of the rider upwards, if a motorcyclist runs into the side of the boot (trunk) or bonnet of a car, he is likely to fly forward and land on the car's boot or bonnet (or on the road on the other side of the car if the speed at impact was substantial).

However, if the rider crashes into the passenger compartment of the car, he rarely rises high enough to clear the car but is thrown upward against the car at roof level. Except at walking pace contact speeds, the result is instant and extremely serious injury.



If the contact point is the head and the rider is not wearing a helmet, the rider's skull often caves in with fatal results. Even if the skull stays intact, without a crash helmet to slow down the deceleration of the head, the head stops almost instantaneously, the brain keeps going, smashing against the inside of the skull. The result is almost certain death.

At best, the rider is a mere shadow of the person he was before - in a vegetative state, an epileptic, intellectually handicapped, or spastic.

If the rider is wearing a helmet, this will reduce the deceleration of the head but the head injuries will still be severe to fatal given a collision at anything other than a modest speed. If the chest contacts, injuries to the chest are usually just as severe with the chance of death being high.

### ***Dropping The Bike***

The speeding rider who falls from his bike - usually through overbraking in a collision situation - is also a candidate for a non-ejected crash (sliding to a chest-caving stop into roadside furniture or the side or underside of the car). A fallen rider is also at risk of impacting with the sliding hulk of his once pristine motorcycle. Worst still, his bike may be tumbling, with lever knobs etc snapping off, creating lovely spears to inflict gruesome injuries should it land on its ex-rider.

Even if there are no sharp bits on the bike to inflict spear-type injuries, any bike, even a small bike, can do a lot of damage if it bounces upon the person who used to be in control of it but who is now carrying out a close, if involuntary, examination of the road surface, all the while trying to avoid sliding into the lump of sheetmetal that has just stopped across the intersection.

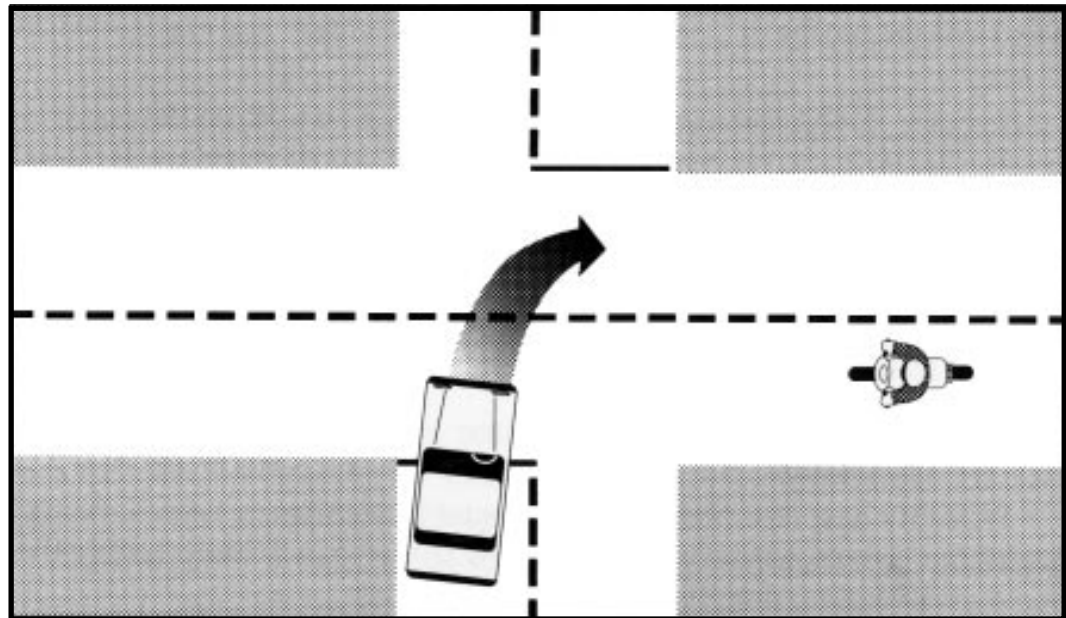
### **If Your Bike Slides Out From Under You:**

1. Kick away from the bike.
2. Slide, don't Roll - or you'll tumble and break extremities.
3. Look where you want to go - and steer with your hands and feet.
4. Move around as you slide to ease wear and friction bums.
5. Don't get up until you KNOW you've stopped sliding.
6. Gather your senses before staggering off the road - you don't want to stagger the wrong way into oncoming traffic.
7. Check your own health before you check your bike's health. The condition of the bike is of no consequence if you're about to die from blood loss.

However, if the rider has the presence of mind to kick away from the bike as it slid out from under him and to dig his hands and feet into the surface to slow himself down (he *was* wearing strong footwear and gloves wasn't he?), the bike should slide past the fallen rider and either out of the scene or else slam into the side of the car and, if the worst comes to the worst, will probably slightly cushion the rider's impact should he also slide into the car. But the chances of severe injury are still reasonably high in this sort of crash.

In any crash situation the rider has the best chance if he doesn't drop the bike but stays with it and tries to avoid the car while reducing speed as much as possible.

### **DEVELOPING YOUR SURVIVAL PLAN**



In an emergency, you only do what you know will work. Look at the diagram above, imagine you are the rider and, in order to avoid the car, write down on a piece of paper in which direction you would head. (Acceleration is NOT an option).

Remember, you only have 1.8 seconds in which to make this decision and take the necessary action.

Having made your decision it was probably one of these:

1. You'd stay in a straight line and try to scrub off speed.
2. You'd brake and swerve to go round the back of the car.
3. You'd brake and swerve to go around the front of the car.

Now, in light of the decision you made, consider this. In 99.9% of all of these types of motorcycle crashes, the car driver sees the motorcycle (or hears its screeching tyres) and instinctively goes for the brakes. When the car stops, it is just about always completely straddling the motorcyclist's lane, with the bonnet over the right wheeltrack and the boot over the left wheeltrack.

The next point to consider is where you usually ride in the lane. If you are following standard expert rider procedure, you will be riding in the right wheeltrack in order to keep away from footpath hazards, to discourage drivers from sharing your lane, and to ensure that you and your bike don't blend into the profile of parked cars and roadside clutter and make you hard to see.


Anyway, as you came up to the intersection and could see the opposing car (the hazard) approaching on the sideroad, if you were riding in the left wheeltrack, you would have moved to the right wheeltrack, away from the point the opposing car was heading towards. This standard riding procedure is called "Moving Away From Danger" and, in this particular situation, has the added advantage that you perform what the road safety research fraternity call a *Lateral Movement*.

### ***Lateral Movements***

Probably best described as a horizontal movement, a vehicle doing a lateral movement, a movement across the lane, is much more visible than one that is heading directly towards the observer.

Some experienced riders claim that moving across the lane away from a car on a Give Way sign doesn't just make you easier to see but actually attracts the eye of the car driver and can thus prevent the crash from developing into any serious problem.

But, given that you've moved to the right and a serious problem still develops, with the opposing car pulling out into your path you have to make some quick decisions and then act to avoid the crash. Which direction will you head as he pulls out.. . Left, Right, or Straight Ahead?



*Straight Ahead*

Our experience when teaching this survival technique is that, when asked to make a quick decision on what they would do should a car pull out on them, a few riders will decide not to change direction at all to try to avoid the car but, instead, will try to scrub off speed by braking as hard as possible. While this idea is not the best solution, it does have the advantage that, in dramatically reducing speed, you will also reduce the chances that the crash will be a fatal one - with you the fatality!

If the car stops in the usual place, and the rider is in the right wheeltrack, the chances are that the rider will “only” hit the bonnet of the car, with an ejected crash likely if the impact speed is high enough.

Problems arise, however, if the car is the one in ten thousand that doesn't stop in the usual place but stops further forward or just plain keeps on going. There's a good chance then that the rider will hit the passenger compartment with the deadly non-ejected crash resulting. But, if you know how to scrub off speed hard, that may not be too much of a problem. Do you practice your emergency braking?

But, most riders, when we ask them to make a snap decision about which way they'd head in a intersection collision situation, suggest that they would swerve to the left, around the back of the car. It sounds good in theory but the “solution” ignores some basic facts.

Firstly, if the rider is going so fast that he cannot stop before hitting the car, he is going too fast to make the tight loop needed to get around the back of the car. So, even if he missed the car, which is unlikely, he would still hit the kerb and, if going fast enough, anything beyond the footpath - a brick wall, for example!

Another important point to remember is that the physics of riding are such that, when you apply the brakes hard on a motorcycle it is very, very difficult to make any great change of direction.

Consequently, under emergency braking you won't be able to make that dramatic evasive manoeuvre to the left and, at best, will turn only a small amount - just enough to hit the passenger compartment of the car.

If you don't believe us, take your bike out onto an empty carpark or similar area, pick a point on the ground to act as the obstacle and try out a bit of evasion while under heavy braking. You are in for a surprise!

## GOING ROUND THE FRONT

Taking all these facts into account, there is one course of action that our experience has shown is the correct one for this sort of crash situation. Sadly, however, most riders who have never gone through the process of thinking about how to crash rarely plump for the best action - trying to go around the front of the offending car. This technique has many advantages.

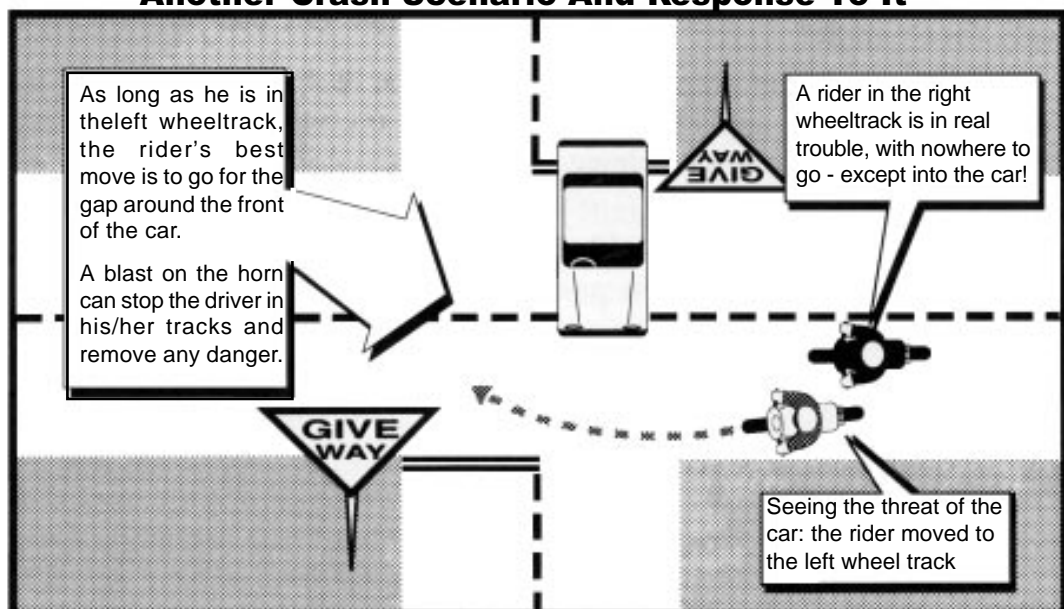
Since you should already be in the right wheeltrack, it isn't an impossibly sharp turn that is needed to get around the front of the opposing vehicle. And, even if the driver proves to be the exception to the rule and doesn't stop as soon as he/she becomes aware of your approach, you are more likely to hit the front of the vehicle and have an ejected crash than hit the deadly passenger compartment. Also, as you are angling rather than turning, you can be stopping hard at the same time.

Another advantage is that, as you move towards the front of the vehicle, you remain in or near the driver's line of sight, thus giving him/her more time to "see" you and act to help prevent the crash occurring.

Also, in heading to the right, you are not braking over the large oily patch in the middle of the lane. There is a chance, however, that you may need to brake over the much narrower painted centre line. Hopefully, it isn't an old one, worn smooth by tyres and raindrops.

Worried that heading to the right may cause you to run into a car coming the other way? Well, if there is a car coming the other way, Car A is more than unlikely to pull out in front of both you *and* the other car.

### Another Crash Scenario And Response To It





## **REDUCE YOUR RISK**

While there is no way anyone can guarantee that you will survive a car/ bike collision or even come out unscathed, our experience has been, in the seven or eight years we have been teaching motorcyclists these sort of preplanned crash survival techniques as part of the NZMCA survival system, that those who apply the technique dramatically reduce their risk of death or serious injury in crashes.

The points to remember in the illustrated crash situation are few, but important.

In an emergency situation, you will only do what you know/have already decided will work. Thus, if you don't at least consider the points in this article and decide whether you agree with them or decide you would rather do something else in a similar crash situation, when the time comes - and it will - you will do very, very little, probably with drastic results.

The natural reaction of car drivers in an emergency is to go for the brakes. This means that in 99% of all car/bike intersection crashes the car stops across the rider's lane.

Overseas research has shown that the most dangerous place for a rider to hit a car is into the main passenger compartment. To survive a car/bike collision relatively uninjured, you must hit the car at a low point.

Remember that you **MUST** scrub off as much speed as possible in such a situation but, in doing so, this will reduce the manoeuvrability of your bike. Therefore, you increase your chances of severe injury greatly if you try to get around behind a potential collision.

Your best chance is to brake hard and angle slightly to go around the front of the car, thus keeping in the driver's line of vision and greatly reducing the chance of hitting the car's passenger box.

## **DEVELOPING YOUR CRASH REACTIONS**

Well, that's just one potential motorcycle crash we've analysed and diagnosed what we consider are the best actions to take when faced with it. Your task now is to pre-plan your reactions for as many crash situations as you can. So, ask your friends about their crashes and work out what you would have done in their place. Read motorcycle crash reports in the paper and see if you can work out what would have avoided or reduced the severity of the crash.

There are lots of crash types to pre-plan.

For example, what do you do when you are having a marvellous time through your favourite set of twisties only to find that you've entered a corner too fast, you don't think you'll make it and you're heading straight towards a telephone pole /light standard/light pole. What should you do?

Did you know there is one, simple and vitally important thing you must do to avoid hitting that pole? (The answer is in the NZMSC book *Cornering - Going Round The Bend On A Motorcycle.*)

If you don't know the answer, then you haven't done enough learning and crash pre-planning.

As Kenny Roberts would say, you've got little packets missing, and the ones you do have don't have enough in them!

**When planning your crash responses, remember:**

- that the best thing to do is to prevent the crash situation occurring in the first place by riding defensively.
- that the instinctive reaction of all parties in a crash situation is to go for the brakes.
- to try to avoid solid objects such as a car's passenger compartment to look for and use any gaps.
- that dramatic changes in direction under brakes on a motorcycle are very difficult to achieve.



## Some Crisis Situations That Need Pre-Planned Responses

### What do you do when:

- your throttle sticks wide open?
- you're going downhill too fast and a corner is coming up on a gravel road?
- it's a wet night, you're doing 100kmh and that car won't dip those blinding lights?
- you get into a tankslapper when accelerating over a railway line or ridge of tarseal?
- your bike starts to lose grip on a white arrow?
- a bad camber makes your bike run wide on a corner?
- on starting, your bike backfires and bursts into flame?
- you hear a squeal of tyres from behind as you sit in the queue at a set of lights?
- a car comes around a corner on *your* side of the road?

Think about these situations and see if you can come up with an answer. Discuss the difficult ones with your friends. You never know, they may have actually been in such a situation.

Ask about the riding crisis situations your friends have been in and work out what you would have done in that situation.

If all else fails and you can't work out an answer to any of the above situations, you can always attend an NZMSC Riding Course. We can answer these questions there.



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