F U L L C O N T R O L

(Adapted from an original booklet published by the Norsk Motorcykkel Union)

This article describes an effective and precise riding technique while also helping you to understand the essential physics of a motorcycle. In addition it also offers you a series of exercises that you can work on every time you ride. Through systematic practising you can learn to override dangerous instincts and let the bike do what it is best at.

Many riders repeatedly act incorrectly, yet get away with it because they build into their riding wide safety margins – or are simply lucky. They ride on in good faith and ignorance and in that way establish a whole bunch of poor riding habits. These habits can then turn on them in a critical situation and lead directly to an accident. It is therefore quite reasonable to believe that many of the accidents that happen are directly caused by the rider's own instinctive actions. Conscious effort to learn precise riding techniques, and thus beat instinct, will inevitably lead to increased enjoyment with fewer 'problems'. To change working habits demands perseverance. It takes humility to realise that you may be wrong, and a measure of stubbornness to practise systematically. The reward is more fun and increased safety.

Of course, a precise riding technique is not by itself sufficient to become a competent rider. There's a lot of other knowledge you need in order to become a good rider. Other articles offer riding tips, but in many of these, a precise riding technique is treated superficially. This article is written to help you practise on your own and establish accurate technique.

All two-wheelers – without exception – steer, brake and accelerate according to the same physical principles. That's why precise riding technique is equally important whether on a Harley or a sports bike.

This article is laid out as a handbook or reference book. You can read it in the order you choose. Start with what interests you the most. We start out with the physical forces that influence the bike and why it is built the way it is.

A natural consequence of physical laws is that some riding techniques are more efficient than others. But since this is not an in-depth textbook, we have had to simplify the scientific and physical explanations a lot. As they are, they are a good starting point to understand what happens physically when you steer, brake or accelerate your machine.

We explain each subject of riding technique separately and later put them together as a whole. Along with the chapters of riding technique we have described exercises that you can employ when you are out riding on the road. One of the last chapters describes more demanding and specific exercises to be practised in an area without traffic.

Your machine is a precision instrument, ready to follow whatever command you give it. But you have to give it the right commands. The key word is communication. The bike does what you ask of it, but if you disturb it, the result may not be what you intended. It is, therefore, important to understand how the machine works best, what it needs in order to do its very best, and what prerequisites are essential for it to do its job perfectly.

In this article we introduce some necessary terms that may be new to you. To understand properly, it is essential that you learn and understand these terms. Indeed, any motorcycle can do only three things: steer, accelerate and brake. Each of these is treated in a separate chapter. Riding skill in itself is a necessary prerequisite to becoming a skilled rider, but there are also other elements of rider competence that you need to know to become a good rider. In the chapter "Other aspects of rider competence" we mention some areas you need to study. To find more on these subjects, you will have to find other textbooks.

The chapter "Exercises in a secluded area" gives you exercises to practise precise technical skills. It is imperative that you perform this practising in an area completely without traffic. Then you can practise undisturbed and without risk. It is important that you understand the physics and follow the instructions faithfully, in order to work carefully, precisely and goal oriented. Do not expect immediate results: in the world of elite athletics one talks about two to three thousand repetitions to achieve correct, automated working practices.

A short introduction to practical physics

How does the motorcycle stay upright? How does it steer and why does it turn when leaned over?

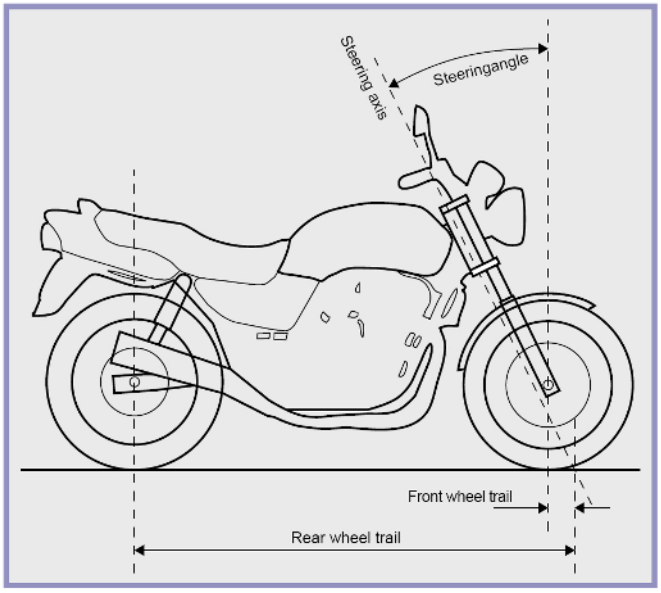
Among motorcyclists there are unfortunately few precise answers to these questions. Most of the explanations are fairly inaccurate and based on notions and interpretations of personal experiences. That's why many riders give their machines imprecise – and even erroneous – commands. In this chapter we will explain some of the physical forces so important to understand in order to fully cooperate with the bike.

Active balance.

The motorcycle has to make do with two tiny contact patches with the road and cannot keep upright when stationary. Perhaps you have watched trials riders keep their balance almost endlessly even though the bike does not move? So it is possible, but we will not be dealing on such acrobatics here. Instead we will focus on what enables a two-wheeler keep its balance when rolling.

Ever tried to balance a hammer upright with the handle resting on your palm? What do you do when the hammer begins to tilt towards the left? You move your hand the same direction, of course. Thus you move the hammer's contact patch (in your palm) back under the centre of gravity. Balance restored.

You balance the motorcycle the same way when it's rolling. If the bike tilts towards the left (falls), and you want it to move straight ahead, you use the handlebar to move the bike's contact patches back under the centre of mass. In practice, it means that you steer the same direction that the bike falls, enough for the wheels to move in back under the centre of gravity. Balance is restored. The effect of this manoeuvre increases with speed – a small steering input moves the contact patches quicker at 50mph than at walking speed.



Inherent balance: The front fork geometry is a precondition for inherent balance and directional stability

Inherent balance and directional stability

Have you watched road racing on television? Then perhaps you have noticed that riderless machines sometimes continue on their own, stable as projectiles, straight ahead after the rider has been thrown off. The reason they can do this is mainly to be found in the steering geometry. The motorcycle's fork is oblique, so that an extension of its centreline hits the ground a bit ahead of the front tyre's contact point with the ground. The distance between these two points is called trail. The geometry of the front fork is a prerequisite for the bike's inherent balance and directional stability. If you want to see for yourself how this works, straddle the bike with both feet solidly planted on the ground. Lean the bike a bit to one side. Make sure you support it firmly with your thighs so it doesn't fall. Let go of the handlebar and watch what happens. If the friction between tyre and ground isn't too much, you will see the front wheel steer to the same side that you lean the bike. The effect of this, at speed, is that the bike on its own, without aid from the rider, will try to steer under the centre of gravity when it cants over to one side or the other, and in this way manages to keep balance and directional stability, thus 'trail' provides stability. Sports bikes with less trail have less stability but a faster turn in, while custom bikes are the opposite end of the scale with greater stability but with a correspondingly slower turn in.

Many advocate that the gyroscopic effect is also important for balance and stability. The gyroscopic effect arises when a wheel rotates and leads to a resistance to sideways movement. The effect is truly present, and increases with speed, but it's relatively small when compared to the effect of the steering geometry.

How do you make a motorcycle turn?

In the last passage we explained how the handlebar, fork and wheel 'falls' to the right when you lean the bike to the right. The front fork geometry makes the front wheel turn when the bike is leaned over. There is another reason that leaning the bike makes the wheel turn. Motorcycle tyres, unlike car tyres, have a round profile. The circumference is thus longer around the middle of the tyre than on the shoulders.

Imagine two conical drinking glasses set together like the picture shows. Set one of the glasses on its side on a table, to emulate a motorcycle tyre leaned over. Give the glass a push and watch how it turns rather than roll straight ahead. The reason is that the side with the longest circumference (the top of the glass) rolls further for each revolution. The same is true for your front tyre and this makes the tyre steer the same way that the bike leans. The front fork geometry and the tyre profile makes the bike turn automatically as soon as it is leaned over.

The rolling circumference decreases: *The front fork geometry and the rounded profile of the tyre makes the bike turn automatically when leaned over.*

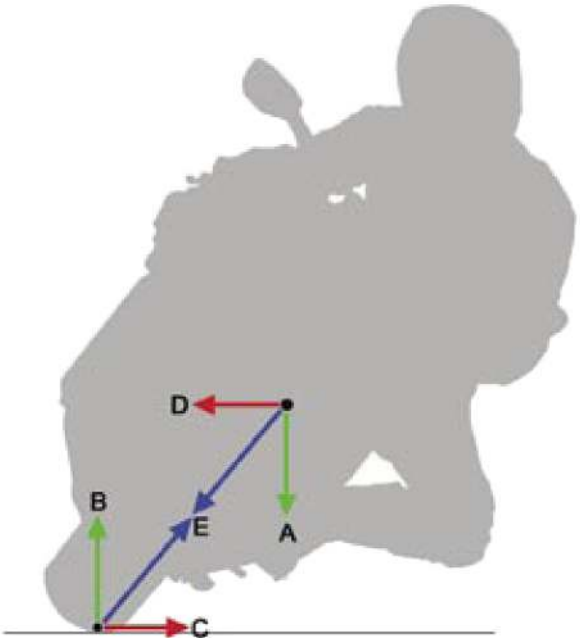
Balancing act in a bend

Newton taught us that an object that is not subjected to any forces, will continue to move with the same speed and direction. If moving, it will go on straight ahead. If it is still, it will remain still. If you affect it with a force in one or other direction, the object will change course and/or speed. Imagine a motorcycle at speed. Seen from behind, when the bike is straight, the contact patches are directly under the centre of mass. It means that gravity points straight down through the contact patches and that the counterforce from the ground points straight up through the bike's centre of gravity. The machine is in balance.

When the bike leans, for example to the right, the centre of mass is no longer directly above the contact point. Gravity and the counterforce from the ground still point straight down and straight up, but past each other and displaced sideways in relation to each other. The bike would have fallen, were it not for a third force working to keep it upright.

As explained earlier, when the bike leans at speed, it also turns. When the bike turns, for example to the right, Newton tells us there is a force pushing right. This sideways force 'attacks' in the contact points between tyres and ground, and since these are far below the centre of mass, impels the motorcycle to 'fall' toward the left (read: straighten up). When the force that impels the bike to 'fall' to the left (sideways force) and the force that tries to make the bike fall to the right are equal, the motorcycle is in balance in the bend.

Given balance and constant speed, the motorcycle will travel in a perfect circle. If you didn't have to control the throttle with your right hand, you could have let go of the handlebar and followed the bike through a perfect bend.



Forces at work in a curve: *when the forces that try to tilt the bike to the left (sideways force) and to the right (gravity) balance each other, the motorcycle is in balance.*

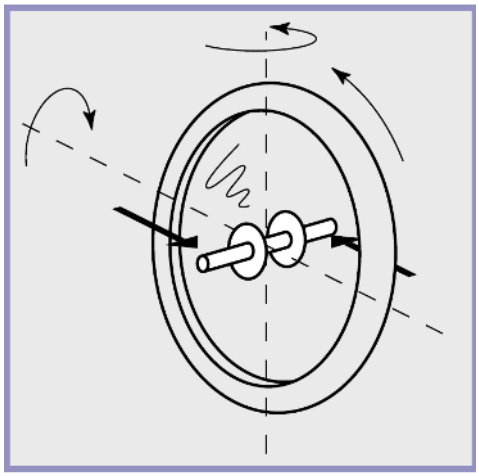
Green arrow A: *Gravity*
Green arrow B: *Counterforce from the ground*
Red arrow C: *A sideways force that attacks the tyres in the contact patch*
Red arrow D: *'Centrifugal force', a force you 'feel', as a result of sideways acceleration in a curve*
Blue arrow E: *The sum of the forces equals balance*

How do you initiate a turn?

To make the front wheel steer the way you want it to go, it follows therefore that you must first lean the bike over. This is absolutely necessary to make a motorcycle turn. Thus, if you are scared to lean, you are in fact scared to turn. A bit unfortunate, isn't it, if the road curves?

So how do you make the bike lean over? It may be done by body language, to move your own body relative to the bike, to one side or the other. We emphasise, however, that this is a very slow and imprecise way of steering that results in long, slow 'banana-turns'.

A far more efficient way to initiate a turn is to give a short push on the handlebar, on the same side that you wish to turn. This push makes the front wheel steer away from the wanted direction. The contact patch of the front wheel moves away from the general direction of the rest of the bike. This makes the bike swivel around its own centre of mass, and lean into the desired bend. Elegant, isn't it?



Gyroscopic precession: *When wheel is turned to the left, it reacts by leaning to the right*

Gyroscopic forces also contribute in this 'opposite' steering movement. You can try it for yourself: Take off the front wheel on your pedal cycle. Grip the wheel by the front axle and hold it out before you with straight arms. Get a friend to help you spin the wheel so it turns fast in the direction it would turn if you rode the bike. Now move the wheel straight up and down in a vertical plane. No problem, right? Next try to steer the wheel to the left as if you steered with the handlebar. Can you feel that the wheel reacts with a powerful cant to the right? This phenomenon is called gyroscopic precession.

If you initiate a bend with a small movement steering the opposite way to that where you intend to go, you immediately achieve the lean you need in order to turn the correct way. This steering technique is called…..

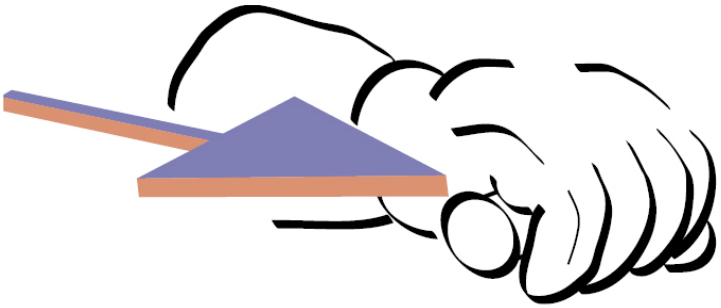
Counter (or Positive) steering

Counter in this context means ‘opposite’.

Countersteering means that you, for a short moment, in fact steer in the opposite direction to that which you want. This short, opposite steering movement effectively makes the bike lean to the side you want to turn. We have already stated that leaning is absolutely necessary in order to turn any two-wheeled vehicle. The countersteering is performed by giving a push forward on the handlebar on the side that you intend to turn. If you want to turn right, you give a short, precise push forward on the right handlebar. If you intend to turn left, you give a short push on the left handlebar. We call this ‘push’ a steering command henceforth – a ‘positive’ action.

Conscious countersteering is by far the most effective way of steering a motorcycle. Immeasurably more effective than the ‘body language technique’, where you try to make the bike lean and turn by moving your body to the side.

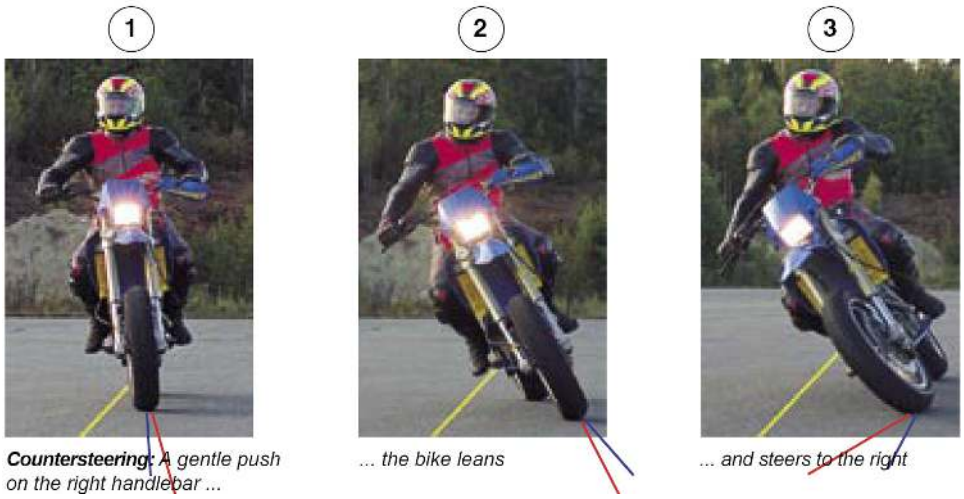
You can always use countersteering to change the direction of the motorcycle – presuming your bike moves at more than walking pace. It is, however, extremely important that you learn exactly how hard you need to push. At normal speed, very little force is needed to achieve a serious change of direction.



Counter steering: *If you want to go right, give the right hand side of handlebar a gentle push*

When entering a turn, the sideways forces will try to tip the bike outwards (read: hold it upright). To counter this, there must be an equal force that ‘pulls’ the bike inwards. That is one of the reasons you must lean the bike into the turn: gravity will try to make the bike fall inwards. When in balance, these two forces make the bike go beautifully through the bend. Countersteering enables you to quickly and precisely achieve the correct lean angle.

The result is that you spend a very short rolling distance achieving the change of direction. You get a very precise ‘turning point’. Imagine you are going into a right-hander. When you reach the turning point you give a short, precise, progressive push on the right handlebar. This done, the front wheel steers left for a short moment. The rest of the bike will, because of its mass and inertia, try to go on straight ahead, while the front wheel steers left. This cants the bike effectively to the right, a prerequisite for turning right. The angle of the front fork and the trail impels the front wheel first to straighten and then to turn into the bend when the bike leans. The bike now finds, all by itself, a perfect balance between the outward force and gravity, so that the lean becomes stable. A perfect, sensitive harmony between the outward and inward forces.



Countersteering: *A gentle push on the right handlebar ...*

... the bike leans

... and steers to the right

Amazing, isn’t it? But remember this: The higher your speed, the stronger the self-stabilising properties of the front end. You feel the bike as sluggish, hard to turn. It means that when speed goes up, your steering command must also be more powerful to make the bike turn when and where you want. In the chapter about steering, we will go into this in detail.

We recommend you to start practising conscious countersteering and make it your only steering technique. This will give you an effective technique that you can use in all situations. When you have to make a quick change of direction or swerve, countersteering is the only effective way.

Acceleration and braking in a bend

It is a fact that a motorcycle 'straightens up' or drifts towards the outside of the bend when you accelerate out of a bend. Why is that? When the forces that work inward and outward on the bike while turning are equal, the bike may continue around the bend endlessly. When you open the throttle the motorcycle will accelerate and the sideways force that tries to pull the bike out of the bend will increase. It exceeds the inward force and thus the bike straightens up and follows the road out of the bend.

It is also a fact that the bike straightens up and drifts toward the outside of the bend when you apply the front brake in a bend. How can that be explained? In a right-hand bend, leaned over, the centre of the contact patch is to the right of the centre of the tyre – and thus also to the right of the imagined extension of the steering axle. When braking, the braking forces will 'attack' in the centre of the contact patch and thus try to turn the wheel, fork and handlebar towards the right. In fact the braking forces make the bike steer more to the right and the lean angle changes. In a bend this feels like the bike is straightening up.

A few words about the suspension system

The suspension gives us comfort but the system has a task that is far more important than comfort:

The tyre is like a football. It bounces. And it bounces hard! Imagine what happens when the rolling tyre at highway speed hits a hump in the road. It is compressed by the hump and then bounces back with ferocious energy. This energy rockets the wheel upwards. The springs are designed to absorb this rocketing energy and gradually slow the wheel's upward travel so that the shock is not fed into the bike. When the movement is stopped softly, the compressed spring pushes your wheel back to the ground again to restore precious grip.

The springs alone, however, are not sufficient to control the wheel's bouncing. The springs just continue their pogo dance if there's nothing to calm them down. The hydraulic oil in the shock absorbers holds the bouncing in check when the wheel rockets upwards and also slows it on the return so that it doesn't bounce back full force. For when the upward wheel travel is stopped, the spring is compressed, and will 'shoot' the wheel back down again with almost the same power as it was kicked upwards. The shock absorber and the oil that has to flow through restricting holes, retards the downward travel and puts the tyre neatly back on the ground.

Thus the tyre is forced to keep in touch with the road as much as possible, where road grip is found, and at the same time keeps the rest of the motorcycle calm and stable. It would not be without danger, but a clear way of seeing just what effect damping has would be to try to ride a bike without any damping, just to learn to appreciate the job it does. If you do however, take great care and only do so in a controlled environment – you have been warned!

There's also another extremely important 'shock absorber' on the bike, which can both stabilise the bike or disturb it. You! The wind pushes and jolts you when you ride. Bumps or potholes make your body bounce and jolt. If you sit stiff-backed and grip the handlebars hard your body's movement is fed into the bike and interferes with its job. A relaxed body when you ride is essential. Under section 3.2, 'Riding position', you will find more about this.

Those dangerous instincts

By “instinctive faulty reactions” we mean here those unconscious, panic-like actions you do when you get scared. They come like a reflex, before you can think, without you planning them. The human body is not really built for riding a motorcycle. It’s built to walk or run.

During evolution we have been equipped with instincts and reflexes meant to protect us when in danger, that are triggered lightning-quick. An example is how you blink your eyes when some sudden movement startles you. Another is when you retract your hand instinctively when touching something hot. These are unconscious reflexes designed to keep you from harm. The problem is that some of these reactions can be life threatening when you ride a motorcycle. Instinctive faulty reactions are a major cause behind motorcycle accidents.

More often than not they worsen a situation that you could easily have mastered if only you knew what you were doing wrong, and how to do it correctly. Each one of these instinctive faulty reactions has the power to override reason. The most common of them is that when in a scary situation you instinctively ”push away from the fear” by straightening your arms and your back, to create distance from the threat, to protect yourself. That is the absolute opposite to what is actually needed to steer the motorcycle, namely loose arms, lower arms horizontal and shoulders low. Been there? Done that? It happens to us all.

A second faulty reaction is that when scared you tend to fix your stare at the danger, what you want to avoid. And so it is with motorcycles as with other weapons: you hit where you aim. Such ‘target fixation’ is probably a reason behind many accidents. This faulty reaction may come into play for example when you ride into a bend on the road and feel that the speed is too high or when a car does not give way for you and suddenly blocks your way. You look at the problem when in reality you need to look for the solution.

A third one is the tendency to suddenly and quickly close the throttle in the middle of a bend because you get worried about the grip. This reaction is no different to hitting the rear brake in a bend, as the engine suddenly brakes the rear wheel you can risk a slide. A second consequence of rolling off the throttle is that you transfer weight to the front wheel and the bike becomes truckish to steer.

How can you learn to conquer these primitive instincts in order to handle the situation properly? There are really only three ways.

- Always be conscious of the problem
- Learn to recognise the situations that can trigger the faulty reactions
- Learn and practise a precise riding technique so that it becomes a new instinctive reaction (a new reflex) to override old one

You are not the only one to get scared every now and then. Seasoned riders and instructors have long since identified what triggers a cold sweat on your forehead:

- You are suddenly scared of not getting safely through the bend
- You suddenly realise your speed is too high going into a bend
- Your lean angle is greater than you are comfortable with
- Sudden worry about grip
- An obstacle right in your path

Use this knowledge positively. No matter if the danger is real or imagined, the instinctive reaction is an effort to save you from harm.

None of them, however, are in harmony with the motorcycle’s physical properties or the principles behind a precise riding technique. In the following chapters we will show you how you can practise techniques that are appropriate – and with their help conquer your instincts.

A precise riding technique

The riding technique we describe is founded on the motorcycle's physical properties. This technique puts you in control of the machine. Established as a precise technique, this competence yields both fun and safety. Correct working technique in this context means well-drilled operating commands that gradually become instinctive and are triggered as a reflex when you need them most.

We know many motorcyclists who regard themselves as skilled even though they time after time act in a way that makes it impossible for the bike to function properly. They experience that their way of riding works for them – so everything is just fine, isn't it? With low demands and a lot of luck most things work out fine. It does not mean you are doing everything right, though. It may be that you always have a lot of margin. That is good in itself. But nevertheless: that word 'experience' can still mean that during extended practice you have established bad working habits.

They may be adequate for everyday riding, but can still cause you trouble in a difficult situation. Tips and good advice from fellow motorcyclists can be valuable, but may be vague, inaccurate and lead you astray. The lack of accurate textbooks on the subject is one of the reasons there are so many assumptions and so little concrete knowledge about riding technique. Formal pre-test rider training probably hasn't given you the precise riding technique that you need in an adverse situation on the road.

"A motorcycle is a precision instrument and an effective riding technique will make you play like Eric Clapton"

The basics of a precise riding technique

To be able to describe riding technique accurately we will have to introduce a few terms that may be new to you. We recommend that you take the time to really get to grips with these terms and their meaning in order to get the full benefit of the explanations and exercises.

Counter / Positive Steering

Counter or 'Positive' Steering is the most effective way to steer a motorcycle. You give a short and precise push at the end of the handlebar on the side to which you want to turn. That is, you give a definite, 'positive', steering command. If you want to turn right, you push the right handlebar. For a short moment you actually steer the opposite way to where you want to go. This moves the front tyre's contact patch with the road outwards from the centre of the turn so that the bike quickly achieves the necessary lean angle and turns. For details, see the chapter "A short introduction to practical physics."

Steering point

This is the exact point on the road where you choose to give the steering command that makes the bike turn precisely into the turn.

Anchored push

To countersteer you must push precisely on the handlebar. In order for the steering command to move the handlebar accurately, and not push your body backwards, you need 'anchoring'. Just try it; stand with your side towards a wall with your feet close together. Raise your arm and give the wall a firm push. To prevent yourself falling you must step out with the foot furthest from the wall to support you. You must 'anchor' yourself. On the bike, the natural anchoring point is the outside footpeg, the peg facing outward from the centre of the bend.

An 'anchored push' means that you anchor yourself on the outer footpeg (consciously feel the peg under your foot), contract your leg muscles just like a small kick-off, and transfer this force to the opposite handlebar end. The term 'anchored push' signifies that you both anchor and push at the same time in order to achieve precision in your steering command.

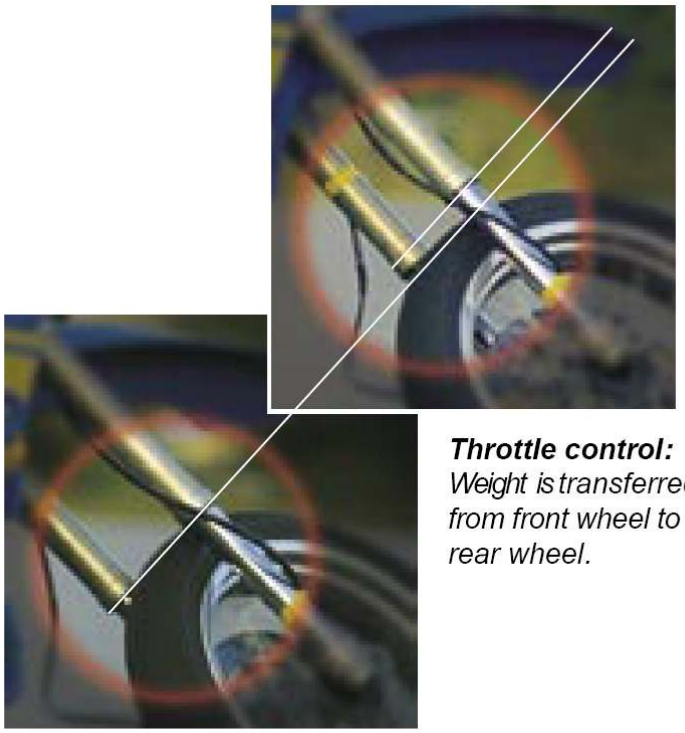
In a normal corner, the anchored push is experienced more as a 'feeling' than an exertion of raw power. But at higher speeds, not to mention emergency swerving, you really need muscle in order to achieve the necessary effect of the steering command. That is why the technique of an anchored push is so important. To aid that push consider at the same time pulling on the opposite handlebar whilst still remaining 'anchored' to the machine.

Throttle Control

When you lean the bike, a situation arises that you need to appreciate. The rolling circumference of the tyre is smaller towards the shoulder of the tyre. Hence, the tyre must turn faster when leaned over in order to keep the same speed. Therefore you have to open the throttle a little, immediately after the steering command, in order to avoid the engine braking the rear wheel.

Throttle Control thus means that you open the throttle a bit, immediately after the steering command. The effect is that weight is transferred from the front tyre to the rear tyre and that the bike feels more willing to steer. In addition, this slight acceleration makes the front fork rise a bit, going back to a medium position, which is required for the fork to work optimally, and keeps your tyres securely planted on the ground. Also, a compressed fork would give less ground clearance, right?

Do you remember how the motorcycle balances the sideways forces and gravity in a bend? This balance demands a steady speed and lean angle. Conscious Throttle Control gives this constant speed. Good anchoring gives you a steady lean. Together these two give you optimal stability and road grip throughout the corner. You know when you do it right: it gives you the exhilarating feeling of safety and control – and it keeps those dangerous instinctive reactions at bay!



Throttle control: *Weight is transferred from front wheel to rear wheel.*

"Throttle control is necessary to maintain the 'harmony' through a turn"

Anchoring points

Precision steering demands good contact with the bike without 'clinging'. You need anchoring points. Footpegs, saddle and fuel tank are the most important ones. By conscious use of these, you achieve effective steering commands and full control under braking – while it allows you a relaxed upper body, arms and hand. In the following chapters we will elaborate on this foundation and describe a Precise Riding Technique that gives you full control over the three things a motorcycle can do, namely to steer, accelerate and brake. But before that, we will look into some other prerequisites for success that you need to know and master.

Riding position and anchoring

Your riding position is crucial for control. A poor riding position can ruin the motorcycle's ability to help you out of a difficult situation. When you ride into a hazard, for example a bend, you have to be ready to handle the unexpected. You must be prepared mentally and physically, set your body to alert, and assume a riding position that enables you to act correctly and accurately.

Your bike is very good at riding, so don't disturb it while it's doing its job

Anchoring

Your riding position influences steering, braking, stability, suspension, ground clearance and weight transfer by acceleration. An inadequate riding position may lead to an inability to carry out the manoeuvre you intended or hamper the bike in doing its job.

You achieve precise steering with the balls of your feet on the footpegs, loose arms bent at the elbow, a relaxed grip at the handlebar and your body leaning slightly forward. A swerve succeeds only if you are correctly anchored as well as your torso and arms in the proper position. Your arms and grip must be relaxed for the bike to be stable, Done correctly, you will sense that you hardly need to hold on to the handlebar at all, if it were not for throttle control. Without an 'anchored push' much of the power in a steering command will be spent pushing your body backwards rather than the bar forwards. In a slight forward crouch, you can tension your abdomen muscles, weight the outer peg and transfer the steering power effectively to the handlebar. In normal bends, this steering command is a subtle, progressive push. But the higher the speed, the more force you need in your push.

Riding positioning a bend

When you approach the steering point, you prepare yourself by assuming the correct seating position; weight the outer footpeg to prepare for an anchored push. At the steering point you give the steering command, which is a deliberate, progressive push at the handlebar, just powerful enough and long enough to make the bike lean as much as is needed. You keep the weight on the outer peg. This gives the bike stability because your weight is fed into the bike low down – and you will not disturb the bike while it is working.

You may also move your bottom slightly toward the inside of the saddle before you enter the bend. This achieves better ground clearance and less lean angle. You make the job easier for the bike. If, for example you hit a spot of gravel and the bike slides, you will make its job easier if you lift your bottom slightly off the saddle and anchor yourself on the pegs and fuel tank.

Suspension and springs carry the weight of both you and the motorcycle itself. Sometimes, in addition, the weight of a passenger and luggage. In some situations it may be too much for the suspension. For example if you hit a serious bump, road kill or a chunk of wood that you fail to avoid. Then you can help your bike by lifting your buttocks off the saddle. The advantages are threefold: you anchor your weight low down, your knees will function as additional suspension, and your body remains still even if the bike is jolted violently. Thus you quickly regain control and avoid clinging desperately to the handlebar.

Riding position while braking

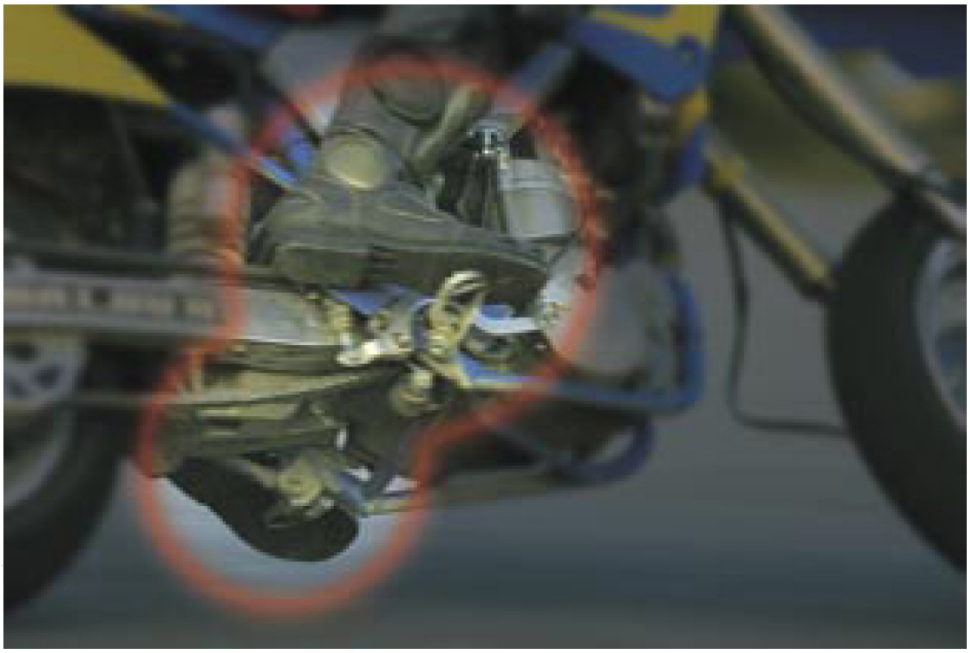
Directional stability depends on your riding position. A relaxed seating position with loose arms and a relaxed grip on the handlebar is crucial.

The rider is the most important 'shock absorber'

Modern motorcycles have very good brakes. But a faulty riding position and braking technique can ruin the bike's braking prowess. During hard braking, anchoring and sight are essential. Relaxed arms and a relaxed grip on the handlebar are necessary for the motorcycle to brake straight and firm. You need to be anchored solidly on the pegs and fuel tank. If, on the contrary, you support your weight, with stiff arms, on the handlebar, the bike will be unstable and tend to dive alarmingly while lifting its rear wheel.

<u>Anchoring:</u>

Balls of feet on footpegs and weight the outside peg



Weight on the outer footpeg through a turn stabilises the bike

Attention and visual focus

It is not a gift of birth to use your vision correctly, but it can be practised. To be fully in control you must have a complete picture of the situation – that is to be consciously aware of all the important elements of the situation in front of you, at your sides and behind you, so as not to be taken by surprise.

To be attentive is not the same as to 'look at'. If you focus on a point ahead of you, you can, with a little practising, have a fairly clear picture of what is happening in the rest of your field of vision, without moving your focus. When you ride through a bend on the road and your focus is far ahead of where you are going, it is

still possible to see the kerb or white road borderline in the periphery of your sight. You can detect if you are drifting towards or away from it without having to look directly at it.

The part of your field of vision where you see sharply is called the focus area. The rest of the field of vision is less distinct, but you can still detect movement, colour and form. Your eyes are actually more sensitive to movement and light outside your focus area. This is called peripheral vision.

When your peripheral vision detects movement – it may be a car on a side road or a deer at the edge of the forest – your focus will automatically move to check it out. This is a reflex. It happens before you can think. It is called the warning reflex.

Wide attention and active visual search

An adept motorcyclist is not just sitting there, waiting for his warning reflex to wake him up. He is continuously and actively searching for crucial information in the scene around him. You have to search far ahead of you to detect which factors will be important in the next few seconds. Also, you have to check the mirrors frequently to survey what is happening behind you.

Using your focus area, you identify everything relevant to you. You have to move your eyes, actively search for important information. The further ahead you work, the smaller the eye movement you need and you will not tire so easily.

When you have identified the points or factors relevant for you, you know their position, and can survey them with your peripheral vision – without focusing on them directly. These points are called reference points. It may be a child by the road, a car on a side road or exit – things you need to keep track of. A reference point can also be the steering point you have chosen, the white border line, a patch of gravel on the tarmac. With wide attention, you can keep track of them – keep them under control – without looking at them directly. You must practise to become skilful in visual search. Hunt actively for information, ahead, at your sides and behind. Well in advance identify the factors that are relevant to you. Anticipate what is going to happen, prioritise them. Monitor them consciously with your attention. Recognise when something moves or changes. You can practise this every time you are out riding: work well in advance, consciously note reference points and track them with your attention while your focus stays ahead. To let peripheral vision work for you is much less exhausting than focusing on every element. This is one of the reasons novice riders experience fatigue long before a seasoned rider.

Speed and attention

When you increase speed it becomes increasingly demanding to maintain a complete picture of the scene around you. All the factors that you must take into consideration come racing towards you. If you lose your grip on the picture, the dangerous instincts sneak out: you can become disoriented and react with target fixation, tunnel vision or frantic search. We take it for granted that you will choose a speed that allows you to see all that you need to see to maintain a complete picture of the situation. The complexity of the scene, the number of relevant factors that you must keep track of determine how fast you can ride – and still stay in control. And of course you need to choose a speed that enables you to avoid the dangerous elements you are tracking.

Look where you want to go!
Motorcycles are like other ‘weapons’: you usually hit what you aim at!

The use of focus and attention in bends on the road

Many riders choose a steering point far too early in the bend and thus often cut the corner or have to make corrections. Others give their steering command at the proper spot, but their steering command is not precise enough and they feel the bike is running wide. Both situations can trigger fear and faulty instinctive reactions.

Two important things you must be conscious of while cornering: where you will start turning, and – no less important – where you want to steer. Choose your steering point early. When you get close to it, move your focus into the bend, to where you are going. Let your peripheral vision keep track of the steering point. When you give the steering command you have to know where to aim the bike. That is why it is so essential to move your focus into the bend before you reach your chosen steering point.

Your peripheral vision, tells you when you reach your steering point, even if your focus is far ahead into the bend. Rehearse this until it becomes instinctive. To let the bike continue until it reaches the steering point can be

difficult. Instinctively you will want to steer as soon as you move your focus into the bend and end up steering too early. This is the instinctive ‘follow your eyes reaction’. Practising and conscious trust in your peripheral vision will help you resist this instinctive tendency.

Visual focus in a turn:

Look into the bend in the direction you want to go…

Head angle

Sight is essential for balance. Your body relates to the horizon and it needs to have your head upright to perceive your environment correctly and to keep your body balanced. When you brake or accelerate, you know how essential this is. You have probably experienced how your head tends to fall forward under hard braking and you stare at the ground right ahead of the bike. Then it is difficult to keep perfect balance. Your body loses its reference points and becomes disoriented.

When cornering, head angle is extremely important. When you lean the bike, you must make sure that you keep your head upright in order to perceive the situation correctly and to be in control. Check to see that you really do this consciously when you ride.

Head angle:

Keep your head upright when leaning the bike in a bend

Steering

You are approaching a bend on the road. At the steering point you give a precise steering command, follow up with throttle control, keep your weight on the outer footpeg, and then relax again. The rest of the bend follows just perfectly, as if by magic. The motorcycle runs through the bend like on rails. Gorgeous, isn't it? But how is it possible? The answer is a conscious cornering technique.

This technique, based on physics and the motorcycle's construction, and established as a natural working practice gives you precision, control, security, safety, fun and the experience of mastering the bike. In order to be able to master cornering, you must train, train and train. In cornering the adrenaline may rush and the dangerous instincts threaten to attack. Correct working practices are the main weapon to meet these attacks.

The ideal bend

Imagine yourself on your own machine approaching a bend in the road. This is how you prepare yourself and negotiate the bend:

The preparative phase:

1. Assume the correct riding position
2. Adjust speed and choose a suitable gear
3. Choose your steering point as the exit comes into view
4. Consciously weight the outer peg
5. Immediately ahead of the steering point, move your focus to the exit
6. Smoothly release the brake

The steering phase

7. Give a precise steering command at the steering point

Throttle control

8. Apply the throttle to keep the revs constant
9. Relax the arms, keep your weight on the outer footpeg
10. Progressively increase the throttle as your vision opens up

The exit phase

11. Keep your focus on the exit of the bend
12. Straighten the bike by acceleration or by pushing the outer handlebar end

The preparative phase

This phase is as important as the rest of the bend. Assume the correct riding position well ahead of the bend. Relaxed upper body, lower arms close to horizontal, elbows loose. Many riders move their buttocks a bit inward and anchor the inside of their outer thigh firmly against the fuel tank with the balls of your feet on the footpegs.

On your way toward the bend, try to determine your steering point, the spot where you intend to give your steering command. Your speed needs to be adjusted before you reach your steering point. Towards the latter stages of braking brake softly while shifting down. Choose a gear that will give you flexibility through the bend. Softly release the brake. A common error is to let go of the brake too quickly and thus upset the bike since it then suddenly extends the front suspension.

Consider the bend, its radius and how much force you will need for the steering command. Premature steering results in cutting into the bend so that you will need to correct mid-corner. To find the correct steering point is a matter of conscious practise and determined by your view of the exit. Close to the steering point, press down on the outer footpeg. Crouch forward a little, 'into the bike', let your upper body 'collapse' so you can feel your arms relax and so that your lower arms are almost horizontal. Immediately ahead of the steering point, when you know where it is without looking directly at it, move your focus to the exit.

The steering phase

Reaching the steering point, you give the steering command. You tension the muscles in the leg anchored on the outer peg, tension your abdominal muscles, and push on the opposite handlebar end. The speed of your steering command decides how quickly you will change course. Normally you give a subtle, progressive push, almost a caress, and keep the pressure until you have achieved the desired lean angle. To make the bike turn quicker then more force is needed. To apply more force then consider aiding the push by a pull on the opposite bar. On a wet road it is, of course, crucial to have smooth inputs and a careful steering command.

Listen carefully to the whispering feedback from the bike during normal riding

If, however, you want to swerve in an emergency, you must push faster and harder. Then you are completely dependent on conscious anchoring and an anchored push to get the necessary force and precision in the steering command. That is why it is imperative to practise the anchored push technique regularly, so you will have it established as an instinctive reflex when you really need it.

Throttle control

Immediately after the steering command, open the throttle. This small movement of the throttle is necessary to avoid the engine slowing the machine down. You then open the throttle carefully throughout the rest of the bend. This progressive acceleration transfers weight to the rear wheel so that you achieve an optimal weight distribution between front and rear. The goal is to have just a little more weight on the rear wheel than on the front. The bike then steers willingly, just as you want it to. You also get optimal road grip, because the bike rises on the front fork, to achieve more travel, placing it in its most efficient working area – and thus absorbs bumps more easily.

The exit phase

When you have achieved the right lean and applied precise throttle control, the cornering is almost finished. Let your vision work far ahead. Start working with the stretch of road that follows the exit. Plan for the next hazard, straightening the bike by increasing throttle and/or pushing the outer handlebar away from you.

Corrections in the bend.

Without precise working practices or because of changes in the circumstances, you will not always be spot-on with your steering command. That's OK. But beware of the alarm clocks in your mind that can wake up the slumbering instincts! They are often ready to take control of your mind and change the situation for the worse. That is when it is important to trust your bike and the technique. Collapse your upper body, to get your lower arms horizontal, anchor your push and progressively apply the throttle. With knowledge and practise you can conquer the instincts that tempt you to close the throttle, straighten your body and clutch the handlebar desperately**.**

Don't ride so fast - you don't learn anything
if you scare yourself all the time!

Steering exercises on the road

You can practise these riding techniques every time you are out riding. Practise on a stretch of road that you are familiar with. Start with a speed that makes you feel completely comfortable in the bends. These exercises are set out in a systematic order for you to learn the various single elements and combine them to a whole that becomes an accurate working practice and gives you smoothness of technique. The six exercises are laid out in two parts: the first five involve cornering without braking before the bend, but the sixth adds braking to the equation. Only start working on the sixth, when you have mastered the previous five.

Exercise 1

Choose a stretch of road that you know well. Choose a gear that gives you flexibility through the bend. First focus on your riding position. Make sure that your upper body is relaxed and your grip on the handlebar is loose. Your arms should be relaxed, your elbows should be able to swing loosely. On a motorcycle with a low handlebar, your arms must be near horizontal. As you approach the bend, consciously weight the outer footpeg. Be conscious that you steer by pushing on the inner handlebar end (countersteering). Make sure that you are properly anchored on the outer footpeg when you give your steering command (anchored push).

Exercise 2

Once again a familiar road, low speed. Practise choosing the steering point consciously. Riding position and anchoring as in exercise 1. Immediately before reaching the steering point, move your focus towards the exit. Give your steering command, correctly anchored on the outer footpeg, and also against the fuel tank.

Exercise 3

Throttle control. Familiar road, low speed. Riding position, steering point, anchoring on the outer peg and visual focus as above. First you ride through the bend with the throttle closed after your steering command. Notice how the engine brakes slightly and your speed decreases. Feel how the bike is reluctant to steer into the bend.

Now repeat, but this time open the throttle slightly immediately after your steering command. Notice how the bike steers more willingly and is more harmonious. Practise this until it has become instinctive to open the throttle after your steering command. Next you can try to open the throttle progressively throughout the bend. Remember to choose a gear that gives you flexibility. Think back to the section about throttle control and how weight is transferred from the front wheel to the rear wheel. Can you feel that the motorcycle is in perfect harmony? Is it steering willingly?

Practise this procedure until it has become instinctive. Now you can increase your speed gradually, but still without braking before the bend. If you suddenly find yourself smiling, you are doing it right.

Exercise 4

Moving your buttocks. In order to increase ground clearance through the bend, you can move your buttocks slightly in the saddle – inward in the bend – so that your outer knee and thigh are firmly anchored against the fuel tank. Perform this movement well ahead of the bend. Then you will not upset the bike. Feel how well anchored you are when you have firm pressure on the outer peg and knee and thigh against the tank.
Once through the bend, move back to the centre of the saddle. Do this by gradually moving your weight from the outer to the inner peg and lifting your body slightly. Make sure you do not pull on the handlebar.

Exercise 5

Lane changes on multi-lane roads. Next time you ride on a multi lane highway, you can practise steering technique while changing lanes. The precise steering technique gives you a precise change of direction. The goal is to achieve ‘straight lines’ between the steering commands. This is very different from the sloppy ‘banana-bends’ so often seen. In this situation, there is probably nothing wrong with the ‘banana-bends’, but it is in your interest to practise precise riding technique even when changing lanes. Without conscious practising, old practices are hard to change.

Exercise 6

In this exercise you will combine exercise 3 and eventually exercise 4 with braking. On your way toward the bend reduce your speed by applying the brake(s). Shortly before the steering point, you softly release the brakes. The rest is like before.

Gradually increase your approach speed and brake harder. If you choose to move your buttock inward on the saddle, you should do this before you brake, in order not to unsettle the bike. Practise until you are comfortable with the complete steering technique as described above. The goal is to achieve controlled, fluid movements through the whole procedure. You will find more exercises in chapter 8 “Exercises in secluded area***”.***

Braking

After all it's not difficult to brake, even brake hard. But serious braking can release an avalanche of faulty reactions in a rider. In order to be in control, you need to have practised precise technique. A precise braking technique stops the motorcycle effectively, stably and reliably.

Front brake or rear brake?

Modern machines have good brakes. Most of them come with a front brake powerful enough to do all the braking alone. On most motorcycles, the front brake is the main brake. Motorcycles are different, however. A custom motorcycle or a touring bike has more weight on the rear wheel. Passenger and luggage also lead to more weight at the rear. It may therefore be necessary to learn to master the use of both brakes at the same time. You have to learn to brake on your own bike – in all situations with and without a passenger and/or luggage. In the real world it is more demanding to control two brakes than one.

The front brake is the main brake. But, the fear of locking the front wheel scares a lot of riders from learning to use it properly. That is why you have to learn to trust the front brake and apply pressure correctly. If the front wheel locks when travelling in a straight line, all you have to do is to let up the pressure a little, so that the wheel turns again, and the bike stabilises itself. It's no worse than that.

Rear wheel locking can be more problematic if you are not quick to release the pedal pressure. On some bikes it is preferable to use only the front brake, and let the rear wheel rotate, to avoid a rear wheel slide.

Remember that if you drive a car more than you ride a bike, there is a danger that you will bring your car braking reflex to the bike….that heavy foot. If you are not consciously aware of this danger, you may find yourself stomping the pedal instinctively when panic hits. This will more often than not lead to a locked rear wheel and a subsequent slide. The conclusion is: if you ride a bike where the front brake alone can handle the braking task, concentrate on mastering the front. If, on the other hand, you ride a bike with mediocre brakes or much weight on the rear wheel, (long customs and touring with passenger and luggage), you must learn to use both brakes and combine them effectively.

Riding position

Your riding position is of great importance when you brake. A common error is to straighten your back and cling to the handlebar with stiff arms. This destabilizes the bike, transfers much of the weight to the front wheel, high up, and invites the rear wheel to lift. When you anchor yourself properly on the fuel tank and pegs, with relaxed arms, you feed the inertia into the fuel tank and saddle, 2 – 3 feet further back and lower down. The result is that you keep the rear wheel down much longer and avoid overstraining the suspension up front. Hug the fuel tank firmly with your knees, let the muscles in your legs, abdomen and lower back hold your body back and relieve your arms.

Riding position during hard braking

Even your vision influences braking, especially in the last phase. Take care to keep your vision level and look far ahead. If you do it correctly, you will be able to sit on the bike, in complete balance, after it has stopped, while it rises on the front forks. Only then should you put your feet on the ground. If you catch yourself red-handed setting down your feet before the bike has stopped completely, you are out of balance and have not done it correctly.

Regulating the brake pressure

Let us focus on the front brake first. Effective braking results from reaching full brake pressure quickly yet smoothly. Too many riders brake too meekly initially and have to squeeze increasingly harder as they approach the hazard. The braking distance then becomes longer than necessary. Thus you need to practise applying the brakes effectively once you realise you have to brake. To do this, you need to apply the brakes smoothly and determinedly. Smoothly to let the front suspension compress in a controlled way. Determinedly to achieve effective braking as soon as possible. Just remember that the bike moves 22 metres per second at 50 mph. There is no time to waste!

A common error is to grab the brakes desperately and powerfully straight away. No weight transfer has had time to develop so grip is less and this also makes the front suspension 'bottom' and the front wheel skid and stomp. Therefore: smoothly and determinedly. How smoothly and how determined? Sorry, but only practice on your own bike can give you the answer**.**

The rear brake is more difficult to modulate effectively. When the rear brake locks up depends on how hard you brake with the front brake and how much weight is thus transferred to the front wheel. If your front brake is really effective, it may be better to leave the rear alone, because the rotating rear wheel actually stabilises the bike. BUT: when you load up the bike with a passenger and luggage, the effect of the rear brake may be considerable. You just have to practise braking with luggage and a passenger as well as solo.

The passenger's riding position under braking.

When you brake hard, your passenger may be thrown forward and hit you hard in your back. If you have not taken the time to instruct your passenger how to react under braking, you risk that they will hit you in the back like a freight train. Then you will have a real challenge not transferring the weight of the two of you to the handlebar and keeping your vision level!

The passenger must transfer as much of his/her weight as possible low down on the bike. He (or she) must anchor themselves by hugging your hips with their knees. It is also important that they tension their abdomen, back and neck muscles to hold their upper torso back. This way they will not crash into your upper back, which inevitably would force you to stiffen your arms and your passenger will not then force your head forward and down. Carried out correctly, you will be able to keep your head level and look far ahead.

Braking in a bend

When you use the front brake in a bend, a motorcycle tends to straighten up; it steers heavily and feels like it wants to go straight ahead, towards the hazard. To keep the bike on the correct course you need to countersteer simultaneously. This is the most efficient way of braking in a bend. It is worth mentioning that you must relieve the pressure on the handlebar when you reach low speed. If you do not you may risk the bike falling.

The fact that the bike straightens when you apply the front brake in a bend, can be exploited in certain, more demanding braking situations: You brake, the bike straightens itself, you can brake hard for a short distance, then release the brake and steer into the bend again'

Braking exercises on the road

Think about this: Under normal riding, you can travel many thousands of miles without ever needing to touch your brakes. This can make you 'rusty' and unprepared when the time comes. Therefore you will benefit from practising your braking every time you are out riding. Practising promotes precise technique. To practise safely on the road you need to make sure you do not disturb other road users. If you want to practise emergency braking, find an area devoid of all traffic – with lots of space, allowing you to make mistakes without incurring any unwanted consequences.

Exercise 1: **Conscious practising with the front brake only.**

Brake preparedness means moving your fingers to the brake lever and carefully taking up the play. Practise brake preparedness consciously every time you approach a developing hazard. The goal is that you always apply the front brake first and as a result have the shortest possible response time. Practise using the front brake regularly when you are riding.

Gradually increase brake pressure, for example by braking a little later when approaching a familiar bend on the road. Do it gradually. Make sure you are always comfortable and in control. Watch your riding position and your vision. Consciously assume braking preparedness every time you approach a road crossing where you expect to have to stop completely. Be alert and always make sure the bike is in complete balance. If it is not, you will have to adjust your riding position and the way you use your vision.

Exercise 2: **Get familiar with the rear brake.**

If you have a bike that does not stop effectively with the front brake only or a motorcycle with much of the weight on the rear wheel, you need to practise rear brake use. It is absolutely necessary, for instance when you ride with passenger and/or luggage.

Learn how much pressure you need to apply to the pedal in different situations to make the rear wheel lock. Lock the rear wheel for a short moment, then let up. Practise until you feel confident about brake pressure. Learn to identify locking both on wet and dry surfaces, tarmac and gravel. Practising with the rear brake should be done very carefully.

Exercise 3: **Combined use of front and rear brakes.**

Notice that the rear locks earlier when you apply front brake as well, because you transfer much of the load to the front tyre and off the rear. Have your focus first and foremost on the front brake. See if you are able to apply the proper pressure on the rear at the same time. Concentrate most of your attention on the front brake with just light application of the rear. The front brake is far and away the most important brake and must be given priority. However if your motorcycle has a considerable part of its braking effect at the rear wheel, you must practise to use it effectively.

Exercise 4: **Moderate braking in a bend.**

Choose a quiet, familiar bend on a day with a dry surface. Choose a speed that makes you feel comfortable, so that you have ample road grip and wide safety margins. Brake carefully with the front brake. Notice how the bike wants to stand up when you brake, and steer straight ahead. The steering becomes heavy, that is, it feels reluctant to steer. When you become familiar with this reaction, try to oppose this stand-up tendency by simultaneously countersteering to make the bike follow your intended course through the bend. Practise until you are comfortable balancing the stand-up tendency with pressure on the handlebar.

You have complete control under braking in a bend when you are able to find the right balance between braking pressure and steering command, so that the bike both brakes and steers and is in complete balance at the same time. This is the best way to perform controlled braking in a bend.

Exercise 5: **Emergency braking in a bend.**

Imagine that you suddenly see an obstacle in the bend in front of and you have to brake hard. You have become familiar with the motorcycle's tendency to stand up when you brake while the bike is leaned over. When you have to brake hard, you can consciously use this stand-up tendency. Remember that in order to use your entire grip to brake, the bike must be travelling straight ahead.

Start at moderate speeds and with moderate braking. Brake carefully with the front brake, the bike stands up, brake hard until you have reduced the speed as much as you want, release the brake softly and steer into the bend again. Notice that when you have reduced your speed and released the brake, the bike steers effortlessly into the bend again. Be sure your riding position is correct.

Gradually increase speed and brake pressure until you feel comfortable with this technique. If you feel most comfortable in left-handers, start there. When you master them, start practising in right-handers. Remember that the goal is effective speed reduction, not necessarily braking to a full stop.

Exercise 6: **Braking and swerving.**

This is best practised in an area free of traffic but you can still practise the technique and establish core skills when you are out riding on the road. Make sure you are alone on the road. Choose a point on the road ahead of you, for example a repair patch. Brake carefully on your way towards the chosen point. When you get closer, release the brake softly. Swerve by applying a light anchored push (steering command) and throttle control. Immediately straighten the bike with a new steering command the opposite way, follow up with a new steering command/throttle control and steer the bike back to your original course. Be conscious that you anchor yourself on the outer footpeg, give a precise steering command and immediately follow up with throttle control. Gradually increase the force with which you swerve and the speed of the manoeuvre. You also need to practise emergency braking combined with swerving. But then you need an area with lots of space and no traffic. In the chapter "Exercises in a secluded area" you will find a description of two good exercises.

Acceleration

Complete control under acceleration also demands knowledge and practise. Sometimes, too little acceleration can be as bad as too much. Under acceleration load is transferred to the rear wheel. This gives you good grip for speed increase. At the same time, the front wheel is unloaded. This can lead to steering problems and front wheel lift. Engine power is transferred to the ground through the contact patch between rear tyre and the road surface. This power propels the motorcycle forward.

The rear tyre is literally trying to 'pass' the rest of the bike – under it. The motorcycle's mass is 'holding back' higher up, in such a way that the bike tends to lift its front wheel. With extreme acceleration the bike may lift its front wheel high in the air or even somersault. With a passenger and luggage this tendency to 'wheelie' increases.

Riding position

The tendency to wheelie under acceleration is related to the bike's centre of gravity, its actual centre of mass. If you ride upright, high in the saddle, the centre of mass will be high up. Under acceleration the body's mass (inertia) will hold it back. If you sit upright and hang on to the handlebar under acceleration the bike wheelies more easily.

To have complete control under acceleration, your riding position must be correct. Lean your body forwards and anchor yourself on the footpegs. This moves some of your body mass forward and downward and you feed much of your weight into the footpegs, low down, making wheelies less likely. Your arms will be relaxed, your grip loose on the handlebars and your vision far ahead.

Choose the right gear

As you know, the motorcycle's power is determined by a combination of engine speed and gear. Almost all motorcycles increase their power with increased engine speed all the way to the redline. A high gear and low revs gives the bike poor acceleration. A low gear and high revs gives the bike hard acceleration.

Acceleration when overtaking

Proper acceleration is crucial for safe overtaking. Too little acceleration can be as dangerous as too much. You want to pass quickly and safely yet in complete control. To plan ahead, anticipate the possibility of an overtake early and get into a suitable position, an 'overtaking position'. Then when it does arise, use the free stretch of road effectively. This is the key. A common error is to start the overtaking manoeuvre too late. That puts you in a hurry during the overtake phase. Another error is to start out in too high a gear and not get sufficient acceleration. That too compromises the end phase of the overtake. Starting out in too high a gear often leads to hectic downshifting midway. Then you lose time, speed and distance covered. A successful overtake is planned ahead of time, well prepared with the correct gear and distance to the car ahead and starts as soon as the chance occurs.

Accelerating onto the motorway

Whether you are entering a motorway from a ramp or entering another high-speed road, you should choose an appropriate gap in the row of vehicles and quickly accelerate to the desired speed to enter it safely. If you accelerate hard on entering via a bend, the bike may tend to go wider than you want it to. You need to correct for this tendency with an anchored push and more steering. When accelerating onto a busy road from a standstill, you also need to master both clutch engagement and throttle control in order to get the needed acceleration and not stall the engine at a critical moment. In order to fully exploit the 'anchored push' in such a turn from a standstill your feet need to be brought quickly onto the pegs, as soon as the bike moves forward. In the chapter "Exercises in a secluded area" you will find an exercise to practise for this type of situation.

Acceleration exercises on the road

Exercise 1: **Acceleration on a straight road.**

When you travel on straight stretches of road with no traffic, you can practise acceleration and riding position. Make yourself familiar with the bike's power in different gears and speeds. Be conscious of your riding position. When you apply throttle, lean your upper body forwards so as not to 'hang from the handlebar'. Tension the muscles in your abdomen and lower back to counter the 'pull backwards'. Transfer some of your weight to the footpegs. Anchor yourself by hugging your knees around the fuel tank. Make sure that your elbows are loose and that your grip on the handlebar is relaxed. When there is no other traffic on the road, you can simulate an overtake. Choose a point where you want to start the overtake manoeuvre. Choose a gear that gives you flexible power. Carry through with the overtake manoeuvre and return to your lane. Do not forget to use your mirrors and check the 'blind spot' if necessary.

Exercise 2: **Entering motorway or two-lane highway.**

Choose the gear consciously. Keep an eye on the speed of the traffic on the road. Accelerate quickly, get into the gap and adjust your speed to that of the other traffic. Focus on riding position and gear. Getting into the gap in the traffic should be totally relaxed and undramatic. Your vision, riding position and correct gear are the keys.

Exercise 3: **Riding with passenger and luggage.**

Instruct the passenger about how to act when you accelerate. A passenger may disturb the bike as much as the rider. Remember that the passenger's body also feels like it is pulled backwards under acceleration. The passenger must also anchor themselves on the footpegs and lean forwards during acceleration. Calmness, predictability and smoothness create balance and safety.

When the motorcycle is loaded with a passenger and luggage it behaves differently from when you ride solo. It is heavier, accelerates slower, has a higher centre of gravity, increases the tendency to wheelie and steers slower. Listen closely to what the motorcycle tries to tell you. In the chapter "Exercises in a secluded area" you will find a very useful acceleration exercise.

Other aspects of riding technique

To ride a motorcycle is a demanding sport. Good machine control is necessary to become a skilled and safe rider. But, rider competence is much more than riding technique alone. Below you will find some short reminders of other aspects of riding proficiency.

Road grip

The contact patches between tyre and road surface are approximately the size of the palms of your hands. The friction in these patches is called grip. Dry road surfaces gives you good grip, wet surfaces offers less grip. Correct riding technique is crucial whatever the road condition and even more important on wet roads than dry. Conscious throttle control in a bend assures maximal road grip and helps you conquer the inclination to close the throttle when you get scared. Anchoring on the footpegs gives stability and balance. Simplified, you have to learn to “trust the grip”. If you do not, your steering commands will be half-hearted. Speed adaptation is the keyword. With the right speed it is much easier to trust the grip and fend off those dangerous instincts.

Lane position and choice of line through a bend

You have a choice of position within the lane. The situation determines which position is the most appropriate at that moment. There is no standard default position. You must continuously analyse the situation and choose the position to your advantage. Do you wish to see better? To be seen? Are you waiting to pass? Do you want to avoid obstacles in the road? Do you need to balance your risks? You need to ask these questions to yourself in order to find the most suitable position for that moment.

Line choice in bends is often debated. Even here no solution is permanent. Position on the approach depends on both the circumstances and your needs. You must create your own advantages and safety by strategic lane position and line choice.

To think strategically can for example be to ask yourself the following questions:

- Which line will be best in order to maximise grip (wet road)?
- How do I position myself to achieve a complete picture of the situation?
- Is it possible that an oncoming car may cut the corner?
- Can I expect obstacles around the bend?
- What lane position do I want to have if I need to brake?

One thing is for sure: if you master the precise steering technique, a ‘wrong’ line through the bend is recoverable. If you are skilled at precise steering technique you’ll be able to make line changes quickly and precisely.

Traffic rules

The traffic rules make it possible for you to predict what another road user is likely to do. Think about it. The traffic rules are then not an instrument for the Authorities to control your behaviour. They are created in order to facilitate predictability and cooperation. Predictability greatly reduces the chance of misunderstanding intentions, surprises and accidents. Just think about how furious you become when someone else fails to give way when you have right of way. In other words: does not behave predictably.

- Are you predictable to other road users?
- Do you actually have the speed that the car driver on the side road expects when he/she is entering your road?
- Do you give the driver a chance to assess the gap correctly?
- Remember that you look smaller and further away than you really are.
- How do you think the car driver will react if you have a speed far over the normal speed in that situation?

Speed choice

You must be able to detect, react to and act on what you meet on the road. Your ability to do so depends on your speed. Speed adaptation is about choosing a speed that:

- Enables you to maintain a complete picture of the situation
- Enables you to detect hazards in time
- Enables you to stop when a danger arises
- Gives you confidence to trust the road grip
- Gives you the confidence to practise throttle control in bends
- Enables other road users to judge correctly how far away you are
- Takes into account the well being of people who live along the road

Technical condition of the motorcycle

Your motorcycle is an extremely able partner – if it is in mechanically good shape. It does not matter how good you are if the bike is not mechanically able to do its part of the job. Make machine checks a daily drill. Learn to interpret the bike's language. The feedback it gives you. It tells you all the time how it is. Motorcycle magazines and textbooks tell you a lot about daily check routines. Read it and practice. Here are six simple, but important points:

- Do all lights, signal lights and warning lamps work?
- Are the tyre pressures correct, tread sufficient and no sign of damage?
- Do the brakes 'feel' normal?
- Is the drive chain oiled and have correct play?
- Any leaks from the brake or cooling systems, suspension or engine?
- Any odd sounds from the bike?

Riding with luggage

The handling characteristics of the motorcycle are influenced by equipment and luggage. With luggage, the centre of mass becomes higher. The danger of a 'wheelie' increases. Heavy luggage should be placed in the tank bag or low in the saddlebags. Only light items should go in the top box. Acquaint yourself with the motorcycle's properties when loaded: how it steers, centre of mass, braking behaviour and stability.

Consider this when riding.

Luggage can be dangerous when not properly secured. Some riders bungee sleeping bags on top of the saddlebags. This is not good enough. Sometimes sleeping bags have moved, come in contact with the rear tyre and have been 'sucked' in to lock the rear wheel! Use both bungees and straps with secure fixings. Check your luggage regularly.

Out of hibernation?

No matter how seasoned a rider you are, you must practise skills and smoothness after any winter break. If you lay your bike up over winter your body forgets a lot. Your head too. Give yourself plenty of time to wake up dormant knowledge and skill after the hibernation. Practise braking – watch out for the 'heavy right' (the car-foot). Find the correct riding position. Be especially conscious about each of the elements of riding technique. Repeat risk factors, for example that many car drivers fail to give way to motorcycles.

Force yourself to ride the first 500 miles slower and more consciously than you used to at the end of last season. Rebuild knowledge and skills systematically. Those faulty instincts are more likely after a period of inactivity!

Borrowed or rented bike?

No two motorcycles are alike. You need to be acquainted with each one. Be humble and take time to learn the properties and language of any unfamiliar bike. Many accidents happen on borrowed or rented bikes. Be restrictive about lending out your own motorcycle. Restrict yourself initially and learn how to get the best from any bike you borrow or rent.

Riding in the rain

Rain reduces vision and road grip. If you are worried about grip, watch out for those dangerous instincts: the urge to close the throttle, the temptation to sit straight up and cling wide-eyed to the handlebar and the fear of giving effective steering commands. All of these instinctive actions only make the situation worse. Throttle control rules, especially when the road is slippery, but you have to be very smooth and gentle with the throttle. If sight is reduced, you must reduce your speed. A foggy visor makes it even more difficult. Anti-fog inner visors that you stick to the inside of your helmet's visor can be useful. They work like insulated windows and greatly reduce fogging.

Dress properly to stay warm and dry. Wet and cold you will be stiff and unable to maintain a smooth riding technique. If you are freezing, concentration and attention will also be adversely affected.

Exercises in a secluded area

When you practise your riding technique on the road, you have to consider other traffic and practise carefully. A secluded area offers you the chance to focus on the exercises and practise more effectively. You will need an area with a dry surface, tarmac and free from gravel. As you get familiar with the exercises and feel that you have mastered them, you can also perform them on a wet surface.

Below we have described four exercises that you should practise carefully, with lots of space around you. You can set up the exercises with cones or plastic bottles. In our descriptions we will use the term ”cones”.

Even here it’s important to start carefully and gradually build up your confidence and skill level. The goal is to hone your skills in order to master difficult situations at realistic speeds. That implies wet surface practising is important. The speed and the braking distances we refer to will give most motorcyclists ample margins on a dry surface. Before you start we recommend you to repeat ”The basics of a precise Riding Technique” in the chapter ”A precise riding technique”. Essential terms that you need to be familiar with are: counter steering, steering command, anchored push, throttle control and anchoring points. Repeat also the section on riding position and visual focus.

Important:

Do you find it embarrassing to be seen practicing like this alone?
Worried other riders may ridicule you?
Well, rise above it – your goal is to become a good rider, isn’t it? Well, then you have to exercise….

The practice ground

A suitable area may be a large tarmac surfaced area or the like, big enough to set up a marked area 110m x 50m. The exercises are set up with chalk, cones, plastic coke bottles or something of the sort. It’s important to have enough space lengthwise to stop safely after each manoeuvre.

Swerving:

Length: about 100m
Width: 6m

Braking to full stop, straight:

Length: about 70m
Width: 3m

Braking in a bend:

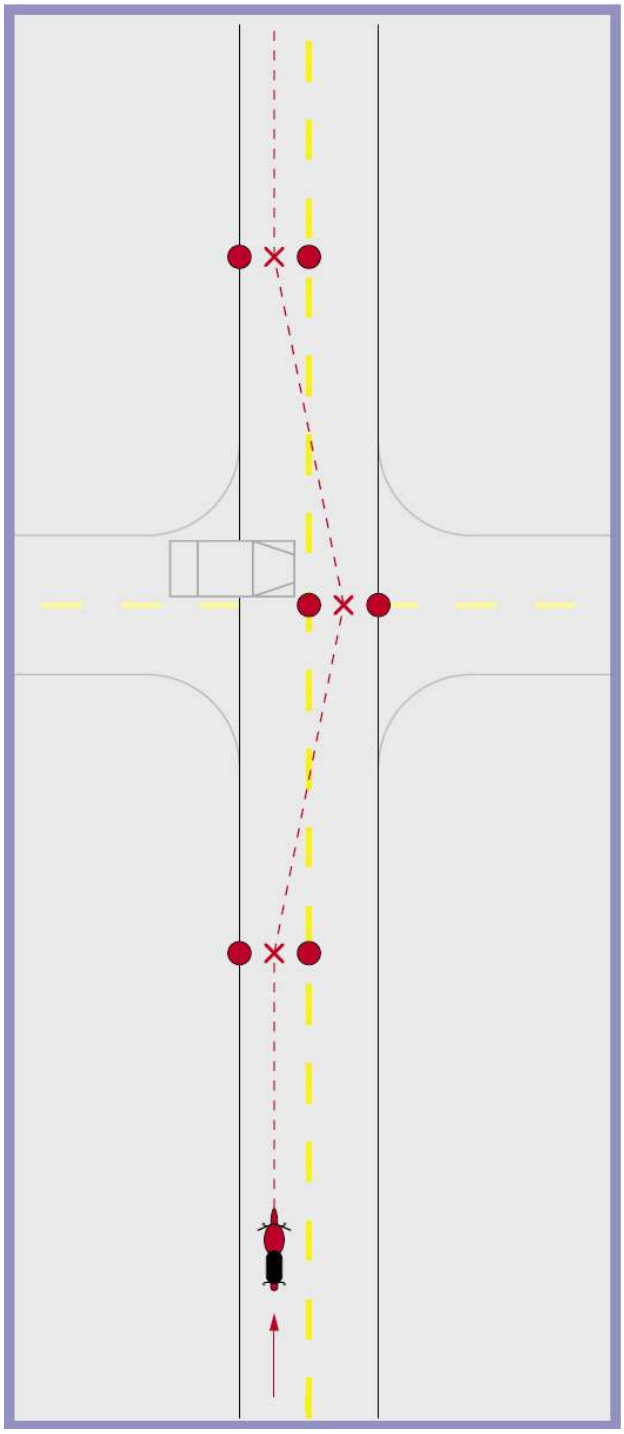
Length: about 90m (incl. 40m bend)
Width: 3m
Radius of bend: 25m

Acceleration:

Length: 30m
Width: 3m

EXERCISE 1: SWERVING FOR AN OBSTACLE IN YOUR PATH

The exercise gives you the ability to master a quick change of direction with an anchored push, throttle control, anchoring points and correct use of your vision. The 30m long area simulates a 6m wide road with mid line and border line. At the starting point two cones are placed 3m apart, on both sides of the 3m wide left lane so as to form a gate. About 15m further down you create a similar 'gate' that spans the right lane. Another 15m further you make a third 'gate' in the left lane (see illustration). You need about 50m room for acceleration.



You accelerate to about 30 mph (2nd gear?). In the middle of the first gate perform a quick and precise change of direction towards the right, with an anchored push. Using throttle control, anchor points and your vision to where you are going, ride a straight line to a point midway between the next two cones. When you are in the middle of gate two, make a quick and precise change of direction towards the left, and ride a straight line to the midpoint of gate three. At that point, change direction again, quick and precise, to ride a straight line, in the middle of the left lane.

The exercise is carried out correctly when the motorcycle changes direction midway between the cones and follows a straight line from gate to gate. It is not correctly performed if your line looks like a banana, that is slow, wide bends; which is what you get if you do not actively use an anchored push to make the bike turn. Neither is it correctly performed if you do not hit the middle of the gates or your speed drops to less than 20 mph.

The goal is that you realise just how efficient the anchored push technique really is and master the technique to achieve effective avoidance of a hazard. The effectiveness of your steering command depends on you anchoring on the outward footpeg. Throttle control makes the bike steer willingly, which is essential for quick changes of direction.

Swerving:

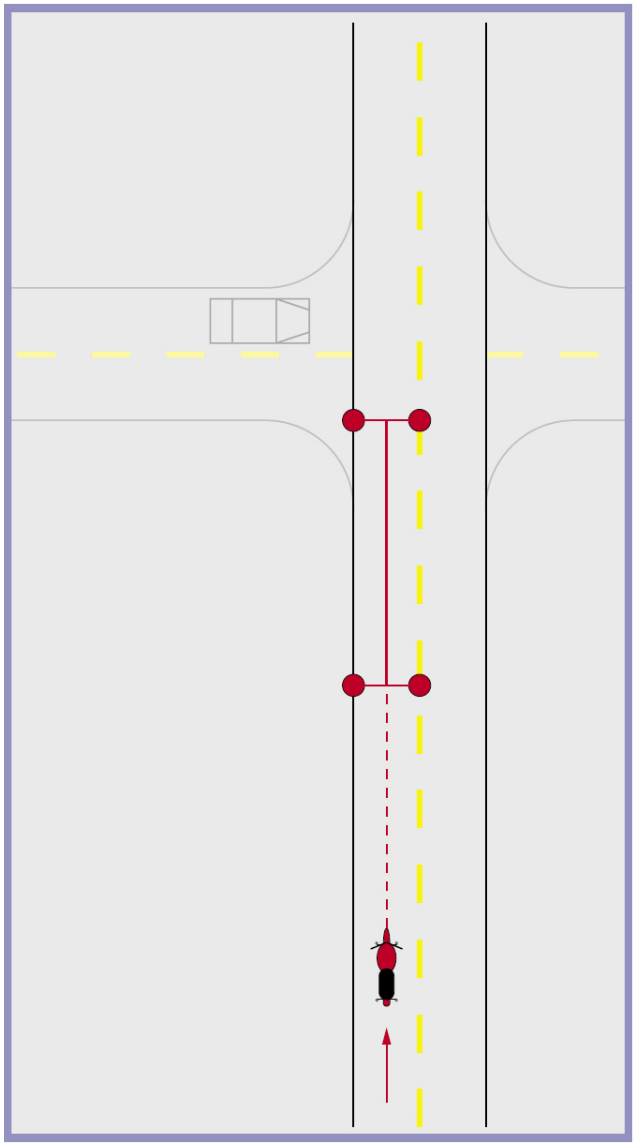
Length:	*30m +*
Width:	*2 x 3m*
In-run:	*50m*
Distance between cones:	*15m*

Cone:
Steering point:
Correct line:

EXERCISE 2: OPTIMAL STRAIGHT LINE BRAKING TO A COMPLETE STOP

Even in this manoeuvre, cones are a great help. The exercise will help you, through correct application and modulation of brake pressure, correct riding position and correct use of your vision, to perform an optimal emergency braking to a complete stop.

You can use the same area as in exercise 1. Gate 1 marks where you start braking. Gate 2 is moved in line with gate one and the distance between them is 12m.



You accelerate to 30 mph. When your front wheel is between the cones in gate 1, you activate the brakes. Whether you use only the front brake or a combination of front and rear brakes, depends on your bike. If you ride a modern sport bike, for example a Honda CBR 600, it is quite natural to use only the front brake. If you ride a Harley-Davidson Soft-Tail, you will have to apply both front and rear for optimal retardation. Whichever bike you ride, you must learn to brake in a straight line and to a complete stop in the shortest possible distance. At 30 mph you need to be able to stop within 12 metres.

The exercise is correctly performed when you brake optimally through correct brake pressure and without locking either wheel. You must also be able to keep the bike absolutely straight, along a straight line, by adopting a correct riding position, correctly feeding your weight into the fuel tank, having relaxed arms and with vision level. Your feet need to stay on the footpegs at all times. A short, controlled locking of a wheel is OK as long as you quickly reduce brake pressure to make it roll again.

The exercise is not correct if all the braking is done with locked wheel(s), if the handlebar flips to one side, if the bike does not follow a straight line or if you have to set a foot down before the bike has come to a complete stop.

To master optimal braking at 30 mph is an absolute minimum! It would be wise to practise maximal braking at motorway speeds. You just increase the distance between gate 1 and 2 according to speed. You also need more room for acceleration. Increase gradually so that you are in complete control at all times.

Ask yourself this question: if you are not comfortable with hard braking at 30, how would you fare with the high speeds on the motorways?

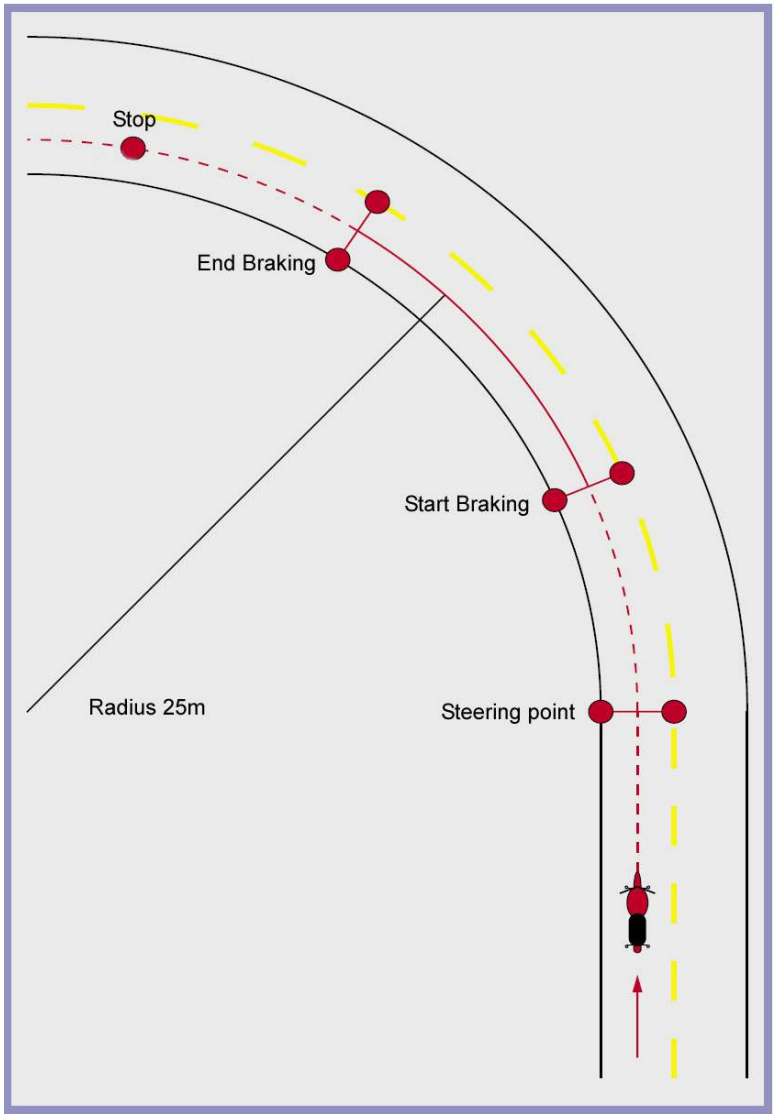
- From 30 mph you should aim to be able to stop within 12 metres
- From 40 mph you should aim to be able to stop within 20 metres
- From 50 mph you should aim to be able to stop within 32 metres
- From 60 mph you should aim to be able to stop within 45 metres

These stopping distances pertain to a dry tarmac surface and should give you ample margins.

EXERCISE 3: BRAKING IN A BEND

This exercise teaches you, through use of anchored push, anchoring and correct use of your vision, to compensate for the outward drifting that arises when you have to brake in a bend.

Set up the exercise with a 3m wide 'lane' with border lines. Use chalk, cones or plastic bottles. Room for acceleration and starting point as in exercise 1. After the starting point the 'lane' goes into a bend with a radius of 25 m. (Measure it out with a 25m length of string). The two cones at the starting point represent the steering point. 10m further down you place a gate to mark the braking point. Still 15m further you place a gate to mark where you stop braking. And finally, 10m after that the end point is marked with a single cone in the middle of the 'lane' (see illustration).



Accelerate to 30 mph. Between the cones in gate 1 you start the bend with the anchored push technique. In gate 2, you start braking down to walking pace by applying the front brake. You should not stop the bike completely, as this easily leads to a fall and unnecessary damage to the bike. When you pass gate three, the bike should point to the last cone in the middle of the lane.

Braking in a curve:

Length:	*35m +*
Width:	*3m*
Radius:	*25m*
In-run:	*50m*
Between cones:	*10+15+10m*
Cone:	
Correct line:	

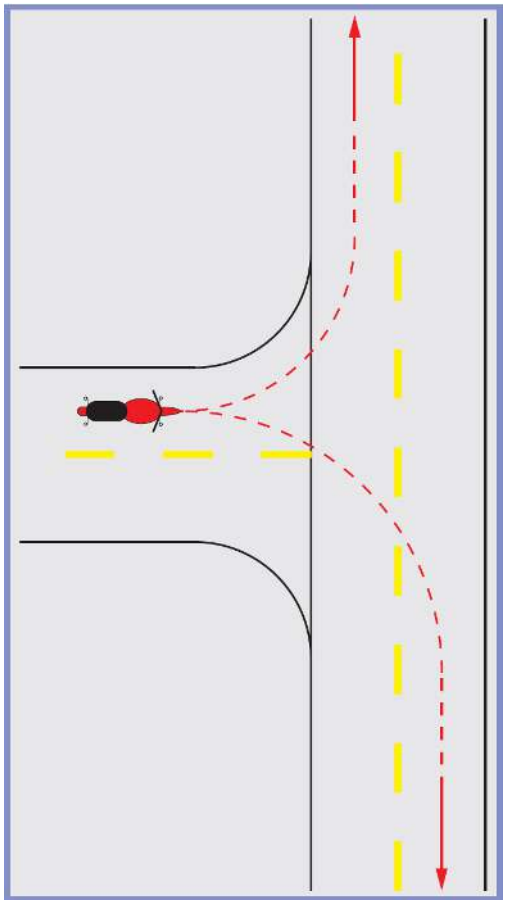
The exercise is correctly performed when the speed is maintained until you enter gate 2 (the braking point), when you brake in complete control down to walking pace and the bike follows the exact middle of the lane. When passing gate 3 the bike should point directly at the last cone.

The exercise is not correctly performed when the speed reduction after the braking point is not considerable or when the bike at the approach to gate 3 is drifting out of the lane towards the left or right. The exercise is a complete failure if the motorcycle at any point crosses the border line. You can also 'turn' the exercise and practise braking in a right-hand bend.

EXERCISE 4: TURNING RIGHT AND LEFT WHILE ACCELERATING FROM STANDSTILL

This exercise enables you to master entering a road with speed limit of 40 mph and dense traffic, from a side road, from standstill, by correct use of the anchored push technique, throttle control, anchoring points and correct use of your vision.

The track is 3m wide, does not demand room for acceleration and can be set up as in the illustration. You should make a quick start and immediately place your feet on the footpegs. The starting phase is controlled through the clutch and throttle. The bike is to be steered to the left (and right) by use of an anchored push while at the same time increasing the throttle opening. Your sight should be far ahead and point to where you want to go, namely to a place in the middle of the lane on the road you enter.



The exercise should be practised both left and right, that is a left turn with acceleration from standstill and a right turn with acceleration from standstill. The manoeuvre is correctly performed when you immediately put your feet on the footpegs, accelerate briskly and follow an imaginary line exactly in the middle of the 3m wide lane.

Acceleration and turning from standstill:

Length:	*ca. 30m +*
Width:	*3m*
In-run:	*0*

Correct line: – – – – –

The exercise is not correct if your feet drag or 'paddle' or if the bike does not accelerate sufficiently. It is also failed if the motorcycle ends up outside the lane to the left or right.