
Full Control
a guide to precise and efficient machine control
NMCU
NORSK MOTORCYKKEL UNION

Dear motorcycle rider!

The book you now hold in your hand is unique. It is a gift from motorcycle riders to motorcycle riders. Motorcycle riding is first of all about the joy of life. The feeling of being on the road. Meet friends. Enjoy the man-machine togetherness on curvy roads. Feel the power of acceleration, the thrill of leaning into a curve. Or the calm, pulsating sensation of freedom on your way towards unknown places.

We are today about 90.000 riders in Norway. Every spring we swarm out on the roads as soon as the snow is gone. Eager to enjoy a new riding season. More than 99% of us return happily home from adventure. But not all. For motorcycle riding is a demanding sport. A small rider error can result in serious injury. The accident could have been avoided if only small things had been done otherwise. Indeed, research shows that many a rider

ditches in situations where the bike itself could have carried him safely through. But often the rider disturbs the bike by inadequate action.

Faced with danger, a human being reacts instinctively. A lightning quick reaction intended to avoid injury. Action that happens before we have time to think. Riding a bike, these instinctive reactions paradoxically increases danger. For example by "freezing" or target fixation. Fortunately correct responses can be trained in, so that you can override the instincts and act correctly the next time you run into a threatening situation.

This book intends to help you with just that. It focuses an effective and precise riding technique, helps you understand the essential physics of the motorcycle and offers you a series of very concrete exercises that you can work on every time you are out riding. Through systematic practising you can learn to override the dangerous instincts and let the bike do what it is best at.

We know that many motorcyclists repeatedly act incorrectly, but get away with it because the choose to have good margins. – or simply are lucky. You ride on in good faith. In that way you may establish a set of inadequate habits. These habits can turn on you in a critical situation and lead directly to an accident. It is reasonable to believe that many of the accidents that happen during the riding season 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 joy and less trouble.

To change working habits demands perseverance. It takes humility to realize that you may be wrong. And a measure of stubbornness to practise systematically. The reward is even more joy in riding and better safety. Keep the book as a real treasure – and use it.

Of course, a precise riding technique is not by itself sufficient to become a competent rider. There is a lot of other knowledge you need in order to be a safe rider. Other books offer a treasure of riding tips, for example the textbook for rider education. But in these, a precise riding technique is superficially treated. This book is created to help you practise on your own and establish correct working habits. All two-wheelers – no exception – steer, brake and accelerate according to the same physical principles. That is why correct working habits are equally important on a Harley as on a sport bike.

Good Luck!

A motorcycle can do only three things: Steer, brake and accelerate

How to use the book

”In Control” is laid out as a handbook or book of reference. You can read the book in the order you choose. Start with what interests you the most. Each chapter has a colour code to make it easier for you to find your way to the different subjects.

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 motorcycle.

We explain each separate 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 motorcycle is a precision instrument, ready to follow whatever command you give it. But you have to give precise 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 motorcycle works optimally, what it needs in order to do its very best, and what prerequisites are essential for it to do its job perfectly.

In this book 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, the 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 become a skilled rider, but there are also other elements of rider competence that you need to know to become a safe 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 concrete exercises to practise precise technical skills. It is imperative that you perform this practising in an area completely without traffic, for example the empty parking lot of a shopping mall. 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 habits.

A short introduction to practical physics

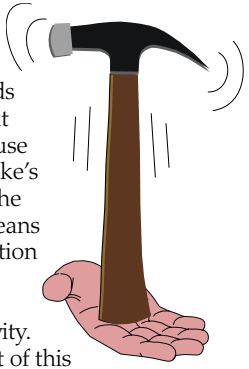
To master the laws of physics is like dancing with Isac Newton without stepping on his toes

How can the motorcycle keep 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 own experiences. That is why many motorcyclists give their mount 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 mother earth and cannot keep upright when still. You have maybe watched trial riders keep their balance almost endlessly even though the bike does not move? So it is possible, but we will not detail on such acrobatics here. We will focus on what makes the two-wheeler keep its balance when rolling.

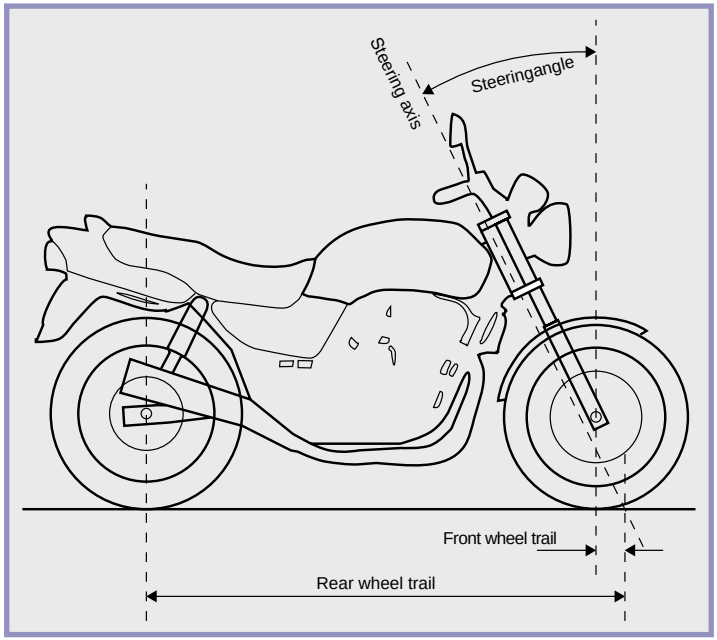
Ever tried to balance a hammer upright with the handle resting on your palm? What do you do when the hammer begins to tilt towards the left? You move your hand the same direction, of course. Thus you move the hammer's contact patch (in your palm) back under the centre of gravity. Balance restored.



You balance the motorcycle the same way when it is 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 mass centre. 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 90 km/h than at walking speed.

Inherent balance and directional stability

Have you watched road racing on the Eurosport channel? Then perhaps you have noticed that riderless motorcycles 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



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

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 does not fall. Let go of the handlebar and watch what happens. If the friction between tyre and ground is not 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 to one side or the other, and in this way manages to keep balance and directional stability. Many advocate that also the gyroscopic effect is important for balance and stability. The gyroscopic effect arises when a wheel rotates and leads to a resistance to sideways movement. The effect is present, truly, and increases with speed, but it is small 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 too, that leaning the bike makes the wheel turn. Motorcycle tires, contrary to car tyres, have a round profile. The circumference is thus longer along 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 farther for each revolution. The same is true for your front tyre and this affects the tyre to 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 curve

Newton taught us that an object that is not subjected to any forces, would continue to move with the same speed and direction. If moving, it will go on straight ahead. If it is still, it will keep still. If you affect it with a force in one or the other direction, the object will change course and/or speed.

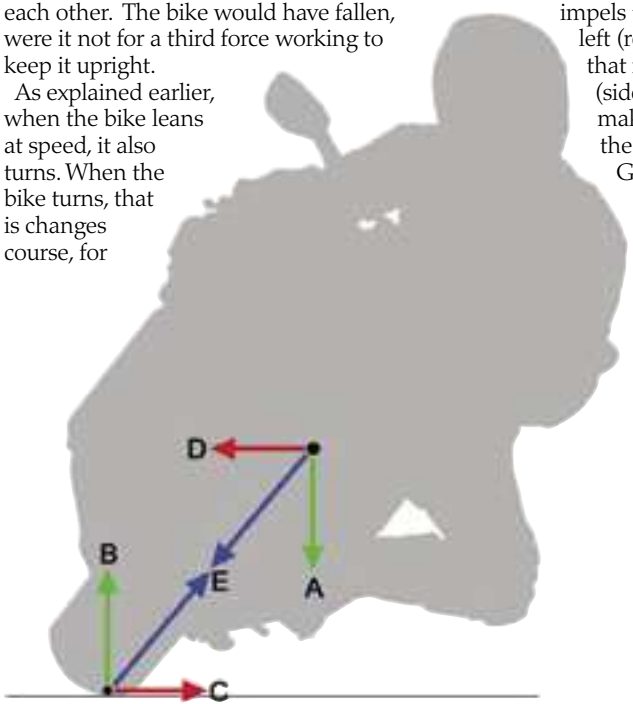
Imagine a motorcycle at speed. Seen from behind. When the bike is straight, the contact patches are directly under the mass centre. It means that gravity points straight down through the contact patches and that the counterforce from the ground points straight up through the bike's centre of gravity. The two-wheeler is in balance.

When the bike leans, for example to the right, the mass centre

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, that is changes course, 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 mass centre, 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 curve.

Given balance and constant speed, the motorcycle will perform a perfect part of a circle. If you did not have to control the throttle with your right hand, you could have let go of the handlebar and followed the bike through a perfect curve.



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 attacs the tyres in the contact patch*

*Red arrow **D**: "Centrifugal force", a force you "feel" a result of sideways acceleration in a curve*

*Blue arrow **E**: The sum of the forces equal balance*

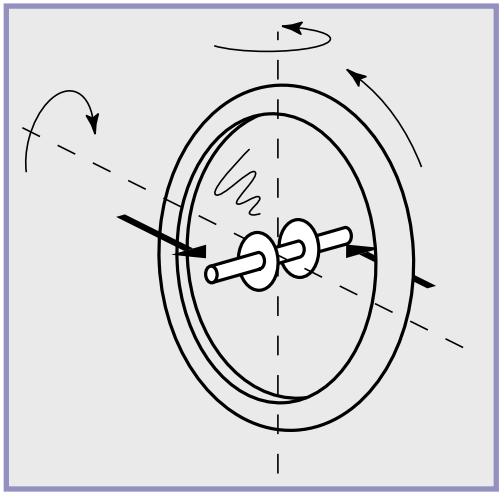
How do you initiate a turn?

To make the front wheel steer the way you want it to go, it follows 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 – cant? It may be done by body language, to move your own body relative to the bike, to one side or the other. We emphasize, however, that this is a slow and imprecise way of steering that results in long, slow"banana-turns".

An extremely 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 towards. 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 mass centre, that is to lean into the desired curve. Elegant, isn't it?

Gyroscopic forces also contribute in this "opposite"steering movement. You can try it for yourself: Take off the front wheel on your pedal bicycle. Grip the wheel by the front axle and hold it out before you on straight arms. Get a friend to help you accelerate 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



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

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 curve by a short moment steering the opposite way of your intention, you immediately achieve the lean you need in order to turn the right way. This steering technique is called…..

Countersteering

Counter in this context means "opposite".

Countersteering means that you, for a short moment, in fact steer the opposite direction of what 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 a two-wheeled vehicle.

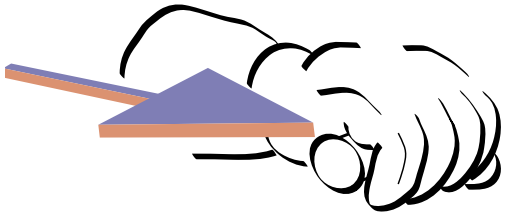
The countersteering is performed by giving a push forward on the handlebar on the side that you intend to turn. If you want to turn right, you give a short, precise push forward on the right handlebar. If you intend to turn left, you give a short push on the left end of the handlebar. We call this "push" a steering command henceforth.

Conscious countersteering is the supremely 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, indeed, needed to achieve a serious change of direction.

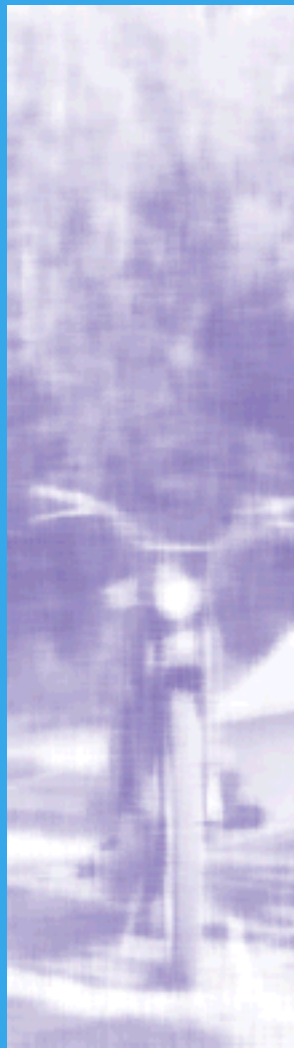
When entering a turn, the sideways forces will try to tip the bike outwards (read: hold it upright). To counter this, there must be an equal force that "pulls" the bike inwards. That is one of the reasons you must lean the bike into the turn: gravity will try to make the bike fall inwards. When in balance, these two forces make the bike go beautifully through the curve. Countersteering enables you to quickly and precisely achieve the right lean angle. The result is that you spend a very short rolling distance to achieve 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 push on the right handle bar end. 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 curve 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



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

If you think you can steer the bike using your bodyweight, we are happy you can read this, because with a little less luck you might as well be dead



1

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

2

... the bike leans

3

... and steers to the right

forces. Amazing, isn't it?

But remember this: The higher your speed, the stronger the self-stabilizing 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 one single working habit 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 curve

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

It is also a fact that the bike straightens up and

drifts toward the outside of the curve when you apply the front brake in a curve. How can that be explained? In a right-hand curve, 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 right and the lean angle changes. In a curve this feel like the bike is straightening up.

A few words about the suspension system

The suspension system gives us comfort on the ride. But the system has a task that is far more important than comfort:

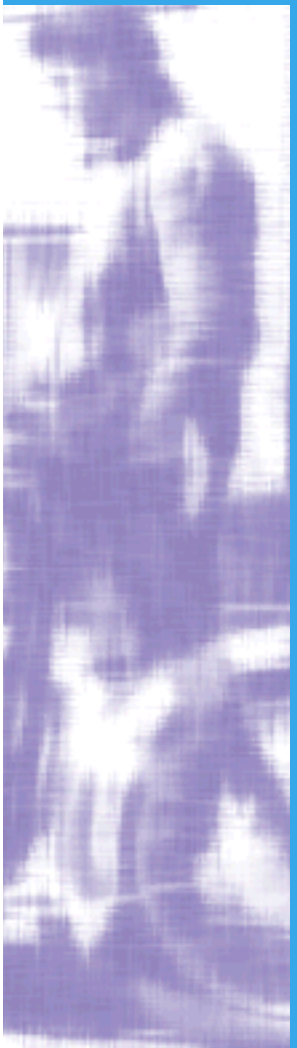
The tyre is like a football. It bounces. And it bounces hard! Imagine what happens when the rolling tyre at highway speed hits a hump in the road. It is compressed by the hump and then bounces back with ferocious energy. This energy rockets the wheel upwards.

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 softly stopped, the compressed spring pushes your wheel back to the ground again to restore your precious road grip.

The springs alone, however, do not suffice to control the wheel's bouncing. The springs just continue their pogo dance if there is 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 it does not 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 an puts the tyre neatly back on the ground.

Thus the tyre is forced to keep as much as possible in touch with the road, 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 you should try to ride a bike without shock absorbers, just to learn to appreciate the job they do.

There is also another extremely important "shock absorber" on the bike, which can both stabilize the bike or disturb it. Yourself. The wind pushes and jolts you when you ride. Humps 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.



”The dangerous instincts”

By ”instinctive faulty reactions” we here mean 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 really is not built for riding a motorcycle. It is built to walk or run. During evolution we have been equipped with instincts and reflexes meant to protect us when in danger, triggered lightning-quick. An example is how you wink your eyes when some sudden movement startles you. Another is when you retract your hand, before you can think of it, 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 easily could have mastered if only you knew what you were doing wrong. And how to do it right. Each one of these instinctive faulty reactions has the power to override reason.

The most common of them is that you in a scary situation ”push away form the fear” by straightening your arms and you back, to create distance from the threat, to protect yourself. That is the absolute opposite to what is needed to steer a 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 it is with motorcycles as with other weapon: 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 curve on the road and feel that the speed is too high or when a car does not yield for you and suddenly blocks your way.

A third one is the tendency to suddenly and quickly rolling off the throttle in the middle of a curve because you get worried about the road grip. This reaction is almost like hitting the rear brake in a curve, as the engine suddenly brakes the rear wheel and you risk a slide. A second consequence of rolling off the throttle is that you transfer a lot of 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 recognize the situations that usually trigger them and the faulty reactions
- Learn and drill precise riding technique to become a correct working habit (new reflex) so that you may override the instinctive reaction

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

- You are suddenly scared not to come safely through the curve
- You suddenly experience your speed to be too high into a curve
- Your lean angle is bigger than you are comfortable with
- Sudden worry about road grip
- An obstacle right in your way

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 motorcycle is a precision-instrument and a correct riding technique will make you play like Eric Clapton

A precise riding technique

The riding technique we describe is founded on the motorcycle's physical properties. The technique puts you in control of the vehicle. Established as correct working habits this competence yields both joy in the riding and safety. Correct working habits in this context means well drilled operating commands that gradually become automatic 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 still: the honoured word "experience" can mean that you during long practice have established wrong working habits. They may be adequate in the everyday, but may 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 precise textbooks on he subject is one of the reasons there are so many assumptions and so little concrete knowledge about riding technique. The formal driver training probably has not given you the precise riding technique that you need in an adverse situation on the road.

The basics of precise riding technique

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

Countersteering / steering command

Countersteering 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 steering command. If you want to turn right, you push the right end of the handlebar. For a short moment you actually steer the opposite way of where you are going. 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 right 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 at the handlebar end. In order for the steering command to move the handlebar precisely, and not only push you body backwards, you must have "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. Not to fall 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 curve.

An "anchored push" means that you anchor yourself on the outward 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 in 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 habit of anchored push is so important.

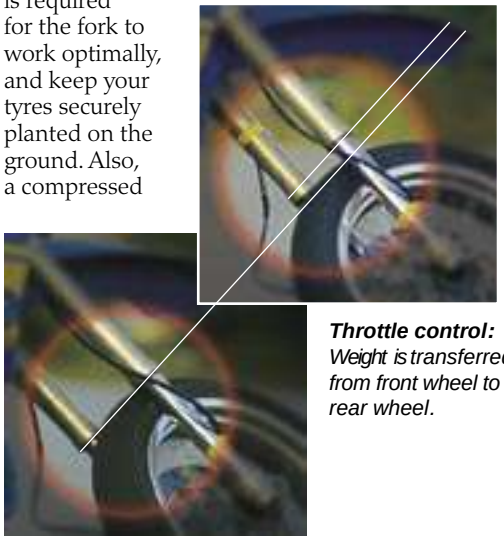
Throttle Control

When you lean the bike, a situation arises that you must realize. The rolling circumference of the tyre is smaller towards the shoulder

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

of the tyre. Hence, the tyre must turn faster when leaned 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 that the engine brakes 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 little acceleration makes the front fork rise a bit, goes back to a medium position, which is required for the fork to work optimally, and keep your tyres securely planted on the ground. Also, a compressed fork would give less ground clearance, right?



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

Do you remember how the motorcycle "balances" the sideways forces and gravity in a curve? This balance demands steady speed and lean. Conscious Throttle Control gives this constant speed. Good anchoring gives you a steady lean. Together these two gives 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 the dangerous instinctive reactions at bay!

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 total 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 total control over the tree 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: *Toeball on pegs, relaxed arms, bowed elbowes, loose grip and upper body leaned slightly forward*

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

Riding position and anchoring

Your riding position is crucial for control. A wrong riding position can ruin the motorcycle's possibility to help you out of a pinch. When you ride into a situation, for example a corner, you have to be ready to handle what is coming up.

You must be prepared mentally and physically, set your body to alert, and assume a riding position that enables you to act correctly and precisely.

Anchoring

Your riding position influences steering, braking, stability, suspension, ground clearance and

The rider is the most important "shockabsorber"

weight transfer by acceleration. An inadequate riding position may lead to failure to do the manoeuvre you intended or hamper the bike in doing its job.

You achieve precise steering with your toe balls on the foot pegs, 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 right, 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 outward peg and transfer the steering power effectively to the handlebar. In normal curves, this steering command is a subtle, sensual push. But the higher the speed, the more force you need in your push.

Riding positioning a curve

When you approach the steering point, you prepare yourself by assuming the right seating position; weight the outer footpeg to prepare for an anchored push. At the steering point you give the steering command, which is a quick push at the handlebar, just powerful enough and long enough to make the bike lean as much as needed. You keep the weight on the outward 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 curve. 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 in pegs and fuel tank.

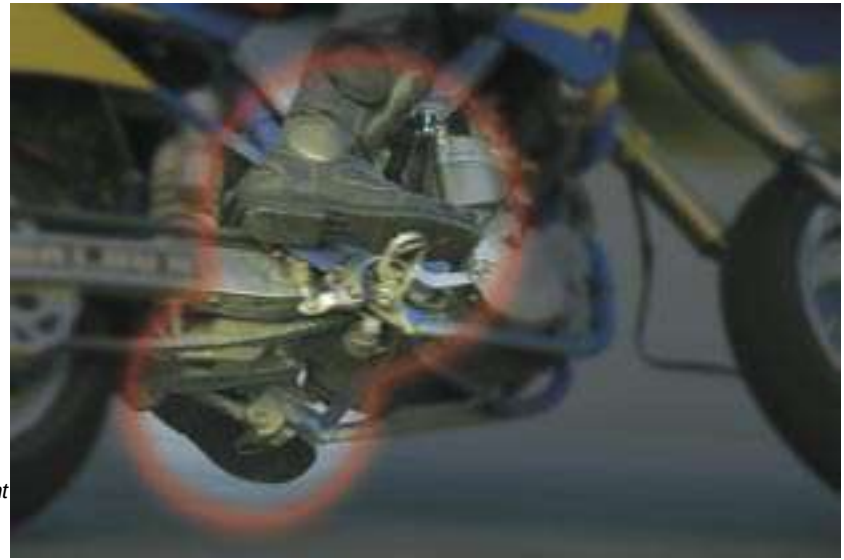
Suspension and springs carry the weight of both you and the motorcycle itself. Some times also the weight of passenger and luggage. In some situations it may be too much for the suspension. For example if you hit a serious bump, a dead badger or a chunk of wood that you fail to avoid. Then you can help 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 keeps 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.

Modern motorcycles have very good brakes. But 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 strong. You need to be anchored solidly on 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 and lift its rear.

Weight on outer footpeg through a turn stabilizes the bike



Achoring:

Toeballs on foot-pegs and weight on outer peg

Attention and visual focus

It is not gift by birth to use your eyes 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 surprised.

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 curve on the road and your focus is far ahead to where you are going, it is still possible to see the white borderline in the periphery of you sight. You can detect if you are drifting towards that line or away from it without looking 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 a little blurred, 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 the peripheral vision.

When your peripheral vision detects a movement – it may be a car on a side road or a moose at the edge of the forest – your focus will automatically move to check it out. This is a reflex. It happens before your 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 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 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 bee the steering point you have chosen, the white border line, a patch of gravel on the blacktop. 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 ahead in time search and sort out the factors that are relevant to you. Foresee what is going to happen. Monitor them consciously with your attention. Discover if something moves or changes. You can practise this every time you are out riding: work far ahead in time, consciously note reference points, - and track them with your attention while your focus stays ahead.

To let the wide attention, the peripheral vision, work for you is much less exhausting than focusing every element. This is one of the reason novice drivers 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 loose your grip on the picture, the dangerous instincts sneak out: you can become disoriented and react with target fixation, tunnel vision or frantic search.

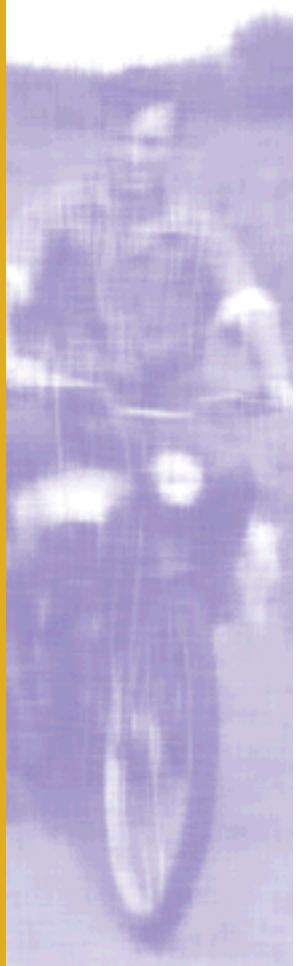
We take it for granted that you will choose a speed that allows you to see all that you need to see to maintain a complete picture of the situation. The complexity of the scene, the number of relevant factors that you must keep track of decide how fast you can ride – and stay in control. And of course you choose a speed that enables you to avoid the dangerous elements you are tracking.

The use of focus and attention in curves on the road

Many riders choose at steering point much too

Visual focus in a turn:
Look into the curve, in the direction you want to go

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



early in the curve 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 going wide. Both situations can trigger fear and faulty instinctive reactions.

Two important things you must be conscious about by cornering: where you will start curving, and, – not less important, – where you want to steer. Choose your steering point early. When you get close to it, move your focus into the curve, to where you are going. Let the peripheral vision keep track on the steering point. When you give the steering command you have to know where to point the bike. That is why it is so essential to move your focus into the curve before you reach your chosen steering point. Your wide attention, through your peripheral vision, knows when you reach your steering point, even if your focus is far ahead into the curve. Rehearse this until it becomes a habit.

To let the bike go straight till it reaches the steering point can be difficult. Instinctively you will want to steer as soon as you move your focus into the curve and steer too early. This is the instinctive "follow your eyes reaction". Practising and conscious trust in the peripheral vision will help you resist this instinctive tendency.

Head angle

Sight is essential for balance. Your body relates to the horizon and it needs to have your head near

Head angle: *Keep head horizontal, even when leaning the bike in a curve.*

horizontal to perceive your ambience correctly and to keep the 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.

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

Steering

”The ideal turn”

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

The answer is conscious cornering technique. The technique, based on physics and the motorcycle's construction, and established as a natural working habit gives you precision, control, security, safety, joy of riding 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 habits are the main weapon to meet these attacks.

The ideal curve

Imagine yourself on your own motorcycle approaching a curve on the road. This is how you prepare yourself and carry out the curve:

The preparative phase:

1. Assume the correct riding position
2. Adjust speed and chose a suitable gear
3. Choose your steering point
4. Consciously weight the outward peg
5. Immediately ahead of the steering point, move your focus to where you are going
6. Softly release the brake

The steering phase

7. Give a precise steering command at the steering point

Throttle control

8. Roll on the throttle a bit to keep the revs constant
9. Loose arms, keep weight on the outward footpeg
10. Roll the throttle on gradually and carefully throughout the curve

The exit phase

11. Keep your focus on where you are going
12. Straighten the bike by acceleration or by pushing the outward handlebar end

”The steering circle”

The preparative phase

This phase is as important as the rest of the curve. Assume the correct riding position well ahead of the curve. Relaxed upper body, lower arms close to horizontal, elbows loose. Many riders move their buttocks a bit inward and anchor the inside of their outward thigh firmly towards the fuel tank. Place your toe balls on the footpeg.

On your way toward the curve, you choose your steering point, – the spot where you intend to give your steering command. Your speed must be adjusted to the wanted cornering speed before you reach the steering point. Apply the front brake if necessary. Brake softly while shifting down. Choose the gear that will give you proper power through the curve. Softly release the brake. A common error is to let go of the brake too quickly and thus upset the bike since it then raises suddenly on the front suspension.

Consider the curve, its radius and how much force you will need in the steering command. A too early steering point results in cutting into the curve so that you will have to correct mid-corner. To find the correct steering point is a matter of conscious practising.

Close to the steering point, you press down on the outward footpeg. Crouch forward a little, "into the bike", let your upper body "collapse" so you can feel your arms relax and your lower arms almost horizontal. Immediately ahead of the steering point, when you know where it is without looking directly at it, you move your focus to where you are going, into the curve.

Forberedelsesfasen:
Rett før svingpunktet – når du vet hvor det befinner seg uten å se direkte på det – flytter du blikket dit du skal, inn i svingen.

The steering phase

Reaching the steering point, you give the steering command. You tension the muscles in the leg anchored on the outward peg, tension your abdominal muscles, and push on the opposite handlebar end. The quickness of your steering command decides how quickly you change course. Normally you give a subtle push, almost a caress and keep the pressure till you have achieved the wanted lean angle. On a wet road it is, of course, crucial with soft movements and a careful steering command.

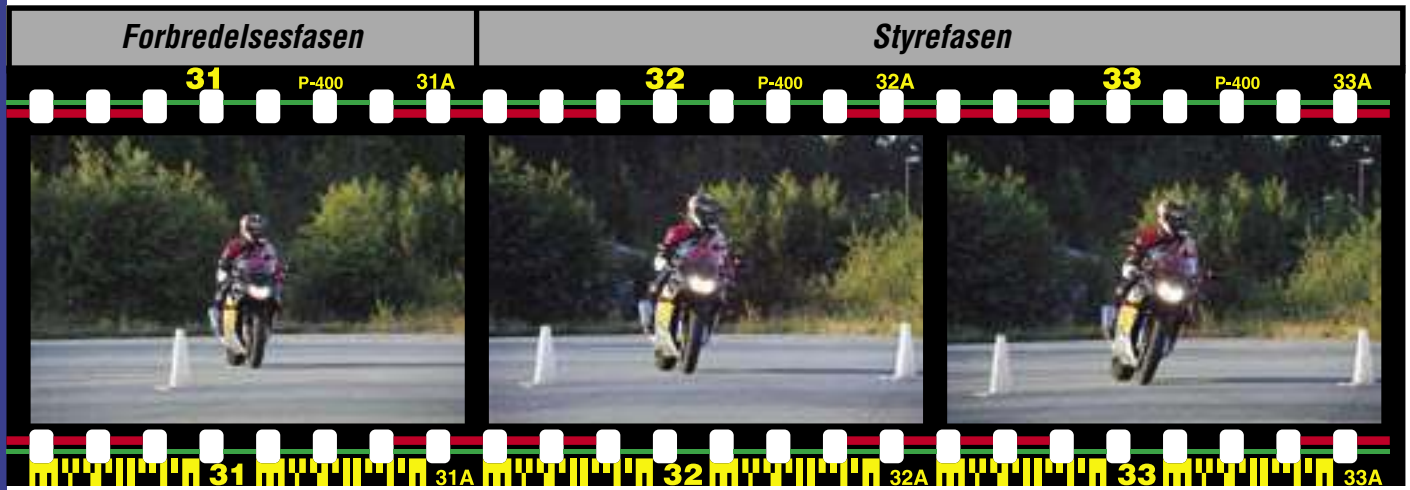
> *Listen carefully to the whispering feedback from the bike during normal riding*

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

Throttle control

Immediately after the steering command, you roll on the throttle a bit. This small movement on the throttle grip is necessary to avoid the engine braking.

Then you roll on the throttle carefully throughout the rest of the curve. This careful 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 the steers willingly, just as you want it to. You also get an optimal road grip, because the bike rises on the front fork, to achieve more travel, right in its best working area – and thus swallows bumps more easily.



The exit phase

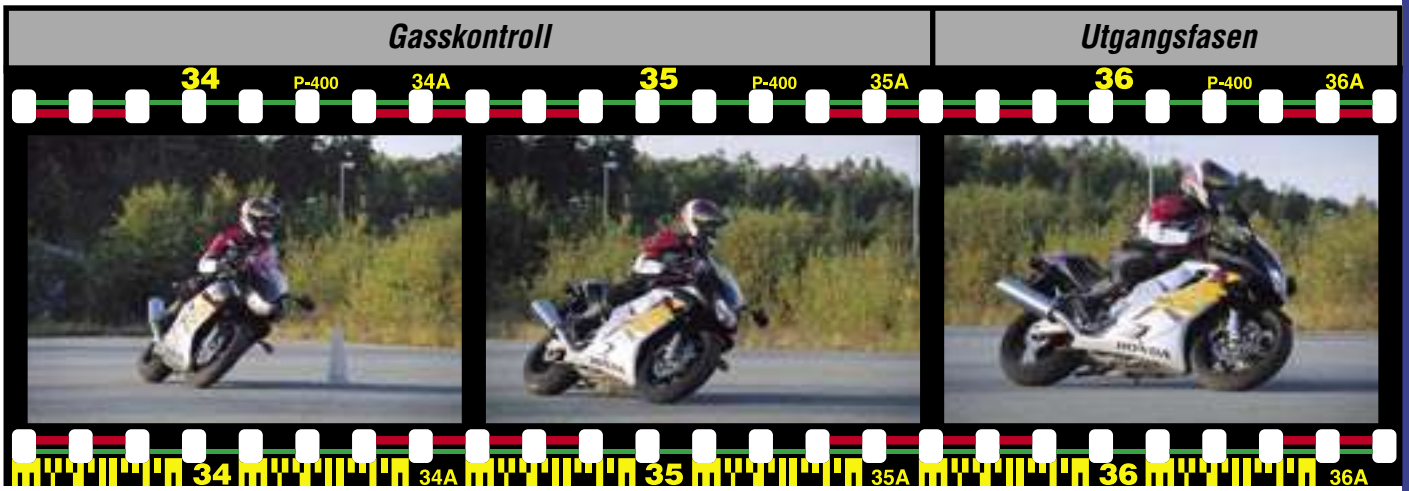
When you have achieved the right lean and applied throttle control, the cornering is almost finished. Let your eyes work far ahead. Start working with the stretch of road that follows the corner. You straighten the bike by increasing throttle and/or pushing the outer handlebar away from you.

Corrections in the curve.

Without precise working habits or because of changes in the picture, you will not always be spot-on with your steering command. You will have to correct. 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 roll n the throttle a bit. With knowledge and practising you can conquer the instincts that tempt you to roll back 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 the precise 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 absolutely comfortable in the curves. The exercises are set in a systematic order for you to learn the single elements and combine them to a whole that becomes a working habit and gives you smoothness. The exercises are laid out in to parts: The first five are cornering without braking before the curve. When you master these, you can start working on the sixth, which includes braking.

Exercise 1

Choose a stretch of road that you know well. Choose a gear that gives you smooth power through the curve. First focus your riding position. Make sure that your upper body is relaxed and your grip on the handlebar loose. Your arms should bee 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 curve, consciously weight the outward footpeg. Be conscious that you steer by pushing on the inward handlebar end (countersteering). Make sure that you are properly anchored on the outward 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 into the curve. Give your steering command, correctly anchored on the outward footpeg, and also against the fuel tank.

Exercise 3

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

Now repeat, but this time you roll on 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 a habit to roll on the throttle after your steering command.

Next you can try to roll on the throttle gradually throughout the curve. Remember to choose a gear that gives you smooth power. Think back on the section about throttle control and how weight is transferred from front wheel to rear wheel. Can you feel that the motorcycle is in perfect harmony? Is it steering willingly?

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

Exercise 4

Moving your buttocks. In order to increase ground clearance through the curve, you can move your buttocks slightly in the saddle – inward in the curve – so that your outward knee and thigh are firmly anchored against the fuel tank. Perform this movement well ahead of the curve. Then you will not upset the bike. Feel how well anchored you are when you have firm pressure on the outward peg and knee and thigh against the tank.

Once through the curve, you move back to the centre of the saddle. You do this by gradually moving your weight from the outward to the inward peg and lifting your body a bit. Make sure you do not pull at 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-curves" so often seen. In this situation, there is probably nothing wrong with the "banana-curves", but it is in your interest to practise precise riding technique even when changing lanes. Without conscious practising, old habits are hard to change.

Exercise 6

In this exercise you shall combine exercise 3 and eventually exercise 4 with braking. On your way towards the curve you 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

Braking:
To brake effectively you must pratice good working habits

After all it is not difficult to brake, brake hard. But serious braking can release an avalanche of faulty reactions in a motorcyclist. In order to be in control, you need to have practised good working habits. A correct braking technique stops the motorcycle effectively, stably and reliably.

Front brake or rear brake?

Modern motorcycles 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 and master the use of both brakes at the same time.You have to learn to brake your own bike – in all situations with and without passenger and 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, all you have to do is let up the pressure a trifle, so that the wheel turns anew, and then the bike stabilizes itself. It is no worse than that.

Rear wheel locking can lead to serious consequences, if you are not quick to release the pedal pressure. On most bikes it is absolutely preferable to use only the front brake, and let the rear wheel rotate, to avoid a rear slide.

Remember that if you drive a car more than

you ride a bike, it's a danger that you bring your 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 rear wheel lift. When you anchor yourself properly in fuel tank and pegs, with relaxed arms, you feed the inertia into the fuel tank and saddle, 60-80 centimetres further back and lower down. The result is that you keep your 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.

Even your eyes influence braking, especially in the last phase. Take care to keep your eyes level and look far ahead.

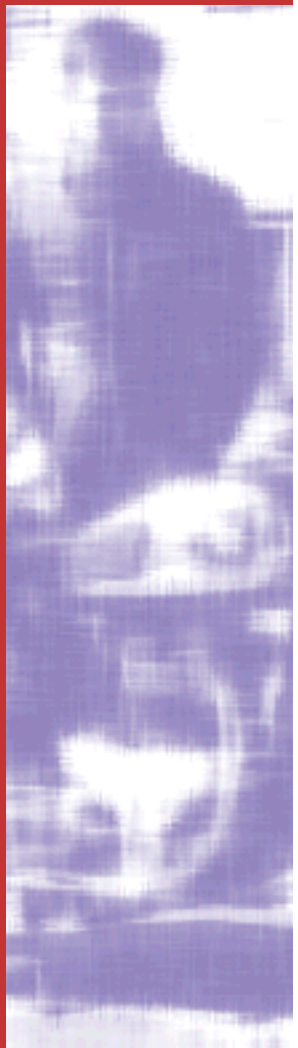
If you do it right, you will be able to sit on the bike, in complete balance, after it has stopped, while it rises on the front forks. Only then should you put your feet on the ground. If you catch yourself red-handed setting down your feet before the bike has stopped completely, you are out of balance and have not done it right.

Regulating the brake pressure

Let us focus on the front brake first. Effective braking results from reaching full brake pressure quickly and smoothly. Too many riders brake too meekly initially and have to squeeze increasingly harder as they approach the hazard. The braking distance becomes longer than necessary.

Thus you must practise to apply the brakes effectively once you realize you have to brake. To do this, you must apply the brake 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 80 km/h. There is no time to waste!

A common error is to grab the brakes desperately and powerfully at once. This 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 stabilizes the bike. BUT: when you load up the bike with passenger and luggage, the effect of the rear brake may be considerable. You just have to practise braking with luggage and 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 you back. If you have not taken the time to instruct your passenger how to react under braking, you risk that he hits you in the back like a freight train. Then you will have a real challenge not to transfer the weight of the two of you to the handlebar and to keep your eyes level!

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

Braking in a curve

It is not advisable to use the rear brake in a curve, because the risk of a slide is considerable.

When you use the front brake in a curve, the two-wheeler tends to straighten up; it steers heavily and feels like it wants to go straight ahead, towards the ditch. To keep the bike on the right course you must countersteer simultaneously. This is the most efficient way of braking in a curve. 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 that the bike falls.

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

Riding position during hard braking

Braking exercises on the road

Think about this: Under normal riding, you can travel hundredscore kilometres without even touching your brakes. This can make you "rusty" and unprepared. Therefore you will profit from brake practising every time you are out riding. Practising gives you good working habits. To practise safely on the road you must make sure you do not disturb other traffic. If you want to practise real emergency braking, find an area devoid of all traffic – a restricted area with lots of space, allowing you to err without unwanted consequences.

Exercise 1

Conscious practising with front brake only. Brake preparedness means to move your fingers to the brake handle and carefully take up the play in the handle. Practise brake preparedness consciously every time you approach a situation where danger can be expected. The goal is that you always apply the front brake first and have the shortest possible response time. Practise using the front brake in all speed reductions when you are riding.

Gradually increase brake pressure, for example by braking a little later when approaching a familiar curve on the road. Do it gradually. Make sure you are always comfortable and in control. Watch your riding position and your eyes. 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 riding position and the way you use your eyes.

Exercise 2

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

Learn how much pressure you must 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 dry and wet surfaces, blacktop 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 load to the front tyre. 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.

To make do with the front brake alone is the best. That gives you only one brake to focus your attention on, when you're in trouble. Anyway, the front brake is absolutely the most important one and must be given priority. But if your motorcycle has a considerable part of its braking effect at the rear wheel, you must practise to use it effectively.

Exercise 4

Braking in a curve. Choose a familiar curve on the road on a day with dry surface. Choose a

speed that makes you feel comfortable, so that you have ample road grip and wide 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 curve. Practise until you are comfortable balancing the stand-up tendency with pressure on the handlebar.

You have complete control under braking in a curve 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 a controlled braking in a curve.

Exercise 5

Braking in a curve. Imagine that you suddenly see an obstacle in the curve 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 go straight ahead.

Start at moderate speeds and 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 curve again. Notice that when you have reduced your speed and release the brake, the bike steers effortlessly into the curve 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 right-handers, start there. When you master them, start practising in left-handers. Remember that the goal is effective speed reduction, not necessarily braking to full stop.

Exercise 6

Braking and swerving is best practised in an area free of traffic. You can still practise the technique and establish the working habit when you are out riding on the road. Make sure you are alone on the road. Choose a point on the blacktop 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 outward footpeg, give a precise steering command and immediately follow up with throttle control. Gradually increase the force with which you swerve and the quickness in the manoeuvre.

You also must practise real 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 practising. Some times, too weak acceleration can be as bad as too hard acceleration.

Under acceleration much load is transferred to the rear wheel. This gives you a good road grip for speed increase. At the same time, the front wheel is unloaded. This can lead to steering problems and front wheel lift. The 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. By extreme acceleration the bike may lift its front wheel high in the air, even somersault. With passenger and luggage its tendency to "wheelie" increases.

Riding position

The tendency to wheelie under acceleration is related to the bikes centre of gravity, its actual mass centre. If you ride upright, high in the saddle, the mass centre 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.

Acceleration:
Full control during hard acceleration demands correct riding position.

To have complete control under acceleration, your riding position must be right. 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, disinviting wheelies. Your arms shall be relaxed, your grip loose on the handlebars and your eyes

far ahead.

Choose the right gear

As you know, the motorcycle's power depends on engine speed and gear. Almost all motorcycles increase their power with increased engine speed all the way to redline. A high gear and low revs gives the bike weak acceleration. A low gear and high revs gives the bike strong acceleration.

Acceleration by passing

Proper acceleration is crucial for safe passing. Too weak acceleration can be as dangerous as too hard acceleration. You want to pass quickly and safely in complete control.
To plan ahead, see the possibility for passing early and then use the free stretch of road effectively. This is the key. A common error is to start the passing manoeuvre too late. That puts you in a hurry in the end phase. Another error is to start out in too high a gear and not get sufficient acceleration. That too hazards the end phase of the passing. Starting out in too high gear often leads to hectic downshifting midway. Then you lose time and speed and distance covered. A fourth problem is too hard acceleration in the initial phase. You can easily loose control because the front wheel hardly touches the ground and you cannot steer. A successful passing is planned ahead in time, well prepared with correct gear and distance to the car ahead, and starts as early as possible when the chance occurs.

Accelerating onto the motorway

Whether you are entering a motorway from the ramp or entering another high-speed road, you have to choose an appropriate gap in the row of vehicles and quickly accelerate to the needed speed to enter it safely. If you accelerate hard on entering, the bike tends to go wider than you want it to. You must correct for this tendency by anchored push, more steering.

When accelerating onto a road with much traffic from a standstill, you also need to master both clutch engagement and throttle control, in order to get the needed acceleration and not stop the engine in a critical moment. In order to fully exploit the "anchored push" in such a curve from a standstill both your feet must come 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 straight stretches of road with no traffic, you can practise acceleration and riding position. Choose different gears and make yourself familiar with the bike's power in different gears and speeds.

Be conscious of your riding position. When you give 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 a passing. Choose a point where you want to start the passing manoeuvre. Choose a gear that gives you smooth power. Do the proper visual search and use your indicator as if it were a real passing. Carry through with the passing manoeuvre and return to your lane. Do not forget to use your mirrors and check the "blind zone".

Exercise 2

Entering motorway or two-lane highway. Choose 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 the other traffic. Focus on riding position and gear. To get into the gap in the traffic should be totally relaxed and undramatic. Use of your eyes, riding position and right gear are the keys.

Exercise 3

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

When the motorcycle is loaded with passenger and luggage it behaves differently from when you ride solo. It is heavier, accelerates slower, has a higher centre of gravity, increases 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.


BALDUR

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. Below you will find some short reminders of other aspects of riding proficiency. More on this type of subjects is found in the textbooks used in the rider education.

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 are called road grip. Dry road surface gives you good grip, wet surface offers less grip.

Correct riding technique is crucial whatever the road condition and even more important on wet road than dry. Conscious throttle control in a curve assures maximal road grip and helps you conquer the inclination to roll back the throttle when you get scared. Anchoring on the footpegs gives stability and balance.

Simplified, you have to learn to "trust your road grip". If you do not, your steering commands will be irresolute. Speed adaptation is the key word. With the right speed it is much easier to trust your road grip and fend off the dangerous instincts.

Lane position and choice of line through a curve

You have the right to choose your position within the lane. The situation determines which position is most suitable at the moment. There is no standard solution. 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? You need to ask these questions to yourself in order to find the most suitable position at the moment.

Line choice in curves is often debated. Even here no solution is permanent. Position on the approach depends on the circumstances and your needs. The traffic rules opens for using the whole lane width. 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 use minimum road grip for turning (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 curve?
- What lane position do I want to have if I must brake?

One thing is for sure: If you master the precise steering technique, a "wrong" line through the curve is not that dramatic. 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 will do. Think about it! The traffic rules are thus 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 yield. 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 is entering your road?
- Do you give him a chance to assess the gap correctly?
- Remember that you look small and farther off than you really are.
- How do you think the car driver will react if you have a speed far over the normal speed in the 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 shows up
- Gives you confidence to trust the road grip
- Makes you confident enough to practice throttle control in every curve
- Enables other road users to judge correctly how far off you are (distance)
- Takes into account the well being of people who live along the road

Technical control of the motorcycle

Your motorcycle is an extremely able partner – if it is in technically good shape. It does not matter how good you are if the bike is not technically able to do its part of the job. Make technical control 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 technical check routines. Read it and practice. Here are six simple, but important points:

- Do all lights, signal lights and warning lamps work?
- Is air pressure in the tyres correct and thread sufficient?
- Do the brakes "feel" normal?
- Is the drive chain oiled and have correct play?
- Any leaks from brake system, suspension or engine?
- Any odd sounds from the bike?

Riding with luggage

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

Luggage can be dangerous when not properly secured. Many riders bungee their sleeping bags on top of the saddlebags. This is not good enough. Some times sleeping bags have moved, come in contact with the sticky rear tyre and been "sucked" in to block the rear wheel! Use both bungees and straps with solid buckles. Check your luggage often.

Out of hibernation

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

Force yourself to ride the first 500 kilometres slower and more consciously than you used to at the end of last season. Rebuild knowledge and skill systematically. The faulty instincts are especially active in spring!

Borrowed or rented bike

Not two motorcycles are alike. You must get acquainted with each one. Be humble and take time to learn the properties and language of the unfamiliar bike. Many accidents happen on borrowed or rented bikes. Be restrictive about lending out your own motorcycle. Restrict yourself and learn the new bike if you yourself borrow or rent a bike.

Riding in the rain

Rain reduces sight and road grip. If you are worried about road grip, watch out for the dangerous instincts: the urge to roll off the throttle, the temptation to sit straight up and cling wide-eyed to the handlebar and the fear to give steering command. All of these instinctive actions only make the situation worse. Throttle control rules, also when the road is slippery, but you have to be very smooth and soft with 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 helmets visor are good help. They work like insulated windows and greatly reduce fogging. They are good value for the money.

Dress properly to keep you snug 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.

Riding in rain:
Throttle control is important, even in the wet

EXERCISES ON A SECLUDED AREA

When you practise riding technique on the road, you have to consider other traffic and practise carefully. A secluded area offers you the possibility to focus on the exercises and practise effectively. You will want an area with a dry surface, hardtop and free from gravel. As you get familiar with the exercises and feel that you master 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, such as an empty parking lot. You can set up the exercises with cones or plastic bottles. In our descriptions we will use the term "cones".

Even here it is important to start carefully and gradually build up confidence and mastery. The goal is to hone your skills at precise riding techniques 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 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 must 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 in a parking lot? Worried other riders may giggle and ridicule you? Well, rise above it – your goal is to become a good rider, isn't it? Well, then you have to exercise.

The practising ground

A suitable area may be a large asphalt paved parking lot or the like, big enough to set up a marked area 110 x 50 m. The exercises are set up with chalk, cones, coke bottles of something of the sort.

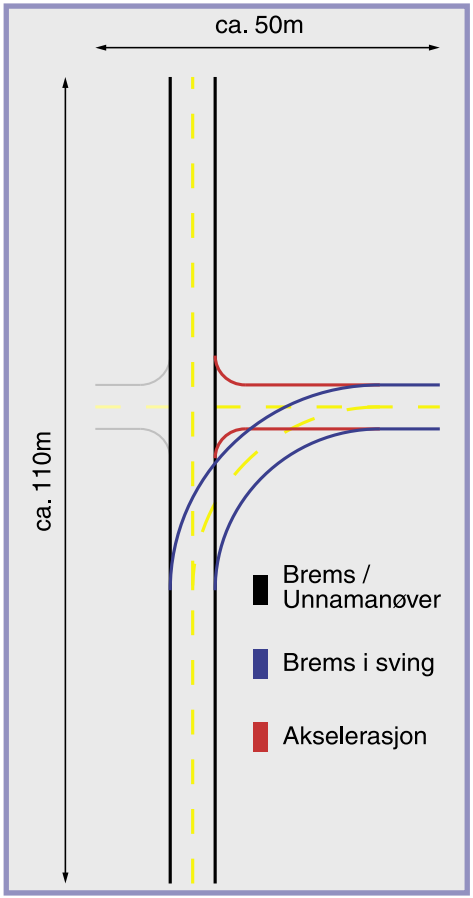
It is important to have enough space lengthwise to stop safely after each manoeuvre.

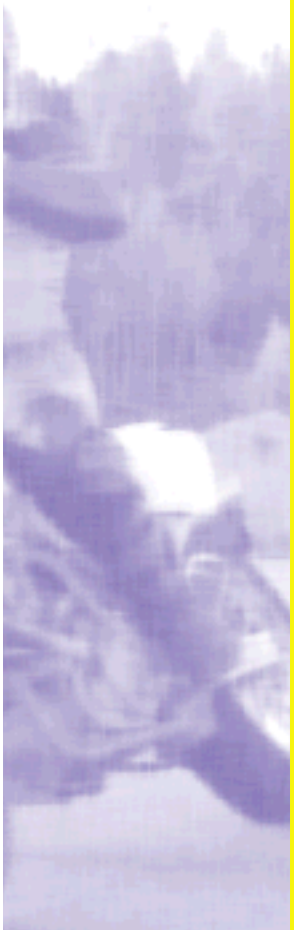
Swerving:
Length: about 100 m
Width: 6 m

Braking to full stop, straight:
Length: about 70 m
Width: 3 m

Braking in a curve:
Length: about 90 m (incl. 40 m curve)
Width: 3 m
Radius of curve: 25 m

Acceleration:
Length: 30 m
Width: 3 m





EXERCISE 1:
SWERVING FOR A CAR THAT FAILS TO YIELD

The exercise gives you the possibility to master a quick change of direction by anchored push, throttle control, anchoring points and correct use of your eyes.

The 30-m long area simulates a 6-m 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 right lane so as to form a gate. About 15 m further down you create a similar "gate" that spans the left lane. Another 15 m further you make a third "gate" in the right lane (see illustration). You need about 50 m room for acceleration.

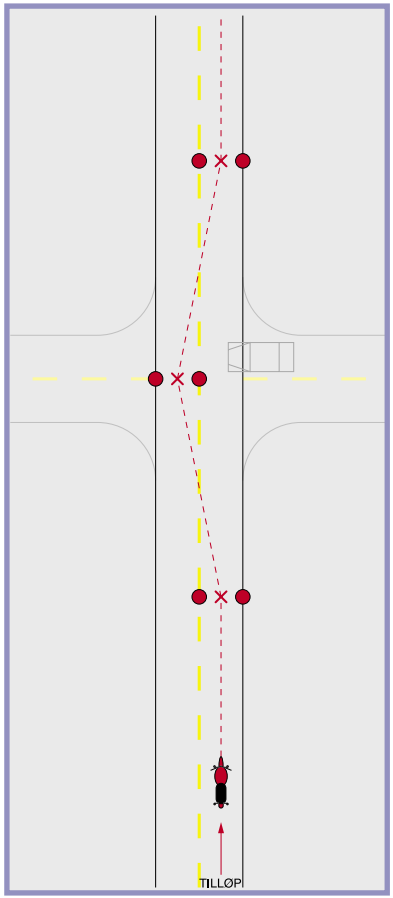
You accelerate to about 40 km/h (2nd gear?). Exactly in the middle of the first gate you shall perform a quick and precise change of direction towards left, by an anchored push. Using throttle control, anchor points and your eyes to where you are going, you ride a straight line to a point midway between the next two cones.

Exactly when you are in the middle of gate two, you make a quick and precise change of direction towards the right, and ride a straight line to the midpoint of gate three. At that point, you change direction again, quick and precise, to ride a straight line, exactly in the middle of the right lane.

The exercise is correctly performed when the motorcycle changes direction midway between the cones and follows a straight line from gate to gate. It is not properly performed if your line looks like a banana, that is slow, wide curves; which is what you get if you do not actively use 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 30 km/h.

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

Swerving: *Between the second cones you should steer firmly to the right*



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 train you, by correct application and modulation of brake pressure, correct riding position and correct use of your eyes, 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 12 m.

You accelerate to 50 km/h. When your front wheel is between the cones in gate 1, you activate the brakes. Whether you use only front brakes 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 50 km/h you must be able to stop within 12 metres.

The exercise is correctly performed when you brake optimally by correct brake pressure and without locking either wheel. You must also be able to keep the bike absolutely straight, along a straight line, by correct riding position, correctly feeding your weight into the fuel tank, loose arms and eyes level. Your feet shall 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 anew.

The exercise is not correct if the whole 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 your feet down before the bike has come to a complete stop.

To master optimal braking at 50 km/h is an absolute minimum! It would be wise to practise maximal braking at highway speeds 90 km/h).

You just increase the distance between gate 1 and 2 according to speed. You also need some 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 50, how do you dare the high speeds on the highways?

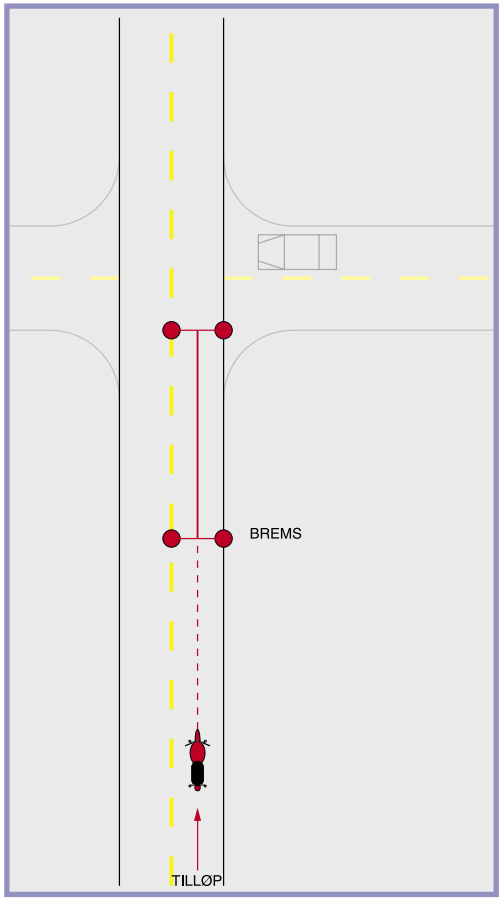
- From 50 km/h you must be able to stop within 12 metres
- From 60 km/h you must be able to stop within 18 metres
- From 70 km/h you must be able to stop within 24 metres
- From 80 km/h you must be able to stop within 32 metres
- From 90 km/h you must be able to stop within 40 metres

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

Hard braking:

Length:	*12m +*
Width:	*3m*
In-run:	*50m*
Distance between cones:	*12m*

Cone:
Correct line:



EXERCISE 3:
BRAKING TO WALKING PACE IN A CURVE

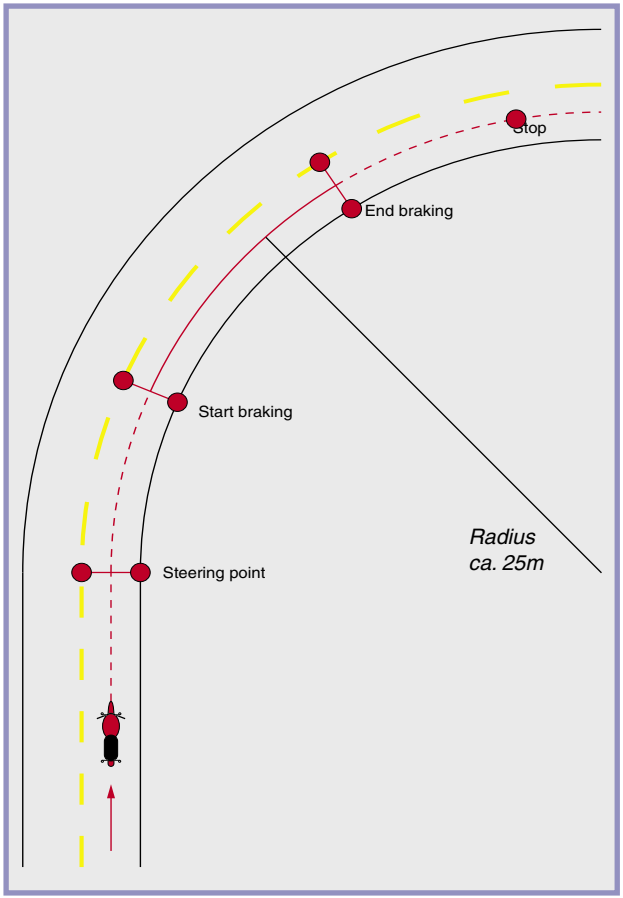
This exercise teaches you, by use of anchored push, anchoring and correct use of your eyes, to compensate for the outward drifting that arises when you have to brake in a curve.

Set up the exercise with a 3-m 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 curve with a radius of 25 m. (Measure it out with a 25-m length of string). The two cones at the starting point represent the steering point. 10 m 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 40/50 km/h. Between the cones in gate 1 you start the curve by 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 shall point to the last cone in the middle of the lane.

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 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 left-hand curve.



Braking in a curve:

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

Cone:
Correct line:

EXERCISE 4:
TURNING RIGHT AND LEFT WHILE ACCELERATING FROM A STANDSTILL

The exercise enables you to master entering a highway with speed limit 80 km/h and dense traffic, from a side road, from standstill, by correct use of anchored push technique, throttle control, anchoring points and correct use of your eyes.

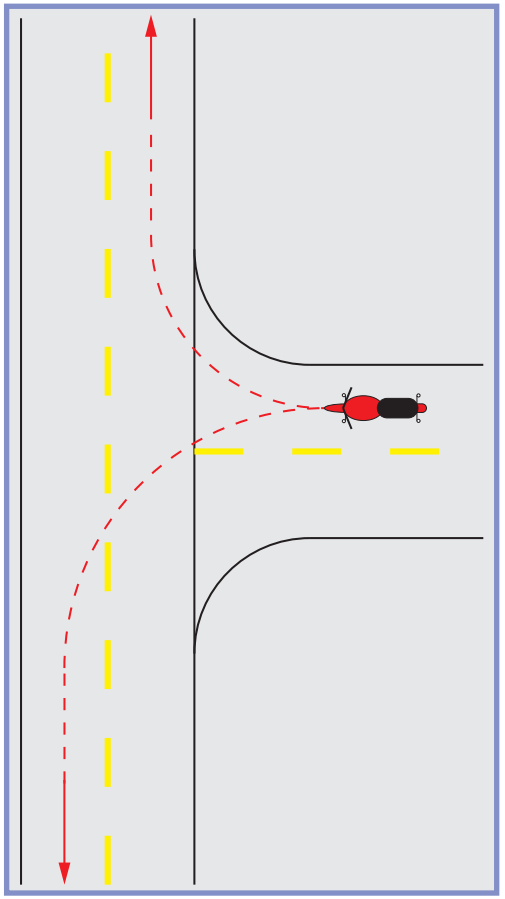
The track is 3m wide, does not demand room for acceleration and can be set up as in the illustration. You shall make a quick start and immediately place your feet on the footpegs. The starting phase is controlled by clutch and throttle. The bike is to be steered to the right (and left) by use of anchored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

The exercise should be practised both right and left, that is a right turn with acceleration from standstill and a left turn with acceleration from standstill.

The manoeuvre is correctly performed when you immediately put your feet on the footpegs, accelerate considerably and follow an imaginary line exactly in the middle of the 3-m wide lane.

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.

Accelerating and turning from standstill:
Put feet on pegs immediately after start



That was the chords: Now you can start composing your song

Acceleration and turning from standstill:

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

Correct line: – – – – –