MOTOR LESSONS

A MOTORCYCLE OPERATION SELF-STUDY COURSE

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INTRODUCTION

This program consists of several lessons based on the Harley-Davidson® Police Motor Course. I have included those exercises that a rider should be able to do without on-site coaching and with a reasonable chance for success. Roughly half the police course is here. However, the skills you will learn are the foundation for the others.

Unlike other courses based on police training, the dimensions of the exercises in these lessons are exactly what are used in the police course. If you decide to use these lessons, it is critical you use them exactly as they are laid out. Altering the dimensions would result in not developing the skills. That of course renders the course pointless.

In a sense this course may be more difficult than others, because you will be judging your own progress. There is no certificate of completion. There is no reward other than your own increased knowledge. If you successfully complete this course you will have developed skills that will noticeably set you apart from most riders. You will improve your riding, you will enjoy riding more, and most importantly, you will ride more safely.

The course from which these exercises are drawn consists of 80 hours of instruction. Of course some portions of the police course have been eliminated, but each exercise here should require your dedicated practice for several hours. Also, you should be aware that the students in the police course are using motorcycles provided by the Motor Company. Progress can occur more rapidly, when the rider is not concerned about damage to the machine. Since you will be using your own motor, you should proceed very slowly and deliberately. As on the street, you are responsible for your own safety when practicing these exercises.

It is important that you read each lesson completely and understand each fully, before attempting the exercises. Should anything be unclear, simply E-mail me at MotorLessons@Hotmail.com, and I'll do my best to explain it further. I am very interested in hearing how you are proceeding. If you have questions or concerns, I'll do my best to help. Also, I'm very interested in hearing your criticisms or compliments on the lessons. That feedback is the only thing I ask in return for these lessons. Also, feel free to share these lessons if you have someone else to work with; but please do not forward them via the internet. Instead, please have anyone interested e-mail me.

Thank you for your interest, and for taking the time to improve your riding.

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Lesson 1 – STRAIGHT LINE STARTS

The first thing covered in the police motor school is machine nomenclature. If you have any questions on it, or find yourself needing the "official" name of a part, consult your owner's manual. The H-D® manuals do a good job on this subject.

The second thing is picking up a down motor, using the technique of putting your butt to the seat, and taking small steps backwards, to lift the machine with your legs. This technique it is fairly simple. First shut off the ignition. Make sure the machine is in gear. If it is down on the high side, then extend the kickstand. Place your butt against the seat of the down motor, with your feet about shoulder width apart and pulled in close, so your knees are bent. Grab the grip that is closest to the ground in one hand, and something structural in the area of the rear fender with the other. Take small steps backward, using your legs, rather than your back, to raise the motor. As it comes up, take care not to go so far that it overbalances, and you drop it on the other side. In motor school we can drop the motors until everyone gets the opportunity to practice this from both sides. Don't do this with your own machine, as minor damage is inevitable.

From there we move to mounting and dismounting. You must always mount and dismount from the high side (the side away from the kick stand) of the motor. This way if you catch the motor with your foot, the kickstand and gravity are working in your favor. If you are mounting the motor from the low side, and you accidentally kick the motor, you can end up knocking it over. For police this is also important so that if two people are riding two motors together, they don't step into one another as they are dismounting.

Without exception, you must use all four fingers to operate the front brake and the clutch. This means every single time. This is because what you practice is what you will do in an emergency. Four-finger braking allows you the best leverage, and the best control of the front brake. We will cover the details of this in later lessons. However, if you are in a different habit, this is the time to break it.

Next is that when stopped, you never have two feet on the ground. Usually you will keep your right foot up on the board/peg and rear brake, and put your left down, but this can vary if the surface is oily, like in the center of a lane, or slippery because of sand or something. There are a couple reasons for this. First, if you only put one foot down, you aren't tempted to drag your feet or "walk" during take-offs and stops. Second, it makes taking off easier. Part of the problem with this is nothing more than you don't "look" like you have total control of the machine. However, as you'll see in later lessons, there is a bona fide safety reason for not having your feet off of the boards/pegs. Having your feet off of the foot boards/pegs, while the machine is in motion serves no purpose, and exposes you to serious leg injury. It is a habit to be avoided. To say this more strongly, placing either foot on the ground, when the motor is in motion, or both feet down while it is stopped, is proof the rider has lost control of the machine. This includes dangling your legs when starting or stopping. Motion, means any movement at all.

Now on to the first exercise under power:

This exercise will build several of the very basic skills that handling a motor requires. When you've mastered this simple exercise you will already possess motor handling skills, for low speed control, that are above that of most riders.

You will need a piece of 2x4 lumber about 2 feet long, and a piece of chalk or a tire crayon.

In a large, level, paved area, place the 2x4 on the ground, and outline it with the chalk. Outlining it will allow you to determine if it has moved.

Ride at a reasonable speed to the board. Use combination (front and rear) braking to stop with the front wheel at the exact point that the tire is touching both the ground, and the edge of the board. Only when you've come to a complete stop do you put down your left foot. Initially you will probably not be able to roll to a stop at that exact point. If not, position the motor so the front tire is against the board.

From that position, coordinate your use of the throttle, rear brake (no front brake now) and clutch to move the motor forward, and over the board. This can only be done by using the "gray area" or "friction zone" of the clutch. That is the area between 1% and 99% engagement. You should hear little change in the RPMs (about 1200). The changes in power to the rear wheel should be accomplished only by use of the clutch.

As soon as the motor begins to move, your left foot must come immediately up to the peg. You will move forward to the point that the rear wheel contacts the board in the same manner the front did, and stop there. Only when stopped does your left foot leave the peg, and go to the ground.

Then; again using the throttle, clutch and rear brake, start off over the board. At soon as you begin, your left foot must come up to the peg. The goal is to start off without causing the board to move.

Throughout the exercise your head should be up, and your eyes focused on a point well out (at least 75 feet) directly in front of you. This is the key to having the motor do what you want it to, not only for this exercise, but also for everything else. Where you look, is where you will go. In this exercise, you want to start out, and move straight ahead. Use your focus on that distant point to control your direction. Use your sense of feel to determine when the tire is at the board. Quickly you will be able to also use your familiarity with the motor's dimensions to know when the tire has moved to the board.

If possible, have a friend watching you from the side, especially during your initial attempts, to let you know that your wheel is properly positioned at each stop, and to reset the board after it moves. This person should be familiar with these instructions so they can critique your foot's return to the peg, and your head and eye alignment. No one

should stand to the rear of the motor during this exercise, as the board can be launched with considerable force.

To summarize, the successful completion of this exercise is as follows:

1) Approach the board and, using combination braking, bring the motor to a stop so the front tire is centered on the board, and just touching the edge of the board.

2) Only when fully stopped, extend your left foot (and only your left foot) to support the motor.

3) Apply power to the rear wheel through the use of the friction zone of the clutch; and controlled by the throttle and rear brake. This power must be sufficient to carry the front wheel smoothly over the board, but well enough controlled so that you can bring the motor to a stop with the rear wheel against the edge of the board.

4) As soon as you begin the forward movement in step 3, your left foot must come immediately up to the board/peg, and remain there until you stop again.

5) Use the rear brake to stop the motor with the rear tire just touching the edge of the board. Then extend your left foot to support the motor.

6) Using the same coordinated application of power as you did in step 3, begin forward motion so the rear wheel smoothly goes over the board. This must be accomplished so smoothly that the board does not move.

7) During the entire process your head and eyes must be up, with your focus far out in front of you.

Practice until you can regularly complete the exercise perfectly on all 7 components. This will likely be very frustrating at first. However, after about 20 tries, you will start to have more successes than failures.

Once you become proficient at this exercise you will have learned several key skills: motor placement (knowing where the machine is without having to stare at the ground), proper use of the single foot to support the motor, and the immediate return of the foot to the board/peg when the motor is moving at all, and most importantly you will have a basic understanding of the friction zone of the clutch, and how to use it to apply precise amounts of power to the rear wheel. These skills are the foundation upon which all low speed handling is built. Additionally, learning to keep your feet on the pegs until you are at a complete stop is critical to your safety. If you're in the habit of putting your feet out early, you will do just that any time the motor becomes unstable, including in a skid or slide. This is how people break or lose legs.

One more note. People often worry that use of the friction zone will result in damage to the clutch. The clutches on these machines are built to be used in this way. If you look in the service manual, you will see that the clutch is engineered for incredible punishment. Additionally, the oil-bath design prevents overheating. If the motor is not an H-D®, the use of the friction zone can be detrimental. The BMW® Police Motors tend to go through clutches rapidly, as they are a dry type. Just to play it safe, after 45 minutes of practice, ride the motor around for 10 minutes or so to let the components cool down. Also, you may notice some stretching of the clutch cable, particularly on a new machine. This is normal. Simply adjust it back to the proper tension.

Lesson 2 – FIGURE EIGHTS

It is important that you not begin practicing this lesson until you have become very comfortable with the Lesson One exercise (straight-line pull out). In that exercise you learned about using the gray area of the clutch – the friction zone – to apply the precise amount of power you want to the rear wheel. You also learned to make the machine accelerate and decelerate while keeping the RPMs steady. You learned that if the machine is moving AT ALL, you must keep your feet on the foot boards/pegs. Finally, you were introduced to the concept of keeping your head and eyes up.

In this lesson, you will build upon all of those skills, and learn the techniques that will be the basis of all low-speed handling. The motorcycle MUST be leaned to take advantage of its full capabilities, and that is what you will now begin to learn.

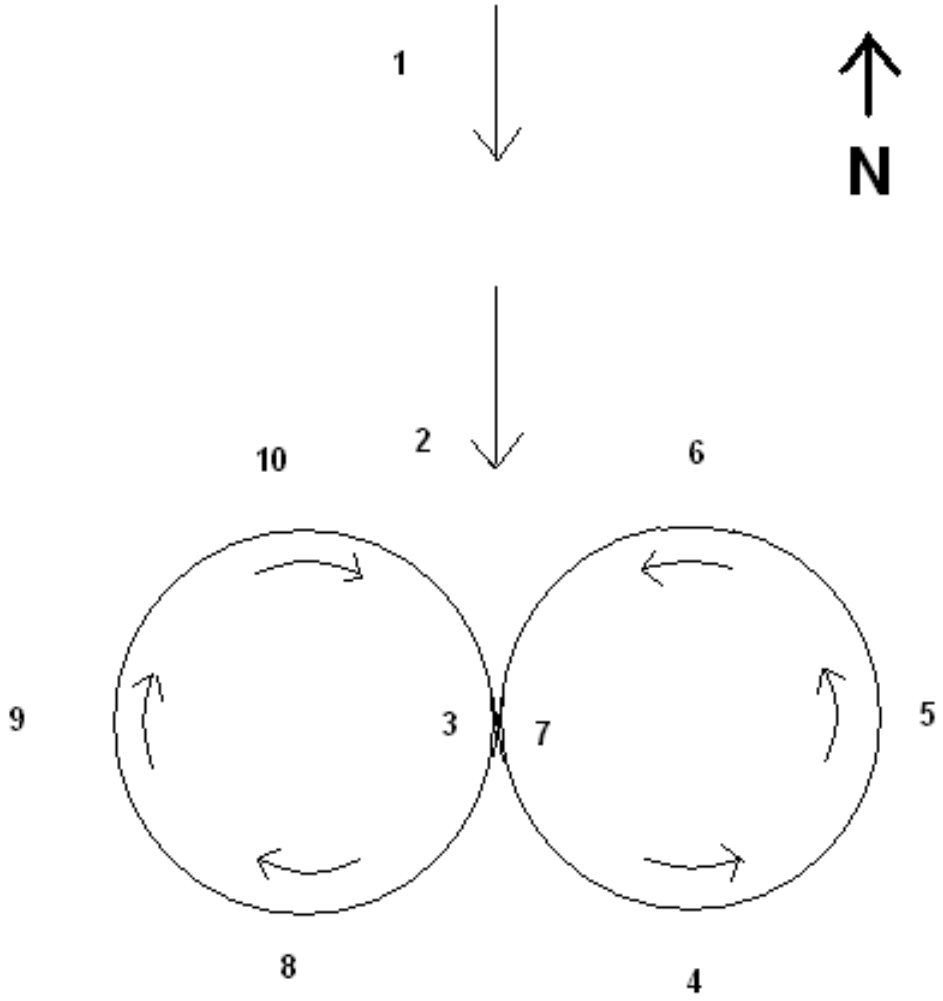
If your motor has engine guards, it is best to wrap them. I use strips of old fire hose, secured with duct tape. Radiator hose or carpet works equally well. To avoid dropping your motor, you should make very small increases in the tightness of your turns, carefully staying within your comfort level during this exercise.

This exercise consists of simple figure eights. Start with the smallest size you feel comfortable with, and then improve your technique - following the instructions here - and reduce the size of your pattern. Initially you will be allowed to make sloppy patterns, but once you have a good grasp of the concept, you will be required to keep your cross-over point stationary.

Ideally you will have a parking lot with spaces marked for straight-in, rather than diagonal parking. If the spaces are painted to code, they will be 9 feet wide, although 8-foot spaces are common. Knowing the width of spaces will allow you to gauge your progress in your efforts to reduce the area needed. An “8” 16 feet wide and 32 feet long is the practical minimum possible on a Touring Model. The Softtails would be very similar. You should not be trying to get anywhere close to those numbers at this point.

The keys to this exercise are appropriate use of the friction zone, and looking ahead on your path. It is important that your head and eyes stay “up”. This means your head should look a little bit like you are trying to “look down your nose”.

The diagram below gives you a guide for where you should be looking as you proceed through the pattern. You should find you are looking beyond ninety degrees over your shoulders. The first step is for you to walk a figure eight, looking the appropriate direction. It would be ideal to have someone work with you as you walk the exercise. They could tell you the direction, as you reach each point. Your head should be smoothly and constantly swiveling as you proceed through the pattern. As you walk the pattern, notice how your peripheral vision allows you to see where you are going even though you are looking somewhat up, with your head held high. This is a critical component to the exercise.



Position 1	**South**
Position 2	**South Southeast**
Position 3	**East Northeast**
Position 4	**North Northwest**
Position 5	**West Southwest**
Position 6	**Southwest**
Position 7	**West Northwest**
Position 8	**North Northeast**
Position 9	**East Southeast**
Position 10	**Southeast**

Continue pattern, beginning at position 3

When you're familiar with the proper placement of your head and eyes as you move through the pattern, you can begin riding the exercise. Start out making large patterns, and concentrate on your head and eye technique. You should keep the RPM's steady. Typically about 1200 RPMs is right, which is just above idle. You will regulate your speed with only the clutch. There should be no braking at all. It is particularly important that you not use the front brake, as that will bring instant disaster during a low speed turn. To review, the bike should be in first gear, your right foot should be only on the board/peg (no brake). Your right hand should be wrapped around the grip, and keeping the throttle at a steady RPM. Your left hand should be on the grip, with four fingers on the clutch lever, regulating its movement to apply between 1% and 99 % of full power to the rear wheel, and your left foot should be firmly on the board/peg.

The exercise in this picture involves riding in through the lane, making a circle within the cones, and riding out through the lane. Notice the seam in the concrete in the center of lane, and through the center of the circle. Notice that the centerline of the bike is not quite yet perpendicular to the seam. However, my head and eyes are looking past ninety degrees, out the lane. In other words, I am looking where I'm going to go. You can also see that I am not looking down at the lane, but out over it. This is how you can keep your focus from getting locked, and is what is meant by "keeping your head and eyes up".

Leaning the motor is the key to low-speed maneuvering. The key to achieving lean is the friction zone. If you want to tighten your turn, you must increase your lean. To do this, you must decrease the speed of the machine. You will do that by decreasing the amount of power to the rear wheel, by pulling the clutch lever in more. Conversely, when you feel that you are leaned too far over, the correct response is to let the clutch lever out.

This will increase power to the rear wheel, and stand the motor up out of its lean. This is a matter of very fine adjustments so initially you will find your clutch use jerky. This will improve quickly, as you figure out how minute changes can cause dramatic effects.

One critical point is that when you feel the lean is too much, your natural reaction is to extend your foot. You MUST fight this instinct. Putting a foot down, on a moving motorcycle will cause several problems. At the least it throws you off your natural path. This likely will result in you dropping the motor. Additionally, since the rear wheel tracks inside the path of the center of the motorcycle, you are putting your foot – which of course will be stationary – into the path of the rear of the machine. This is particularly noticeable on the touring models, as the saddlebag is moving along at ankle height. If it catches your leg, you will be pulled from the saddle and likely break your ankle. This is not intended to scare you, but to stress the importance of keeping those feet where they belong.

After you have practiced making the figure 8, and feel you have gotten it down to a reasonable size (I would set 24 feet wide by 48 feet long as a good goal), it is time to add some precision. To do this, simply set two cones 5 feet apart from each other. Make your eights so that your crossover occurs each time between the two cones. The cones would be where the 3 and 7 are in the diagram. This will make you keep from wandering in your pattern.

Again, any time you are practicing low-speed maneuvers, ride around for a few minutes after every forty-five minutes of practice, to let the components cool.

For informal practice, I use orange plastic marker discs, which I got at a discount store. They are sold in the sporting goods department in packages of four. They are marketed for marking the corners of a soccer field. They are nice because they will stack, and fit in a saddlebag, or luggage bag. If you can, purchase 22 of them. You will need them for later exercises. If you perform an Internet search for “disc cones” you should be able to find pictures of the type I’m referring to.

Although the figure eight is a simple exercise, it includes all of the techniques used in low speed handling: leaning the motor, proper use of the clutch, and proper head and eye use. Make practicing figure eights a part of your routine, and your low speed skills will keep their edge, allowing you to always be ready to operate your motor in restricted areas.

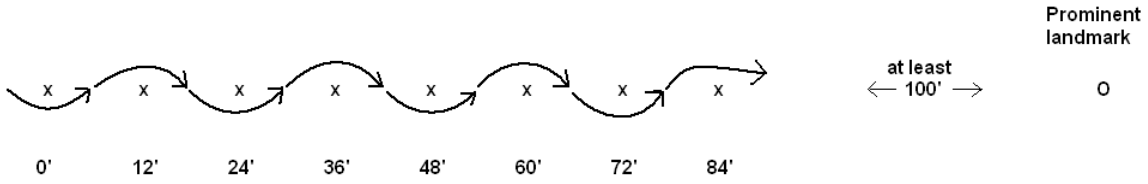
Lesson 3 – SLOW CONE WEAVE

As always, this exercise builds upon the skills you've learned in the previous exercises. The key to this exercise is to keep your focus up, and use only your peripheral vision to locate the cones. This pattern will develop your ability to gauge your motor placement, as well as further develop your skills in coordinating the clutch and throttle to control the machine. In lesson 2, you were allowed to make figure eights without regard to their shape, or particular placement, until the end when the cross-over point was defined. In maneuvering around objects you will have to adapt your position to reality, so this exercise will introduce you to placing the motor according to obstacles.

The first thing to do is walk around your house, looking up, at a 45-degree angle, toward the ceiling. Notice that you can still navigate around all furniture and steps, while your focus is well above the items. To clarify, this is merely to demonstrate to you how much you can see with your peripheral vision. When riding, your head will be either level or a few degrees up.

The exercise will be completed in first gear, and again you will not use either the front or rear brake. You will control your speed with only the clutch, keeping constant RPMs, just above idle.

The exercise is simple to set up. You will need eight of the cones or discs. Simply place them in a straight line, 1 every 12 feet (center to center for the discs). You should look for a prominent object, such as a tree or sign, beyond your practice area, and line the cones up so they go toward that object, as it will help you focus. It is important that you find a level area to set up your exercise. If you're riding uphill through the course it slows you, making it too easy. If you're riding downhill you cannot properly control the speed.



This exercise is relatively easy if you use the proper technique, and impossible if you do not.

First walk the pattern, focusing on the distant object. Again notice that you have no problem seeing the cones, even though you are not looking at them.

Now ride the pattern on your motor. Again I cannot stress strongly enough the importance of keeping your feet on the boards/pegs anytime the motor is moving. As you approach the pattern, you should be focusing on the distant prominent object you have selected. This should be at least 100 feet beyond the end of the exercise, and high enough that you are not looking down. What this results in is your approaching the exercise looking across the pattern. You will keep that focus throughout the exercise. You will quickly realize you can see the cones in your peripheral vision.

It is important to recognize that the motorcycle has the properties of an articulated vehicle. That is to say that the rear wheel tracks inside the front during a turn. Of course, as you make a tighter turn, you increase this effect. Therefore, you must come out far enough around each cone that the rear wheel clears. This skill will be critical in the real world, when you are curving past an object, rather than a cone.

You will quickly realize this exercise cannot be completed by simply steering. You MUST lean, and lean well over, to complete it. Negotiating this pattern requires a definite turning of the bars to induce the lean you need at the precise moment you need it. As you gain skill you will feel how the increased speed, with release of the clutch lever will cause the motor to stand up and straighten out, while pulling the clutch in will cause decreased speed; and combined with turning the bars, will cause lean. Additionally, if you pay attention, you will notice that the motor's speed continues to decrease during a curve. This is true at any speed. The reason for this is that turning produces greater friction between the tires and surface than traveling straight. You can learn to use this fact to help you in controlling the machine.

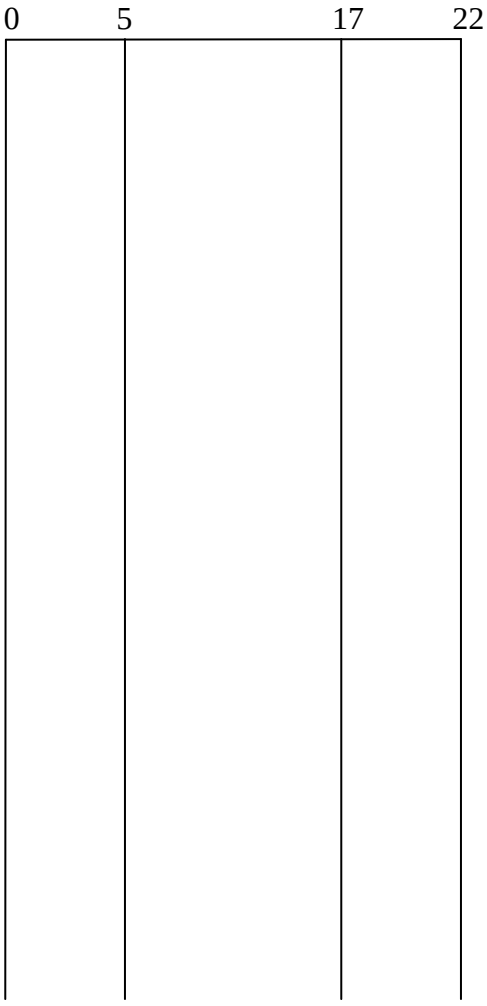
Successful completion of this exercise is distinguished by smoothly proceeding through the cone pattern. You and the motor should look and feel as if you are "flowing" through the pattern. Your speed should be steady, and there should be no revving of the engine. Initially you will likely find that you enter the pattern, and make it through the first several cones, only to have trouble near the end. This is actually indicative of poor motor placement early in the pattern. Being a little out of position at the first cone, will multiply through the pattern. Therefore, if you find that you are having trouble in the second half, you must examine and correct your approach, and maneuvering through the first few cones. Soon you will find the difficulty happens later and later in the pattern. Later still you will find that, even when you find yourself out of position, you can compensate with greater lean (from increased steering and clutch use), thus correcting your position enough to complete the exercise. Finally, your skills will come to the point that you complete the exercise with no stress. When you've reached the point you can repeatedly do so, you have completed this lesson.

With the completion of this lesson, you have the skills to start, stop, and maneuver the motorcycle at low speed. In the next lesson, you will progress to having the ability to control your machine in these circumstances, in a manner that will set you apart from other riders.

Lesson 4 – OFFSET CONE WEAVE

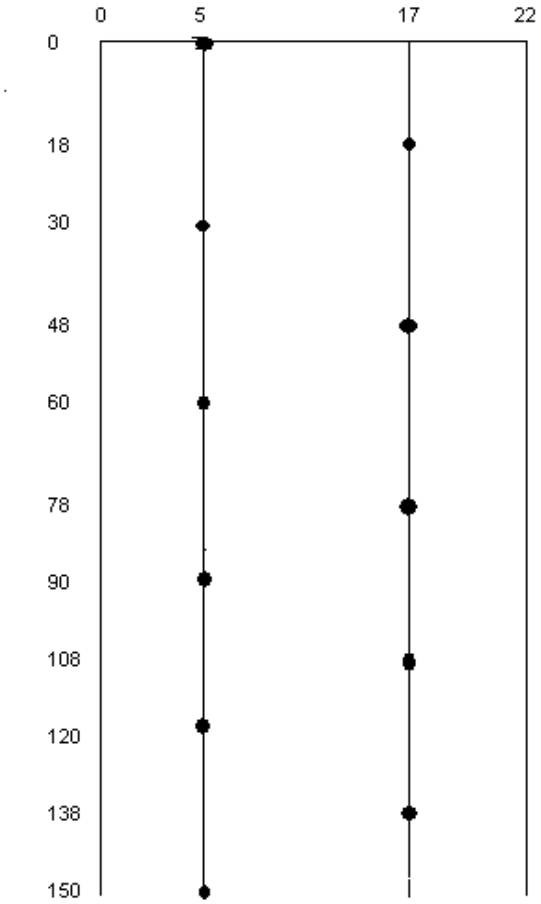
This exercise will build upon all of the skills you've developed, and instill the confidence you'll need to handle the motor in confined areas. You will find this ability sets you apart from "regular" riders, at rallies and other events where there is a lot of congestion. There you'll see people walking their motor (straddling it, with both feet on the ground, often dragging their feet). You will be riding.

This is the most complex exercise to lay out. First, you need a baseline 22 feet long. Then you need four lines perpendicular to it. The first at zero feet, the second at five feet, the third at 17 feet and the fourth at 22 feet. The lines need to be 150 feet long. It should look like this:



Of course you do not actually have to draw the lines out, they are shown here so you can visualize the layout.

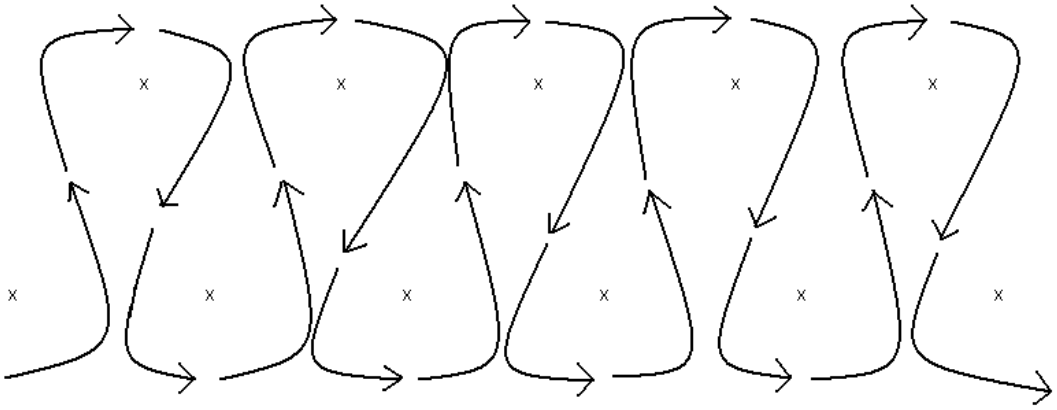
Initially you will place cones only on the 5 and 17 foot lines. On the five foot line, place a cone at the base line, and then every thirty feet. On the 17 foot line, place a cone 18 feet out from the base line, then every thirty feet. It should look like this:



This exercise is performed with no brake use whatsoever. You will control the speed of the motor with only the clutch. As with all the prior exercises the throttle should remain at a constant RPM.

You will use your head and eyes in the manner you learned in the earlier exercises. Keeping your head up, you will focus well ahead on your path. In this exercise, this means looking a little past where your path will be AFTER the next cone. In other words, as the motor is passing the cone at zero feet, your focus should already be past the cone at 18 feet. Remember also that you are constantly moving along the path, and therefore your focus should be constantly moving as well. Your focus should not be "snapping" from point to point, but rather should be "flowing" through the exercise.

This exercise requires you to maneuver the motor around the cones. It will be necessary for you to use a "teardrop" type of turn, in order to maintain proper motor placement. This diagram, illustrates how the turns will look.



You should notice that it is not enough to merely ride to the cone, and around it. Instead you must make a loop out, then pass the cone, then make a loop back. You will never be riding toward the cone you are passing. You should recognize the motion from the figure 8 exercise. At this stage of the exercise, you may use all the room you need to make your loops. As you have learned in earlier exercises, if you feel that a lean is too great (as if you're going to fall) release your grip on the clutch somewhat. If you need to tighten your turn, increase your grip on the clutch.

You must lean the motorcycle to complete this exercise. On a touring motor, this lean, when done properly, will take you close to the point where the floorboards scrape. However, scraping should not occur. As with the slow-cone exercise, if you find yourself having difficulty toward the end of the exercise, it is indicative of poor motor placement in the early portions of the exercise.

Once you are able to regularly complete the exercise successfully and feel your comfort level is sufficient; add a row of cones on the zero line, just opposite the row on the five foot line, at the 30, 60, 90, 120 and 150 foot points. This will create a series of gates. Now ride the exercise exactly as you did before. You will likely find it is more difficult, as this forces your loops on this side of the exercise to become more precise. However, you can still use the open opposite side to make larger loops, thus correcting your motor placement.

Finally, when you feel your proficiency is adequate, add a row of cones on the 22 foot line, at the 18, 48, 78, 108 and 138 foot points. This will close off your ability to make

"sloppy" loops. When you can repeatedly complete this exercise in that lay-out, you have successfully completed this lesson.

As always, it is critical that you not put a foot down. That is a certain path to injury. Someone listening to you perform this exercise should hear a steady engine tone, at between 1200 and 1400 RPM. Someone watching you perform it should see you and the motor moving smoothly through the gates. There should be a noticeable flow and rhythm as you pass through. Your head should be swiveling constantly, as it did in the figure 8 exercise; since you will constantly be looking along your intended path as you move. If you have difficulty, head and eye use is the most likely cause.

You may have heard of using the rear brake to help control the motor at low speed. A light feathering of the brake can help. However, by following this course, you will have learned to handle the bike without it. This prevents becoming dependent on it, and substituting braking for proper use of the clutch.

This is the last low-speed exercise in this course. There are several others in the police course; however, I do not feel they can be taught properly without "in-person" coaching. Also, the skills in these exercises are merely refined in the others. As you become proficient in these, you are developing the skills used in all of them.

The remaining lessons will be geared toward staying alive on the street.

Lesson 5 – DEFENSIVE RIDING

Having perfect control of the motorcycle is pointless if you are not riding defensively. There are too many aspects to this to cover all of them in this format. I genuinely believe that I learn something new about riding every time I ride. There are little things you can notice that, if you watch for them, will heighten your awareness, and thus your safety. Those things will be your responsibility. In this lesson I will give you some very basic information. Although it is basic, I often see it ignored.

First is to constantly be aware of the condition of your machine. One of the prime benefits of doing your own routine service is that you become much more familiar with the workings of your motor. This adds to your safety, since you will be more likely to notice a problem. If you don't do your own service, at least take the opportunity when you wash your motorcycle to look carefully at each component. A true "sudden" failure is rare. Typically some part has deteriorated, and then finally gives up completely, often at the least opportune moment.

Most people are very good about checking their engine oil. However, much more likely to vary, and much more important to safety, is the tire pressure. As the weather changes, the tire pressure can vary dramatically. A tire with low pressure has a tremendous effect on handling and braking. Of course your tire wear is adversely affected as well. Each model has its own recommendations for the pressure in each tire. These recommendations are not necessarily the maximum pressures listed on the sidewalls, so take the time to read your owner's manual. Of course you need a reliable gauge, and tires must be checked cold for an accurate reading.

Also before each ride check all your lights. Pay particular attention to the brake light. Make sure it comes on with the application of either brake, and that it goes out immediately upon release. A sticking brake light is not uncommon, and is just as dangerous as no brake light at all.

On the subject of lighting, use the lights to your best advantage. There is no better way to make motorists aware of your presence than your lights. On most machines this means riding with the high-beam on during daylight. On the touring bikes, which have passing lamps, ride with the headlight on low-beam, and with the passing lamps on. Remember that on high-beam, the passing lamps switch off automatically on US models. You can use this to your advantage, if you want to catch someone's attention. Switching quickly from low-beam to high-beam and back causes a dramatic change in the lighting configuration. However, be aware that a driver may take this for a signal that you are yielding the right-of-way.

While the horn is important, and should be checked, it is almost useless at highway speed. I'm always frightened when I hear people speak of using their "throttle as a horn", referring to causing noise from their pipes. As loud as some horns, and some exhausts, are, you should never think that you are going to catch a driver's attention with them. Sirens, which run at about twice the decibel level of horns, can often not be heard more

than two car-lengths back at 60 MPH, in a car with the windows up. When you add the distractions many drivers operate under: radios, cell phones, kids, and all the other things we've all seen; only a fool would believe that a noise they make would get through to the average motorist.

Loading the motorcycle is critical to its handling. Often people are amazed by the low weights listed for the various racks and saddlebags. However, they are not because the equipment cannot support more weight (it can), but because the effect of weight increases geometrically as you move it away from the center of gravity. The effective weight doubles after one foot, then again at two feet, and so on. Therefore, a one pound weight, on a rack three feet from the center of gravity has an effective weight of eight pounds. This is especially critical when it comes to storing items on the handlebars or in the fairing lowers on Ultra Classics. I have talked to several people with Ultras that complained of poor handling. It would turn out they were storing heavy items in a fairing lower. The most common culprit is a disc lock. Likewise, think twice before mounting something on the bars like a GPS unit, or other accessory. Especially because when you take it to the shop to have them diagnose the handling difficulty, you will probably be removing this. The keys when loading your motor are to stay as close to the centerline as possible, as low as possible, and as close to the center of gravity as possible.

Hopefully every one is aware of the concepts of defensive driving. I work on my skills by trying to think of what the worst thing a particular motorist could do would be, and how I would react to it. Be specific when you are doing this. Ask yourself what braking or steering would be like on the particular surface and at that particular point. Is your speed appropriate? One thing few people do, which can save a lot of trouble, is to look a sufficient distance ahead. It sounds like a long way, but 12 to 17 seconds is the appropriate distance. At 30 MPH this is over 500 feet. Initially you will probably have to make a conscious effort to scan that far out. However, you will find yourself avoiding a lot of traffic problems since you will be seeing things in plenty of time to take a proper position.

This brings up another important issue. While I've talked about having a "focus" at a point, you must be clear that this does not mean you should fix on it. Your eyes should constantly be scanning all areas and, of course, your mirrors.

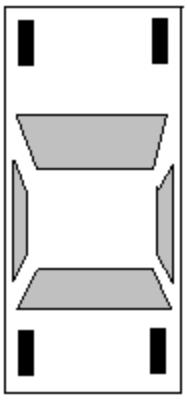
Use of your mirrors is critical. If you find yourself being tailgated, a motor is no place to play games. Let the other guy pass you. If this means pulling off and stopping completely, so be it. This is especially true since – when braked correctly – your stopping distance on a motor is much shorter than a car's.

This brings us to an issue I really want to stress, your motor placement when stopped in traffic. In Lesson One we covered using only one foot when stopped. This is important because if you only have one foot down to begin, you only have to get one up to take off in an emergency. Anytime you've stopped in traffic, your transmission MUST be in first gear; you MUST have the clutch pulled in; and you MUST be paying attention to your mirrors to know what's going on behind you. I get incensed when I see people on

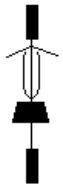
motors, at lights, with both feet down, the transmission in neutral, their hands off the bars, and looking at the birds or something. Granted, if they get rear-ended the motorist will be at fault. However, a fender-bender between two cars turns into an injury accident when a car strikes a motor. By riding defensively, you can take a proper position at a stop, plan an escape route, and be prepared for the inattentiveness of others.

As you're coming to a stop, consider whether you will be first in line, or if there will be a car in front of you. Either way, stop so that you are angle. If you see a vehicle coming up behind that is not going to stop, you cannot just accelerate to get out of its way; you must get off to the side. If you will be behind a vehicle, it is critical that you leave enough space so that your angled position leaves you on a straight path to your escape route. It is also important to be off-set to either the right or left side of the lane, not centered behind the car in front of you. The idea is to get forward, and out of your lane. It doesn't matter whether you go to the left or right, but you must plan this as you are coming to a stop. Things like curbs, poles, and on-coming traffic should be taken into consideration as you formulate your plan. It is not always possible to have a completely clear escape path. However, it is far better to drop your motor on a median or sidewalk, or even scrape the side of a vehicle next to the one in front of you, than to be rear-ended. If someone comes up behind, and isn't going to stop, your goal is to release the clutch, and get straight off to a position, that would be next to the car in front of you. I've only had close calls, but I know people who have used this technique and ended up, unharmed, next to a car that was rear-ended. There is no better feeling than knowing you just saved your own life. Below are several diagrams that illustrate this concept.

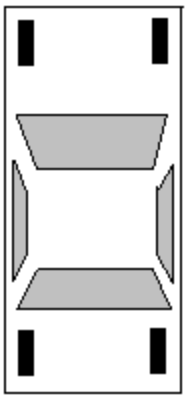
WRONG



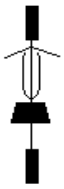
Too close, centered, and straight



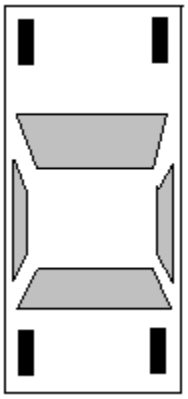
STILL WRONG



Offset, but still too close and straight

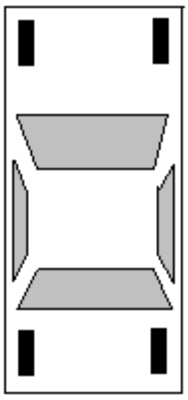


STILL WRONG



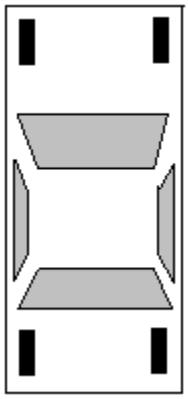
Offset and angled, but too close for a safe escape

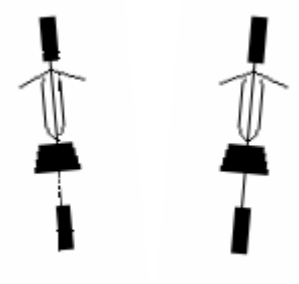
CORRECT



Offset to one side (in this case the left), plenty of distance, and angled for a straight escape path

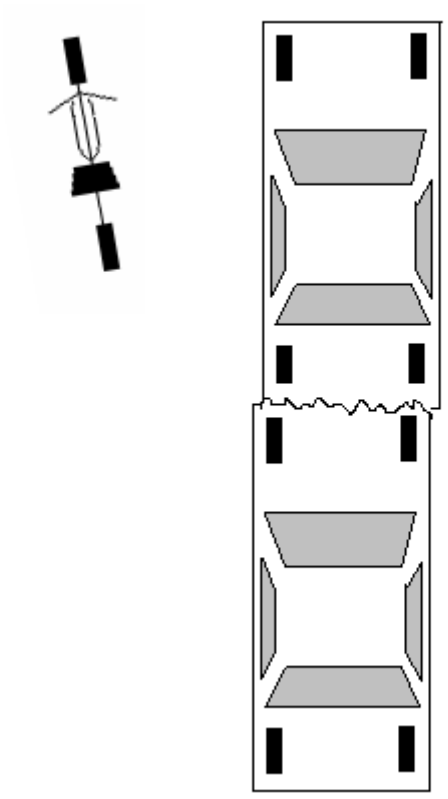
CORRECT POSITION FOR TWO MOTORS





Motors even with each other, each motor offset to its respective side, both angled for a straight escape, and with plenty of distance

CORRECT POSITION OF REST IF AN ESCAPE HAS BEEN EXECUTED



Motor has moved out of the lane, and off to the side along the angle at which it had been stopped

There is no exercise to accompany this lesson. Instead just incorporate the concepts into your regular riding. Every single time you ride, try to think of at least one thing you could do differently that would increase your safety.

Lesson 6 – COMBINATION BRAKING

There is nothing more critical to safe operation of a motorcycle than braking. Most people are familiar with the concept that most of a motorcycle's braking power comes from the front brake. However, few people are clear on how much of the power can come from the front brake, and how to maximize the use of that power. This lesson will get you to the point where you are genuinely a safer motorcyclist. These skills absolutely WILL save you from an accident or injury at some point. Once you have learned them, make a point of practicing them at least monthly. It's one thing to understand the concept. You must be able to properly execute to remain safe.

Frequently people will use the figure of 70% of the braking power as coming from the front brake. This is actually too low a figure. In reality it is possible to get 85 to 90 % of the braking out of the front brakes, on a Harley-Davidson®. On sport bikes, it is possible to move the weight transfer to the point that 100% of the braking power is at the front wheel. This occurs when the rider performs a "stoppie". This is not possible on a touring motor, as front wheel lock-up occurs prior to this. However it illustrates that technique is important to front brake application. It is certainly possible to cause front wheel lock-up on a sport bike, but a rider who has learned to properly apply the brake can avoid this to the point that the rear wheel lifts up.

Since so much of the stopping power comes from the front brake, people occasionally wonder if it's worth bothering with the rear brake at all. The answer is a definite yes. Suppose on a given road, at a given speed, use of the front brake alone could get the motor stopped in 100 feet. If the added stopping power of the rear brake was only an additional 10 percent; that would shorten the stop to 90 feet. Now suppose on the given road, at the given speed, the reason for the stop was a mini-van, being backed out of a driveway 93 feet from the point the brakes were first applied. Use of both brakes – combination braking – is critical. As with everything else, what you practice is what you'll do in an emergency.

Proper application of the front brake involves a rapid but gradual squeezing of the brake lever. This is why it is critical to use all four fingers when braking. First you want the maximum amount of your strength available to you, but equally important, you want every bit of your ability to control with minute adjustment. You must squeeze the brake lever so that, as the stopping force is applied, weight begins to transfer to the front end of the motorcycle. This compresses the front forks. Only as this weight transfer begins, do you continue your squeeze, applying more and more braking power. If you "grab" the lever, it puts all the braking power to the wheel instantly, which will cause a front wheel lock-up. If a front wheel lock-up occurs, the correct response is to **RELEASE IMMEDIATELY AND RE-APPLY PROPERLY**. Again, the amount of braking available when the front brake is applied properly, allowing the weight to transfer; will cause lock-up if the lever is pulled that same amount before the weight transfer has occurred. Even though it is a gradual process, the weight transfer takes very little time, only that brief fraction of a second difference between a controlled squeeze, and a panicked grab.

In full combination braking, you may notice the ride gets rough. This is not a problem. Instead it is indicative that you have fully compressed the front forks, thus eliminating their ability to absorb the road's imperfections. You may also hear noise that you believe is a skid. This can be caused either by "rotor whine" or an impending skid. Noise is NOT a reliable indicator of a locked front wheel. There are several important signs of a locked front wheel you should be very familiar with. First, the ride will become noticeably smooth. This is because the wheel has stopped rolling and started sliding. Second, the bars will shift to one side. For most people the right grip will move away from you. Third, you will notice a change in sight-picture. This is because the motor has started to lean over. Recognize these signs, and react to them – **RELEASE IMMEDIATELY AND RE-APPLY PROPERLY**. The motor's natural state, when the wheels are turning, is to roll straight ahead and upright. Therefore, it will return to that state immediately when the locked front brake is released. Proper re-application is critical, since whatever condition was present to make you want to stop is presumably still there.

Application of the rear brake is actually quite simple. The most common error is over-application. This is particularly likely as you develop your skill at properly using the front brake, since you will now be transferring more weight than you are used to away from the rear wheel. The easiest way to get the appropriate amount of pressure is to act as if you are being watched, and must use the rear brake, but act as if you are cheating. Your conscious effort should be to merely rest your foot on the rear brake lever (your heel should remain on the footboard or peg). What actually occurs is the same weight transfer that affects the machine affects the rider. Your foot will move just enough to apply the proper pressure. For those of you who have attended the MSF or Rider's Edge courses, you probably remember being told that if you lock the rear wheel, you should simply leave it locked. The theory is that by keeping the wheel locked, you will not induce a "high-side" if the wheel suddenly regains traction. However, our goal here is to develop your riding skills far beyond the basic level. Part of this will be your response to a locked rear wheel. Instead of just leaving it alone (locked), you should release pressure only until traction is regained. This way you retain full control of the machine, and achieve the shortest possible stop. The danger of a high side comes from a sudden and complete release of a locked rear wheel, when the rear end of the motor has slid out at least six degrees. So again, I will stress that if you lock the rear wheel, release pressure only until traction is regained. Recognition of a locked rear wheel is usually easy, as it is the same sensation most of us have felt while driving a car. The motor's rear-end starts to move to one side. The squealing noise of a tire skidding is more likely with a rear wheel lock-up.

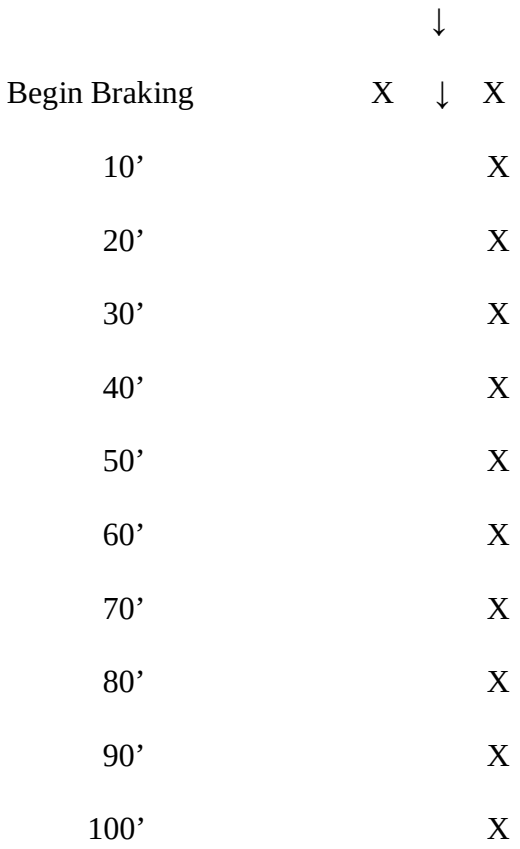
No attempt should be made to pump or modulate the brakes. Both the front and rear should be given a steady, constant application.

While braking, it is critical to keep your focus up and out. If you focus on the obstacle, you will find yourself looking further and further down, as you approach it. As you learned in the low-speed exercises, where you look is where you will go. Having your focus out and up keeps you in control of the motor, and allows you to constantly assess

your options to cease braking and switch to maneuvering as an evasive technique. Further, in addition to misapplication by the rider, a locked wheel can be caused by a change in the road surface. Things like a different pavement surface, a painted line, sand on the road, or anything else that alters the friction will likely cause a locked wheel. By having your focus where it belongs, you can anticipate the problem. If you lock the front wheel **RELEASE IMMEDIATELY AND RE-APPLY PROPERLY.**

When braking in this manner, it is vital that you pull in the clutch, and downshift as you slow. You must be in first gear as you stop. It does you no good to stop in time to avoid one hazard, if you cannot get out of the way of another vehicle that can't stop. Do not attempt to use compression braking in an emergency stop. Also, make sure you're pulling the clutch lever while you begin your braking. Removing power to the rear wheel after the rear brake has been applied often leads to rear wheel lock, since the removal of power to the wheel enhances the brake's effect.

The exercise for this lesson is very straightforward. You will ride between a pair of cones, placed ten feet apart. These will be your cue to begin braking. Along your path there should be a cone every ten feet, for 100 feet. This will allow you to gauge your improvement.



BRAKING CHUTE DIAGRAM WITH X's REPRESENTING CONES

Make sure your pavement surface is uniform, and unpainted. You will need enough room prior to the cue cones to accelerate to 40 MPH, and there should be several hundred feet past the end of the exercise.

Begin at 20 MPH. On your first run, use only the rear brake, and stop as quickly as you can without locking the rear wheel. Note the distance. Next, take several runs at 20 MPH, and use only the front brake. You will immediately see how much more effective the front brake is. Pay attention to the weight transfer. You will quickly learn to feel how it occurs, and when it is safe to add additional pressure to the brake lever. Again, if you lock the front wheel, **RELEASE IMMEDIATELY AND RE-APPLY PROPERLY**. Note your best distance using the front brake alone.

Finally move on to combination braking. Remain at 20 MPH. You should immediately notice a distance shorter than your previous efforts. Work on your braking, until you consistently get smooth stops, using all the principals discussed. Then move up to 25 MPH, and determine what your shortest, regularly attainable distance is. Continue in 5 MPH increments, to 30, 35, and finally 40 MPH. At 40 MPH you should be able to come to a complete, controlled, and safe stop within 70 feet or less. However, this will take considerable practice. Do not push yourself for big improvements all at once. It is more important that you practice the techniques, as the way you do it here will be the way you do it in an emergency on the street.

To summarize:

1) Ride steadily at your designated speed to the cue cones. You may "cover" the brakes prior to the cones, but do not apply early.

2) Keep your focus out and up

3) At the cones, apply both the front and rear brakes, using a quick but gradual squeeze of the front, and merely resting your foot on the rear. Let the force of the weight transfer take care off the rear brake application.

4) Simultaneously with your brake application, pull in the clutch lever, and downshift.

5) Remain alert for the signs of a locked front wheel; smooth feeling in the handlebars, the handlebars turning to one side, and a change of sight picture. If you have a front wheel lock-up, **RELEASE IMMEDIATELY AND RE-APPLY PROPERLY**.

6) If you have a locked rear wheel gradually release pressure only until traction is regained.

7) When you come to a stop put only your left foot down. Since you are not removing your foot from the footboard until fully stopped, it should never be necessary to move your foot once it touches the ground.

Take your time, and do not increase your speed in this exercise until you are quite certain of your abilities at the present speed. Should you have any difficulties, drop back at least a few miles per hour. It is best to have someone present while you are practicing this exercise. Failure to properly respond to a locked front wheel will cause a fall. Injury is likely in that case. Therefore it's best to have a person there to summon help should you need it. That person should also watch to see if you are letting off your speed prior to the cue cones. That is a common problem for riders in this exercise.

Once you have become fully proficient in getting your stops to their shortest possible distance, and thus are competent in emergency stopping, there is one more technique to practice. This is for use in your everyday riding, not in emergency stops. However, you will practice in the same way. Using your braking chute, come in the exact same way, and at the same 40 MPH. However, at the end of your stop, release just enough pressure on the front brake lever to allow the compression of the front forks to ease back out, rather than spring up at the moment of complete stop. This will allow you a better feeling of control as you stop. You should find that this adds only a few feet, if that, to your stopping distance. This will give you a feel for how to stop, putting the motor on exactly the spot you desire.

While you should not attempt to use compression braking in an emergency stop, for regular riding, where you're making planned stops, use the engine's compression to help slow you. This makes your stops more controlled, and ensures that you're in the proper gear should you need to resume acceleration, for instance when you're slowing for a red signal that then turns green.

Having completed this lesson, you have developed two of the skills that separate skilled operators from most riders. You now have the ability to handle the motorcycle at very low speed, and the ability to effectively utilize all of the motorcycle's braking power.

Lesson 7 – OBSTACLE NEGOTIATION

Now that you've developed excellent braking skills, it's time to learn what to do if they are not enough. There are times when an object comes into your path, and there is no way to avoid it, and not enough distance to stop. That leaves you only the option of contacting it. Obviously, if the object is another vehicle, or fixed object taller than the radius of your wheel, you are left with only using maximum braking, until contact, so the impact is at the lowest possible speed. However, that option is still better, than to lose control, and have the first collision be you and the ground, followed by a second collision between you and the object. Often riders will say they "laid the bike down to avoid an accident". That translates to "I had a collision to avoid a collision". What this means, when you start asking questions is "Something encroached on my path. I panicked and locked the brakes. I fell over". It's not nearly as *macho* sounding when phrased correctly.

Often the object that cannot be avoided is something smaller. A piece of wood, a box, a speed bump you hadn't seen in time to slow, etc. There is a specific technique for dealing with this.

First, it is important you are moving straight, and the motor is upright. If you are in a curve or lean, straighten up, before braking. Once you are upright, use the maximum braking technique from lesson 6, until just before contact with the object. Simultaneously downshift to the gear appropriate to your speed. This way you've bled off as much speed as possible. Then, at the point just before contact; release both brakes, raise your butt up off the seat about 2 inches, and give the motor slight acceleration with the throttle.

Releasing the brakes accomplishes two things. First, it unloads the front suspension, effectively lightening the front end. This helps the front wheel's ability to go up and over the obstacle. Second, it removes the drag of friction between the road and the tire, which was there when braking. Any given road has a particular "drag factor", which is expressed as a number. A drag factor of 1.0 means it takes 1 pound of lateral force to move a 1 pound object across the level surface. A drag factor of .75 means it takes ¾ pound of force to move 1 pound, and so on. The drag factor is the maximum stopping force that surface can provide. Using maximum braking, you will be achieving, or very nearly achieving the full potential of the surface. However, if you strike an object, while braking at maximum efficiency, that small increase in friction, caused by the object, will be enough to lock the wheels, sending you into a skid.

Rising out of the saddle accomplishes two things. First it allows your knees to absorb the shock. Second, it concentrates your weight lower on the motor, at the footboards.

Accelerating also accomplishes two things. First, it enhances the lightening of the front end, by causing weight to transfer to the rear. Second, it slightly raises the front end, giving you a minor increase in ground clearance as the front of the frame passes over the obstacle.

Just at the point the front wheel has passed over the obstacle, release the throttle. This gives maximum friction to the rear wheel, while stopping the weight transfer to some extent.

While negotiating the obstacle, it is important to retain a firm, but gentle grip on the bars, and keep your arms loose enough to let the front end work itself over the irregularity. Trying to lock the bar with your arms will cause more trouble than it solves.

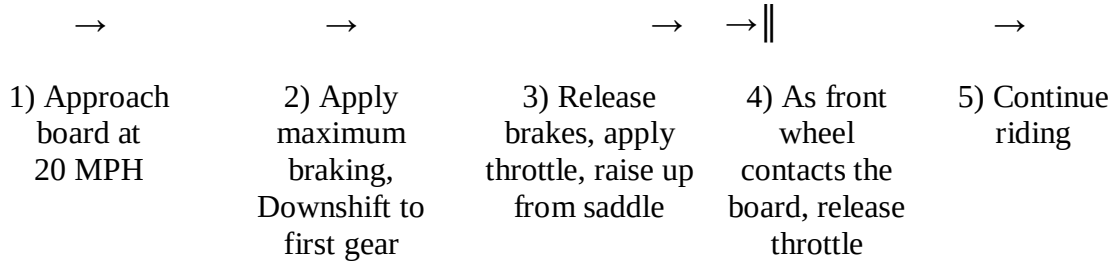
Throughout this maneuver, it is critical to keep your head up, and your focus down the road a good distance. Your peripheral vision will allow you to determine the point just prior to impact. Do not focus on the object!

This technique is exactly the same one to use if you cannot avoid hitting an animal. A small animal, like a cat or dog, will likely go down, and under the motor. A larger one may be shunted off to the side, causing some handling difficulty. Riders have hit animals as large as deer and kept the motor upright, through the proper application of this technique. Of particular note if you hit an animal, ride some distance past the impact, before you stop to check your motor and the animal. It is not uncommon for an animal to be merely injured or stunned. It may appear dead, then suddenly get up, and be unhappy with the outcome of the encounter.

After any contact with an object, stop and carefully check your motor for damage. A common problem is the kickstand spring can get knocked loose, so when you stop the stand may be hanging out to the side. It will still function, but you must insure it is all the way forward so that it locks correctly. Look carefully at the tires, for damage to the tread or sidewalls, and check the rims for dents.

The exercise to practice this technique is simple. You will need a piece of 2x4 lumber at least four feet long. You will ride toward it at a speed of 20 MPH, in either second or third gear. As you near it, use maximum braking to slow, until just prior to contact; downshifting while braking, to first gear. Then release the brakes, rise up slightly from the saddle, and accelerate slightly. Release the throttle at the moment of contact with the board. Keep your focus up and out throughout the exercise.

EXERCISE LAYOUT



When practicing this exercise, it is important to hit the board at a ninety-degree angle, and at its center. Failure to do so increases the likelihood of it washing out under your front wheel. Also, it may be helpful to first practice the technique using only a painted line, to gauge the appropriate place to begin braking. You want to end up with about 5 MPH of speed left at contact.

This is the one exercise in which I've changed the dimensions from the police course. In that class we use a 4x4 board. However, even with a 2x4 this exercise subjects the motor to some abuse. Therefore, run through this just enough times to acquaint yourself with the technique.

Like so many of the skills you've learned in this course, this method of obstacle negotiation must be practiced so you can be ready to apply it. At the moment it is needed, you won't have time to do more than rely on your practiced skills.

Lesson 8 – COUNTERSTEERING

The concept and proper execution of countersteering seems to cause a lot of confusion and misunderstanding. This is unfortunate, particularly since to take full advantage of a motorcycle's handling capability, countersteering must be used, and used properly.

To properly execute the technique, it's important to understand the concept.

Countersteering is the only efficient way to maneuver a motorcycle at speed. A lot of riders countersteer without knowing it. However, completely understanding it allows you to practice and hone your technique. If you only do it because you've picked it up, it's difficult to sharpen your skills.

You can figure out how countersteering works by thinking about this. Imagine the motor standing still and perfectly balanced, so it is upright. If you then pushed forward on the left handlebar, the motor would topple over on it left side. Of course if you pushed on the right, it would fall to the right. This is because of the "trail" of the front end. The contact point of the tire is behind the point where an imaginary line, through the steering head and front axle, intersects the ground. (The distance from that imaginary point to the contact point is the trail by the way). You can more clearly visualize the physics involved if you sit on your motor and have someone stand, facing you, with the front wheel of your motor held firmly between their legs. Note the alignment of the steering head (a straight line). Push away from you on the left bar, and watch how the steering head moves to the left. Push away on the right bar, and note the opposite effect.

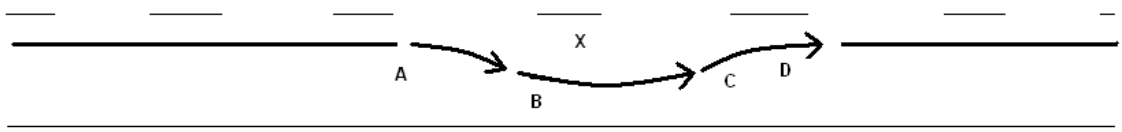
Countersteering is effective only at speeds over about 12 MPH. You learned in the early lessons of this course how to control the motor at lower speeds. Countersteering will be used for all of your maneuvering at speed. It will serve you equally well for position adjustments within your lane, avoiding hazards, and making curves. A common misconception is that a motorcycle is steered, or at least can be steered, by pressure on a rigid frame, or by shifting the rider's weight. While the direction of a motor can be affected by a weight shift, that will not provide the positive control necessary. Further, shifting your weight can cause a lack of the precise control you want to achieve. This is the reason this lesson will teach you to only push the bars away from you. You may have been taught to push down and away. That method tends to cause a weight shift.

As with every other aspect of motor control, your head and eye placement is critical to properly executing countersteering. Since you will be traveling at speed, your focus should be far out in front of you, and scanning along your intended path. It is vital that you not gaze at a fixed spot. That is called "target fixation" and is a frequent factor in accidents. It is common for a rider to lock in on the object that he is trying to avoid, and end up moving directly toward it. This (staring at it) is a natural reaction to danger, so you must develop the ability to overcome it; since the other natural fact you've already learned is the motor will go where you look.

Now that you understand the concept, it is important to understand the practical application. To countersteer the motor, requires nothing more than a positive push on the side of the bar in which you want to go (push left, go left; push right, go right). To return to straight riding you make an equal and opposite positive push on the other bar. While not "jerky" this push should be crisp.

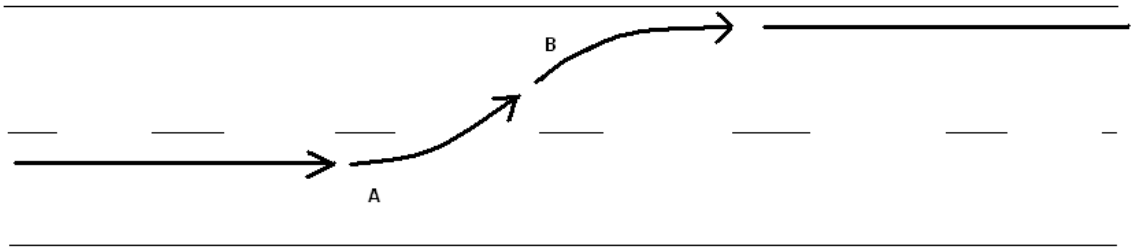
As there are a variety of applications for countersteering, your technique will be tailored to the situation. The three most common uses are obstacle avoidance, changing lane position and making a curve.

Obstacle avoidance, as the name implies, involves merely getting past some object or hazard in your intended path, and returning immediately to that path:



This diagram shows how your path should look, using countersteering to avoid obstacle X. A positive push on the right bar, at point A, redirects the motor. A positive push on the left bar, at point B, brings it back into line with the road, and – by holding it a moment longer – brings the direction back toward the original line. A positive push on the right bar, at point C, directs the motor to the desired line of travel. Finally a positive push on the left bar, at point D, returns the motor to its upright and straight path. You should notice that no move is left to inertia. At each step you take an action to cause the desired result. Throughout this process, you should keep your view far down the road, using peripheral vision to track the obstacle.

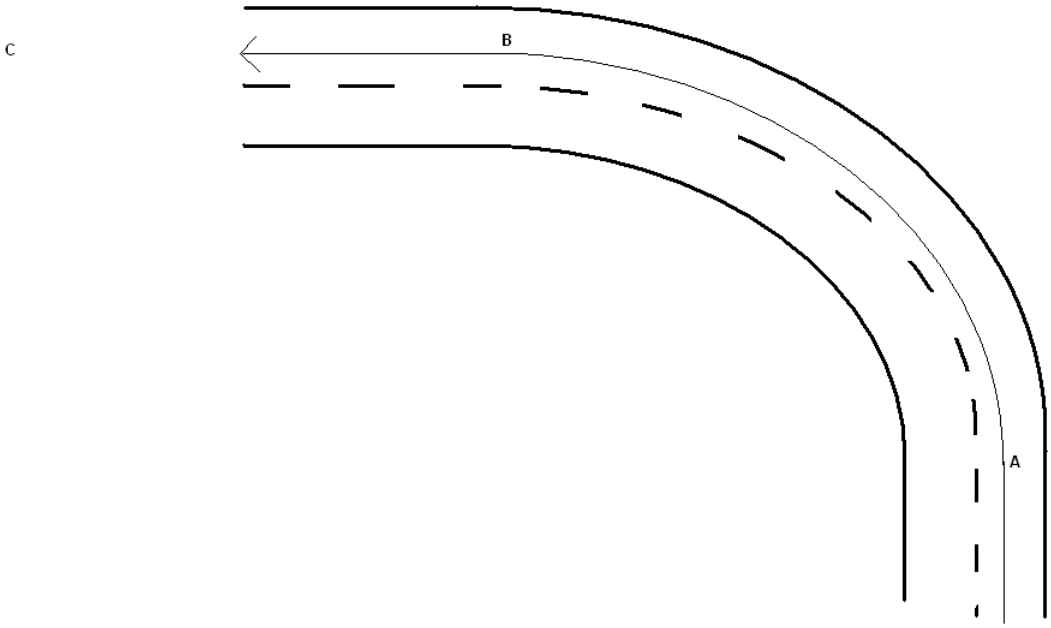
Changing lanes, or lane position, uses a simpler version of the same technique:



A positive push on the left bar, at point A, redirects the motor, and a corresponding positive push on the right bar, at point B, brings it back to the desired line. By keeping focus down the road, this change will be accomplished with exactly two pushes, without any need for further minor correction to line up on the desired course. If, in the course of

your riding, you find yourself often needing to correct your lane position, your focus is likely not out far enough.

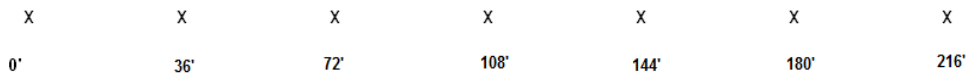
The next lesson will go into detail on techniques for curve negotiation. In this lesson I will only cover the aspect of countersteering. The goal you want to achieve on a curve is to set up properly so that you make one positive push at the beginning of the curve, hold it through the curve, and make one positive push at the end to straighten up. Most curves on roads have a constant radius, which makes this fairly simple, if your focus is where it belongs – beyond the curve.



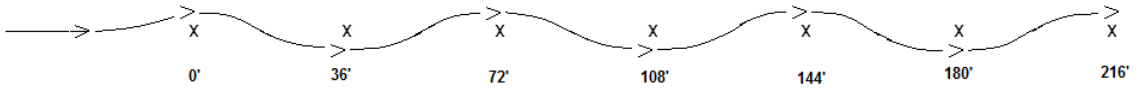
Setting up for the curve, the rider uses point C as a focus, using his peripheral vision to monitor the road, and its surface. At point A, a single, positive push on the left bar sets the lean, which is held – by maintaining force on the bar – through the curve. At point B a positive push on the right bar returns the motor to a straight path.

The exercise for this lesson is deceptively simple. To complete it correctly is difficult. Unfortunately, it is a difficult exercise on which to accurately judge your own performance. It requires that the rider maintain a constant speed. It is very common that riders allow their speed to drop in the exercise, without realizing it. You can only gauge your speed by paying attention to your RPM's, since, if you look at your speedometer, you will not be able to maintain the required concentration. In the motor school, we use radar, and coaching to teach proper speed control. You will not have that luxury.

The exercise requires seven cones in a straight line, with 36 feet between each. You will need sufficient distance prior to the cones to get up to 30 MPH, stabilize your speed, and make an initial positioning adjustment. You must have sufficient distance after the cones to decelerate safely. Of course you need a clean and dry paved surface.



Begin your practice on this course at 20 MPH. Approach the cones and get your speed at a steady 20 MPH. Pay particular attention to the way the engine sounds at that speed. Ride directly at the first cone, until you reach a spot approximately 20 feet from it, then make a positive push to the bar, in the direction you want go, to go past the first cone. If you try to approach the exercise aligned to a position already off to the side, you will not be able to establish the necessary rhythm as easily. Just prior to reaching the first cone, make a positive push to the opposite bar; this will set your direction for the next cone. Continue the "push-push" pattern through the exercise.



You will likely find that, at 20 MPH, this does not seem challenging. However, please take the time at this speed to develop your rhythm and to learn to keep your speed constant throughout the exercise. Once you have done this, move to 25 MPH. At this speed, you may begin to notice that things are more difficult. I have always found it helpful to actually say the word "push" at each point, to help me keep cadence. As happened in the low speed cone weaves, if you find yourself out of position toward the end of the pattern, it is indicative of poor position in the early part. If that happens in this exercise it is most likely you are late on making the pushes to change direction.

Finally, when you are comfortable at 25 MPH, move to 30 MPH. At this point you should be in third gear. In second the engine will slow you too much, making it difficult to maintain speed. If you find yourself scraping the footboards, but otherwise completing the exercise, you are likely trying to use your weight to steer. In other words you are trying to lean, rather than countersteer.

Someone watching you should notice the motor appears to "jump" from cone to cone. However, on the motor, you should feel this to be a very controlled flow through the cones. That being said the direction changes should be quite marked, since your pushes on the bars will be decisive.

Of course you should not use either the front or rear brake during this exercise. If you clip a cone, do not attempt to continue the exercise. Straighten up, and ride alongside the pattern. A cone caught in the front end can affect handling.

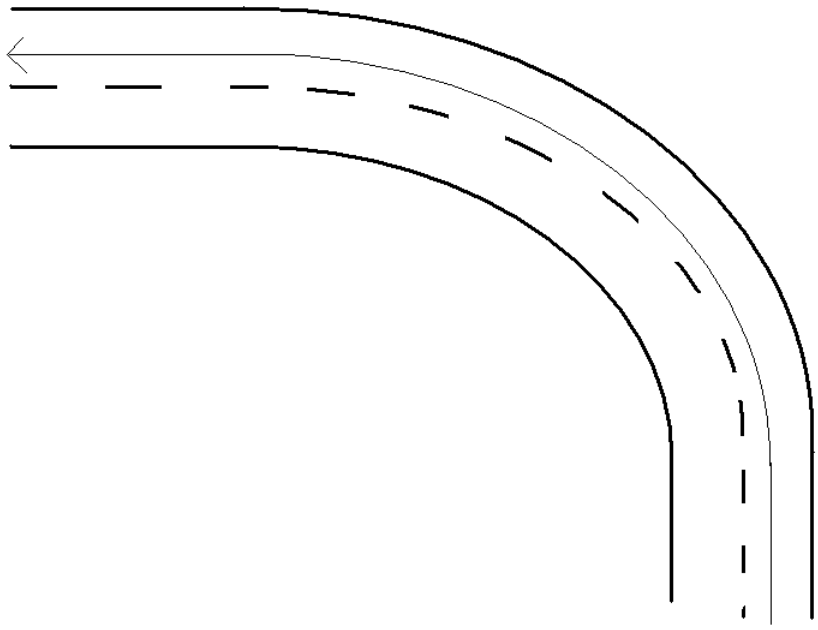
With the completion of this lesson you have the fundamental skills upon which great riders rely: use of the friction zone for low speed control, proper combination braking, and countersteering.

Lesson 9 – CURVE NEGOTIATION

Curve negotiation is often taken for granted. However, like everything else, with practice skills can be improved. Since riding in curves is one of the primary pleasures of motorcycling, it only stands to reason that developing your ability in this area will increase your enjoyment.

This lesson will cover three methods for curve negotiation: the “traffic” line, the “racing” line, and the “late apex” line.

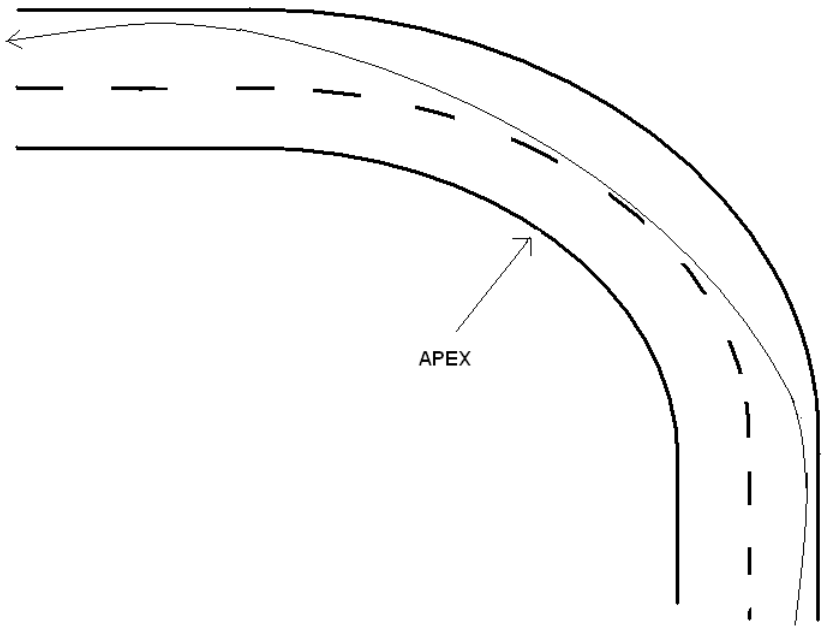
As the name indicates, the traffic line follows the radius of the curve itself. This is the line that works well when traveling sedately along. It is good to practice using this line, since it requires not only that you stay in your lane, but in your portion of the lane. This skill is vital in group riding. Whether riding in pairs, or riding staggered; if you are unable to follow the traffic line, you will encroach on other group members’ paths.



TRAFFIC LINE
Route follows radius of the curve

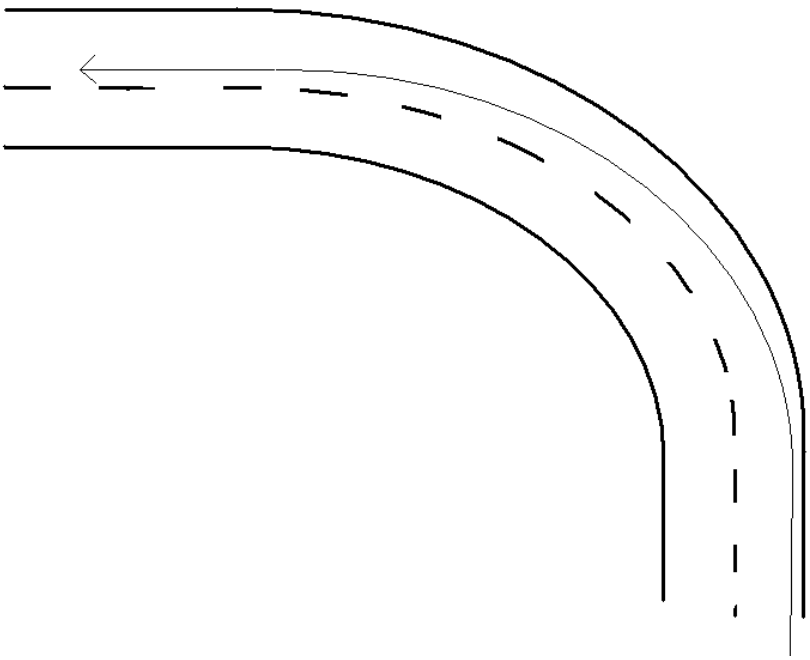
The racing line is the most efficient way to negotiate a curve. It requires that you set up for the turn by moving to the outer portion of your lane, then, as you move through the curve, you cross to the inner portion of the lane, getting as close as you can to the inner edge, while remaining fully in your lane. At the apex (center point) of the curve you then begin moving back toward the outer edge of the curve. This has the effect of increasing the radius, allowing you to take the curve at a higher speed. This method is only safe when you can see your entire path through the curve, and have use of your entire lane.

The racing line requires you set up for the curve by moving to the outer edge of the road. After the curve is complete, you return to your proper lane position from the outer edge of the road.



RACING LINE
Route moves across the curve from the outside to the inside then back to the outside

The late apex method is a useful compromise between the maximum speed of the racing line, and the safety of the traffic line. It allows an alteration of the curve's radius, yet places your motor in a position allowing you room to react to an unforeseen problem. For this reason it is the best option when you are not able to see the entire curve, either because of oncoming traffic, a hill, or any other obstruction. It has the additional advantage, on a curvy road, of leaving you properly set up for the next curve, if that curve takes you back in the opposite direction. In the late apex line, you start at the outer edge of the curve, remain to the outside of the curve past the curve's apex, and then cross to the inside of the curve. By ending up in the inner portion of the curve, if you encounter an obstacle both momentum and your lane position make it easy to avoid it by moving further out.



LATE APEX LINE
The route stays to the outer portion of the curve until after the curve's apex

Regardless of which line you choose, there are some portions of curve negotiation that remain constant. To complete the curve, you must set up for it before you reach it. This means having the correct lane position and speed when you begin the curve. Of course you should complete any braking, to achieve your desired speed, prior to beginning the curve. In the first portion of the curve you should maintain steady throttle. Then, at the curve's apex (not necessarily the apex of your route), apply throttle. This will push you through the curve, and assist in returning your motor to an upright state. The application of power should be distinct and deliberate. You do not have to add a lot of power, unless you are riding to achieve speed. However, the application should be sharp, to gain the handling advantage.

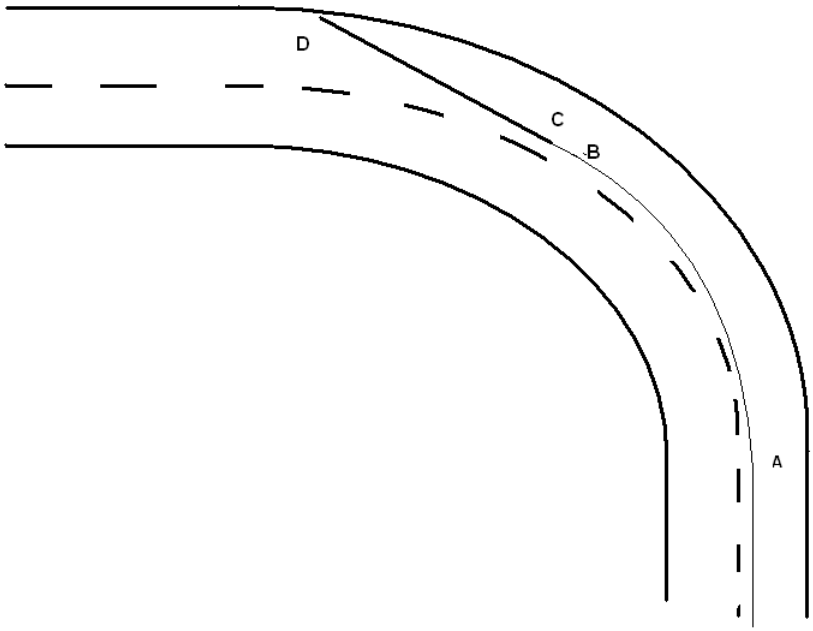
As you learned in Lesson 8, a curve should be negotiated with a single push on the bar, to initiate countersteering. That push should be held until the curve is complete. During the curve, your focus should be completely through the curve, using your peripheral vision to monitor the road for obstacles or hazards.

Although the single push held through the curve is the ideal, the reality is that you may find it necessary to change the amount of lean. This is simple if you apply proper countersteering. If you need to tighten your turn, you merely push more firmly on the bar you are already pushing. If you need to lessen it, push on the opposite bar.

The most common motorcycle accident on curves is a single motor, going off the outside of the curve, without skid or scrape prior to leaving the pavement. What this means is the rider has lost confidence in his ability, and simply not leaned enough to make the curve. The stated cause in a case like this is "excessive speed". However, that is not accurate, since the rider didn't reach, let alone exceed, the motor's handling capability. The point of this is: the first tactic to employ if you feel you cannot negotiate a curve is to increase the pressure on the bar to the side you are turning. This, combined with maintaining your focus will result in an increased lean, allowing you to complete the curve.

You should recall the discussion of the "drag factor" in Lesson 7. It is important here as well. When negotiating a curve, you are using a good percentage of the available friction. This is the reason braking in a curve is so roundly discouraged. If you were using up 70 percent of the available friction to make the curve, a small amount of braking would use up the rest. Of course once it is used up, a skid occurs. To further add to the difficulty, a skid while leaned over for a curve, leaves very little time for correction. However, there are instances when braking in a curve is appropriate. The key is to have practiced the technique. The idea is to use a light feathering of both brakes, which will bleed off the desired amount of speed. That will serve to correct your speed if you have misjudged the curve.

If a hazard presents itself, and you must slow or stop in a curve, it is necessary to get the motor upright, and then apply maximum, combination braking, as you learned in Lesson 6. Clearly this is an emergency procedure. You must practice this technique, to correctly use it when you need to. When you practice this, you will find you likely have plenty of room on the pavement to execute the stop.



STOP IN A CURVE

The curve begins normally at point A. When the need to stop becomes apparent, the curve is abandoned, by pushing on the opposite bar, causing the motor to come upright and straight at point B. Only then is maximum combination braking applied at point C. This results in a safe stop at point D.

There is no exercise with this lesson. However, you must practice the techniques to become proficient. If you cannot find a suitable curve in a lightly traveled area, you can construct a curve with cones. A curve with an inner radius of 75 feet works well at 25 MPH. Practicing the different lines, looking beyond the curve, and proper use of the throttle will greatly increase both your safety and your enjoyment when riding.

This is the last lesson, and the end of this course. It is my sincere hope you've found it useful, and the material will help you ride more safely and enjoy riding more. Please let me know if I can help with specific questions about this material, or other aspects of riding that are not covered in this series of lessons.

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Appendix – Anti-Lock Braking Systems

In 2005, when *Motor Lessons* was written, anti-lock braking systems (ABS) were not yet available on civilian Harley-Davidson® motorcycles, and were quite rare on motorcycles generally. Since then ABS has become widely available, and this trend will doubtless continue. It has become apparent that – although more riders are riding motorcycles with ABS – many do not fully understand how it works, what it can do, and what it cannot.

The first thing to understand is how ABS works. Its sensors determine, through measurement of wheel speed, when a lock-up is incipient. The system then begins modulating the brakes (releasing and re-applying them) at something like 6 or 7 times a second. This keeps something near the maximum braking, while allowing the wheels to keep rolling. There are two reasons a rolling tire is good. The first is the only one that matters for us on a motor – only a rolling tire can keep the motor upright. The second is that a skidding tire takes longer to stop. In a car both reasons are important, since ABS allows both a shorter stop than a skid, and allows the car to be steered.

From the above it should be clear ABS will not make a vehicle stop faster. In fact a perfect rider, under perfect conditions, can stop shorter without activating ABS, than activating it. This is because ABS works by backing away slightly from maximum braking.

The primary braking exercise in police motor school is the Brake and Escape, which involves slowing from 40 MPH in less than 62 feet to a speed that allows maneuvering around a tight obstacle. Prior to ABS being available significant crashes were common in training courses, due to a locked front wheel the student did not handle properly (release immediately and properly re-apply). On top of that most riders weren't using all of the braking power available, for fear of a lock-up. The point here is that these were very well trained riders, with perfect road conditions, reacting to a known hazard. Even then there were problems.

For training purposes, student officers are taught to brake without activating the ABS. If they do activate it, it's not a successful run. We train this way because, as noted above, even an ABS equipped motor will stop shorter if the ABS is not activated.

In the Brake and Escape, if ABS is deliberately activated (through improper application of the brakes) and held throughout the exercise, it becomes very difficult to get the necessary slowing in the distance allowed.

So, what all the above is designed to point out is that ABS isn't the absolute fastest way to stop a motorcycle (or any vehicle).

It is common to hear riders say that a motorcycle without ABS will stop faster. As the above should make clear, the presence or lack of ABS has no effect on the stopping power of the motorcycle. That is solely a factor of the brakes themselves. ABS only changes what happens if too much brake is applied.

Having discussed what ABS is, and how it works, it's now important to bring that knowledge to "real world" applications.

First, it's extremely unlikely that when riders need maximum braking they will have perfect road conditions. Any change in the surface, which lowers the friction on the braking path is likely to cause a wheel lock. A pothole, a manhole cover, a painted line, sand, oil, or anything that is more slippery than the road surface will obviously cause an impending skid to become a locked-wheel skid.

Second, even if the road surface is perfect, are you willing to bet your life (or at least bet injury and property damage) that your braking skills are perfect? The only reason riders on the street should be braking at the threshold of traction would be that an emergency has arisen that they failed to foresee. Skilled operators practice threshold braking over hundreds of repetitions, and yet typically use the skill only a few times on the road in a lifetime of riding.

The technique of front brake application on a motorcycle is critical, and requires practice. The brake must be applied with a "squeeze and progress" technique to yield maximum braking power. During the "squeeze" portion, weight transfer to the front occurs. Only once this has happened, can the lever pull – and consequently the braking force – be increased for maximum stopping power. If the lever is simply "snapped," the weight transfer does not occur. On a non-ABS machine, this results in front wheel lock-up although relatively little braking force has been generated. On an ABS equipped motor, this causes ABS activation far earlier than would be desirable, resulting is excessive braking distance. This factor is often described by the rider as the ABS "causing" the poor braking. In fact the rider caused it by improper brake application. The need for proper braking technique is not lessened by a motorcycle (or any vehicle) being equipped with ABS.

A lot of riders have foregone developing good braking habits and skills, and, instead, simply rely on the ABS routinely. Used properly, ABS should activate rarely. A good rider thinks of ABS like a pilot thinks of an ejection seat. It's critically important, and is there for emergencies. It's not something to be used on every trip.

Having ABS gives a rider the confidence to brake to the maximum. As mentioned above, prior to ABS being available, riders in braking training usually left a little of the motor's braking power on the table for fear of locking a wheel. They were still successful, but not as confident as they could have been. With ABS the concern of locking a wheel is removed, allowing the rider to concentrate on riding the motor. A rider braking to the threshold of traction has plenty to worry about. ABS allows riders to concentrate on the important issues (evaluating the hazard, planning an escape route, downshifting to be in the proper gear should the hazard clear, etc.) rather than simply concerning themselves with the mechanics of getting the maximum out of the brakes.

By now it should be clear the technique of braking is exactly the same whether a motorcycle has ABS or not. The difference comes when the technique has failed. On a non-ABS motor a front wheel lock-up requires an immediate release and proper re-application. That takes time, and time equals distance. It also requires a cool reaction to a hot situation. On an ABS equipped motor, if the ABS activates, it absolutely is an indication the rider has made a braking error. However, with ABS, the response is simply keep pulling the lever, or pressing the pedal. As noted above, it will lengthen the braking distance, but by very little, and by far less than the method needed on a non-ABS motor. This means the rider can sit down later and consider how the braking error occurred, rather than letting the accident reconstructionist do it. (By the way when riders feel ABS activate on the street, they should figure out what they have done wrong in braking, because something can be improved).

Another common complaint, from riders not clear on what ABS is doing, is something like, "I was on a gravel road, and had no brakes at all." If the surface is poor enough, it will feel very much like the brakes have failed, and no stopping power is being applied. However, the reality is that the ABS is doing exactly what it was designed to do – allowing only the amount of braking force that can be used without locking the wheel. The problem is that on loose gravel, that braking force is very low. Riders who blame ABS are failing to consider their lack of proper appraisal of the road surface. Loose gravel, a washboard surface, a wet surface, and other low friction conditions will make for a greatly lengthened braking distance. ABS didn't make the poor surface, and it can't make it better. Riders are responsible for where the motorcycle is being ridden, and consequently where they are trying to brake. A major part of riding skillfully is to consider the possibility that it may be necessary to stop from the speed the rider has chosen to go.

Most people's first experience with ABS is on their cars. A common braking tactic for ABS equipped automobiles is called "stomp and steer." This means the driver activates ABS, and then steers to avoid the obstacle. This works on cars because ABS prevents a locked-wheel skid (a sliding wheel cannot provide steering; only a rolling one can). It is important to understand that "stomp and steer" is not a valid tactic for motorcycles. Regardless of whether a motorcycle has ABS, steering and emergency braking must be separated. If a rider realizes that evasion of the obstacle is the better option, it is important to forego braking before steering.

When a rider gets an ABS equipped motor, it is important take it out to a safe area and do some braking with it. Deliberately over-brake with the front and the rear, to activate the system in each. A rider should know what it feels like, both in the lever/pedal, and how it makes the motorcycle behave. Ideally, this practice should be done both on pavement and on gravel or dirt. The Harley-Davidson® ABS system has a strong "pedal pulse" designed into the system. It is there so that the rider is well aware that an ABS event has occurred, but it can be disconcerting. The DVD that Harley-Davidson® provides with its ABS motors is well worth watching. The DVD explains ABS, and it explains how the Harley-Davidson® ABS works and what the rider will see and feel.

To conclude, ABS has only one function, and that is to prevent locked wheels, and consequently skids. The rider remains responsible for riding at the right speed, and braking well. A skilled rider uses ABS to compensate for lapses in braking technique, not as a braking technique.

The goal when riding a motorcycle equipped with ABS is to never know it's there. Just like all other forms of insurance and other safety equipment. Unlike a helmet, a seat belt, an air bag, or car insurance, the beauty of ABS is it can jump in to prevent an accident, not just lessen the severity, or try to fix things later.