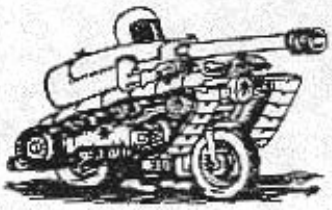
TRAFFIC SURVIVAL
Part VII
Braking



Article and Illustrations by David L. Hough

In January, we offered the pointed suggestion that the name of the survival game for motorcyclists in traffic is "move it or lose it." And we suggested several evasive tactics a motorcyclist can use to avoid getting scrunched by an errant driver. Perhaps the most useful evasive tactic is being able to stop in the minimum distance when faced with an immovable object in our path.

We sometimes call this "panic braking." We've talked about it—now it's time to hone our braking skills.

We've got very good tires and brakes these days, so just about every contemporary motorcycle is capable of making quick stops. But accident statistics point to bad braking habits and techniques. The worst scenario is the rider who—afraid of using the front brake—stands on the rear brake pedal and slides, slides, slides hundreds of feet into a smasho. So, the weakest link in motorcycle braking systems seems to be the nut on the brake lever (If you'll pardon a pun).

Before we get our scooters out for braking exercises, it would be wise to review the dynamics of braking, and then we can have a little heart-to-heart chat about responsibility.

We covered braking dynamics back in the September and October, 1990 issues of *Road Rider*. If you are interested in a little more information about braking, I urge you to dig out those back issues, and review them.

It takes a lot of energy to get several hundred pounds of motorcycle and rider up to speed. And once bike and rider are zipping along, all that mass wants to keep on moving. It takes a lot of energy to overcome that forward inertia and bring all that weight to a stop.

All of the energy required to stop a speeding motorcycle must be transmitted through the tires to the pavement. If we brake so hard that the tires slip, we won't be able to stop as fast as with the tires rotating. Worse yet, when the tires slip we may also lose directional control and balance.

With brakes applied, the tire contact patches are trying to slow the machine down at pavement level, while the inertia of the machine keeps pulling it straight ahead. The result is that the motorcycle is pitched forward over the tire contact patches, and it seems as if the weight of the machine has been "transferred" mostly to the front tire. (Figure I)

Theoretically, a tire can create a braking force equal to the force pushing down on it. So, under hard braking, the front tire gets loaded with almost the entire mass of the machine. Typically, the front brake of a motorcycle supplies more than 70 percent of the total braking force. This "weight transfer" complicates how we must apply the brakes during a quick stop.

Quickest stops require immediate application of both front and rear brakes, then constant adjusting of brake force during the stop. Hard braking is a difficult skill to master, which is why some manufacturers build in "integrated" brake systems, or computer controlled "antiskid" or "antilock" brake systems.

Good News/Bad News: Integrated and automatic systems are marvelous, *but they can't handle all situations.* Even the riders of ABS-machines should practice braking in a variety of situations.

Heart-to-Heart Stuff

Frankly, I'm reluctant to explain how to practice skill exercises, because I've encountered a great many riders who have come up with creative ways to subvert the instructions. If you choose to teach yourself, you'll have to be responsible for the results. If you are even a tiny bit appre-

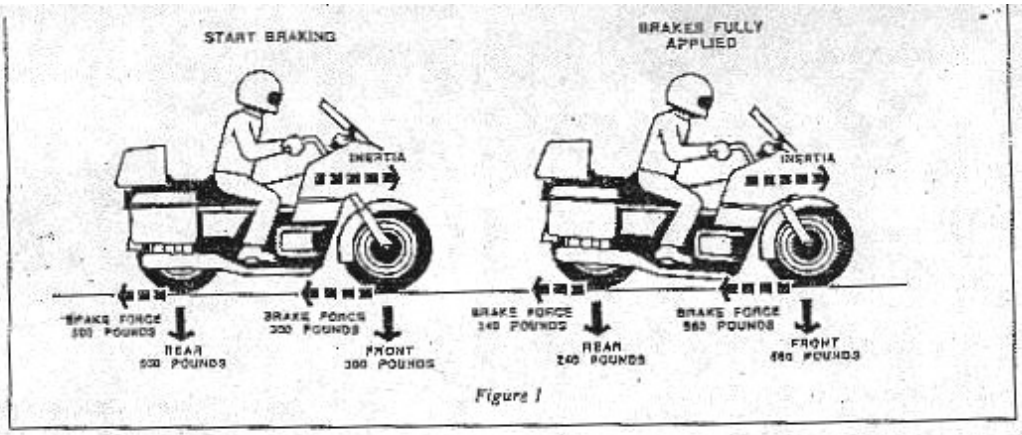


Figure 1

hensive about trying any of these exercises, do us all a favor and sign up for an Experienced RiderCourse where you'll have the benefit of a qualified instructor.

High Sides

It may seem backwards, but the most insidious skids are on the rear tire. If the rear end starts to slide sideways, and the rider releases the rear brake, the bike can snap violently back to center with enough force to throw the rider off. Veteran riders call this "high siding" because the rider is flipped over the side of the machine that a moment ago was on top. Rather than live in fear of high siding, let's practice some rear wheel skids to gain familiarity with the correct skills.

Rear Wheel Skids

It is safe to skid the rear tire so long as the tire is perpendicular to the road surface. The motorcycle must be kept vertical and sliding straight ahead, and the smart rider keeps the tire skidding to a complete stop.

Figure 2 is our basic braking chute. Find a lane of clean, dry pavement away from traffic, and mark it off so you have a reasonable distance to get up to a steady speed, a braking point, and plenty of runout distance at the end. For the first three or four passes, use the rear brake only. Stabilize approach speed at about 18 mph. When you reach the double cones, mash the pedal down as hard as you can to skid the rear tire, and keep it mashed down all the way to the end of the stop. Come to a complete stop with your foot still holding the brake—don't let it lurch forward while you try to hop along on your left boot. Try the rear wheel skid again until you can do it perfectly. If your machine won't let you do rear wheel skids, you won't get full benefit from this exercise.

If the bike tries to slide sideways, it is most likely because you are leaning over slightly, or not headed straight down the chute, or not looking where you want to go. If the rear end *does* start to slide out, the creative side of your brain will try to signal your foot to let up on the pedal. *Don't do it.* Point the front end in the direction of skid, stay on the rear brake, and slide it to a stop.

Both Brakes

Shortest stops require both brakes but no skids. Stabilize approach speed down the chute, about 18 mph at first. As your front axle reaches the double cones, squeeze the clutch and apply both brakes together. Concentrate on maximum front brake pressure just short of a skid. As the "weight transfer" loads the front tire, you can squeeze harder on the front, and ease up on the rear.

If you skid the rear tire, use less pressure on subsequent passes until you can stop without skidding. An impending skid on the front tire makes the front end wiggle around. If you should brake hard enough to skid the front tire, immediately release the lever and use the runout area to regain control.

Integrated Brakes

If your machine has integrated front/rear brakes, you will be able to make reasonably good stops using the foot pedal only, but if you want to make really good stops, you will need to use the front brake lever as well. Be prepared to let up slightly on the lever towards the last few feet of the stop to keep from skidding the front tire.

ABS

If your machine has antilock brakes, this exercise will be easy, because the computer will do all the brake modulation for you. But don't get smug until we have finished all the exercises.

Braking In Curves

Imagine yourself zipping around a blind curve, only to find a lumber truck overturned in your path. You need to stop down as quickly as possible, but the bike is leaned over in the turn and eating up most of the available traction.

Leaving the road isn't a good option, because of that concrete wall on the outside of the shoulder. You've got to brake. Anti-skid brakes won't save you here, because the computer probably won't recognize a sideways skid—it only computes wheel rotation.

There are two techniques for making quick stops in a curve: Brake modestly while continuing around the curve, or get the bike upright and brake hard in a straight line. The Motorcycle Safety Foundation commissioned a study on different braking-in-a-curve techniques, and reports that the quickest stops can be made by getting the bike upright and braking hard in a straight line. This also works best for the anti-skid owners.

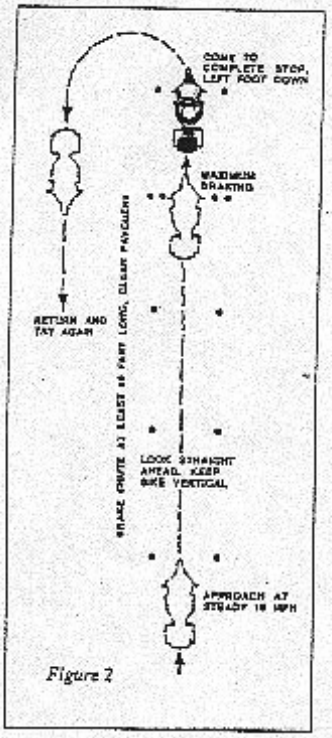


Figure 2

because it eliminates any sideways skid recognition.

Figure 3 depicts an exercise for practicing quick stops from a curve. Mark off a semi-circular lane with about a 25-foot radius. Set out double cones as a point of reference for braking. Approach at a stable speed, and stabilize lean angle as you enter the corner. When you pass the braking point, first get the bike upright, then brake hard in a straight line toward the outside of the lane. Once the machine is upright, braking technique is the same as for a straight-line stop. Try to point the straight line toward the outside shoulder of the lane, not off on an angle toward that concrete wall.

As you gain confidence, move the brake point to different locations, alter the radius of the turn, and then ride in the opposite direction to give your skills a little flexibility.

This same exercise can be used to practice braking while continuing around the curve. The technique is to brake modestly at first on both brakes, then apply harder braking as the machine gets more upright.

Engine Braking

When a hazard appears around the corner, your first reaction is likely to be rolling off the throttle. Remember that engine compression demands traction from the rear wheel the same as rear wheel braking. Suddenly slamming the throttle closed can use up enough traction to break the rear wheel loose, resulting in a slide-out. If the rider then panics and pulls in the clutch, the rear tire can hook up again, and toss the rider off in a classic "high side."

If the machine you are riding has a tendency to slide the rear tire under engine braking, you may wish to get in the habit of squeezing the clutch first and then using only the brakes for deceleration.

We're assuming you are clever enough to have already replaced that bald tire.

Motorcycle Damage

When I was first introduced to exercises such as rear wheel skids, I rebelled. I didn't want to grind flat spots in my expensive tires, and I didn't want to risk dropping my shiny motorcycle. What I discovered is that rear wheel skids at 18 mph won't cause any detectable wear on the tire, and that what lets motorcycles fall down is lack of rider skill. I decided that if I didn't have confidence in practicing skills in a parking lot, I probably shouldn't be out riding the urban streets where the real skill tests occur without warning.

We have separated the swerving exercises from the braking exercises for a good reason. Both swerving and panic braking can use up all of the available traction. If you must brake and swerve in close proximity, separate them. Get off the brakes before initiating a swerve. Get the bike straightened out from a swerve before grabbing the brakes.

Riding a motorcycle is a lot easier if you follow my advice to stay out of cities. If you are going to ride around in traffic, I urge you to practice your control and evasion skills.

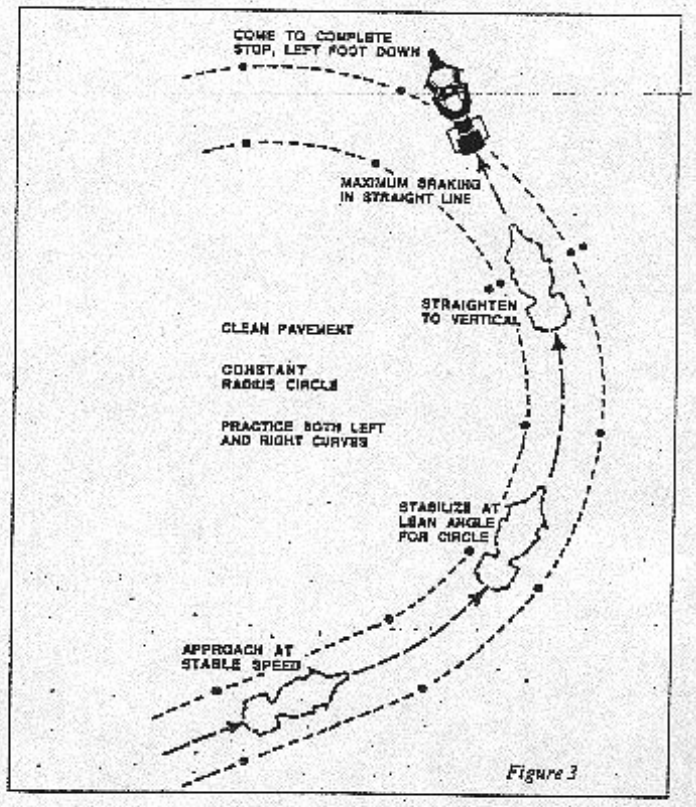


Figure 3

Braking in a Curve

Braking in a curve can be about as tricky as anything else you'll ever try on a motorcycle, and the consequences of doing it badly can be very serious. So, if you've been practicing what I told you in my article on basic, straight-line braking in the May '98 issue of *Rider*, and you think you just about have braking solidly in your bag of tricks, it's time that you step back and take another look. There's more, my friend, there's more.

In the article on straight-line braking, I talk about the technique for getting the most out of your bike's brakes in a straight line. The main point is that you should use both brakes, concentrating on smooth, progressively firm application of the front brake while applying a light, steady pressure on the rear brake. The goal is to achieve as-close-to-perfect (impending-skid) braking on both wheels as is practical, and it's relatively easy to get close to this goal after some practice. Now we come to a situation which is not quite so easy to deal with.

Braking in a turn can be done safely so long as you have plenty of warning and have time for a smooth, controlled brake application. But, as a general rule, it should be avoided whenever possible. You should, instead, plan your turns so that you get your braking done before you enter them. But, sooner or later, you're going to find yourself in a situation where you have no choice, so you need to know how to do it correctly.

The nice part about braking in a straight line is that everything is rather simple. You can pretty much utilize the maximum degree of traction that the friction between the tires and road will give you. I say pretty much because small steering corrections to keep you heading in a straight line do take away from traction, but not significantly in straight-line braking. Recovery from an inadvertent skid is usually successful. However, when a motorcycle is leaned into a turn, a portion of the total available traction is used by the side force producing the turn. This means that less traction is available for braking, that the tires will skid at a lower amount of brake pressure than they would if the bike were going straight. And a skid due to overbraking in a turn frequently results in loss of control and a crash.

But how much traction goes into turning, and how much is left for braking? Unfortunately, there is no simple answer to these questions. It varies depending on the sharpness of the turn and the speed of the bike. At a constant speed, the sharper the turn, the more the bike and rider must be leaned over and the smaller the amount of traction remaining for braking. A few examples may make this relationship a bit more clear. First of all, let's assume we're riding a bike with properly inflated, sport-compound tires on a smooth, level surface of clean, dry concrete or asphalt. In short, let's assume the best of all possible worlds for operating on the street.

If your lean angle is small, say five degrees, then a little less than nine percent of the available traction is used for turning, and you still have nearly all of the remaining 90-plus percent to use for braking. What happens when you increase the lean angle to 15 degrees (still a modest amount of lean)? The amount of traction used for turning jumps to a little less than 30 percent of what is available. At 30 degrees of lean (a respectable lean, but still short of the peg-scraping region on most bikes), you're using almost 60 percent of your traction to turn. And when the lean angle approaches 45 degrees, then virtually *all* of the available traction is being used to stay in the corner, and even the slightest pressure on the brakes will cause a skid (and almost certainly a crash).

Now remember, in each of the above situations, we were assuming a perfect street situation. What if, for example, you're using normal street tires rather than the stickier sport-compound? Or suppose the surface isn't exactly the best (perhaps there are painted lines or it's a bit damp), or the turn is slightly off camber or has some ripples or bumps in it. In short, what if you're riding your motorcycle on real streets and roads? Well, friends, then the total traction available will be significantly less, and the percentages used for turning given above for each lean angle will be correspondingly higher.

So, I hope it is obvious that you need to be very careful about applying the brakes in a turn. However, the same basic principles of straight-line braking still apply: Use both brakes and concentrate on smoothly squeezing the front-brake lever. Initially, you can apply only light pressure. Then, as the bike slows and leans less, you can increase brake pressure proportionately. When the bike is completely upright, then you're back to the full straight-line braking potential.

"OK," you say, "but what happens if I really have to stop *right now* in a turn?" In that case, there's one thing to remember: The sooner you get the bike upright, the sooner you can get it stopped. The best technique for an emergency stop in a curve is to immediately get the bike going straight ahead. You can do this very rapidly by pressing firmly on the outside handgrip. Then, when the bike is upright, square the handlebars and use maximum braking in a straight line.

Using this technique, you will stop in the shortest overall distance and be least likely to fall down. You should use it unless your in-lane position precludes a safe stop straight ahead; that is, if you're already at the outside of the curve and going straight would put you in more trouble than you're already in (like into an oncoming truck or over a cliff). Then there are but two things left to do. Carefully apply the brakes while leaned over or try to go around the problem.

Concerning this latter alternative, it is often better to swerve around the problem that to try to stop. With good skills in both swerving and braking, you can swerve around a car-size obstacle in less distance than it takes to stop at speeds over 15 to 20 mph. But there must be space for you to get by. If there is no place to go and you think a collision is going to take place no matter what you do, then the only sane choice is to try to scrub off as much speed as possible before making contact.

If swerving is a viable option, then there's one note of caution you should remember: Stay off the brakes until you've completed the swerve. If your swerve is to be successful, you'll probably need all the traction your tires and the road can manage. Swerve, then brake, or brake, then swerve. Combining the two will, more often than not, provide the crash you're trying to avoid, and it may make it even worse. □

About the author: J. Lemons is a chief motorcycle safety instructor in Clarksville, Tennessee. He also trains other chief instructors to Motorcycle Safety Foundation standards.