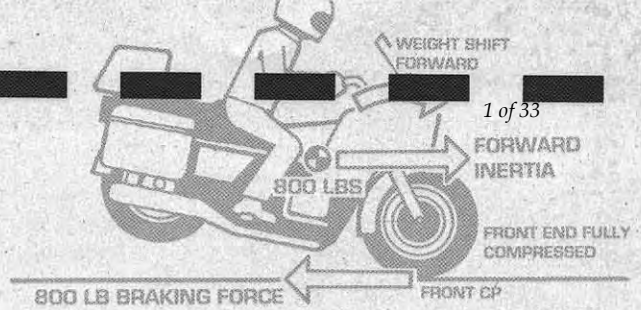

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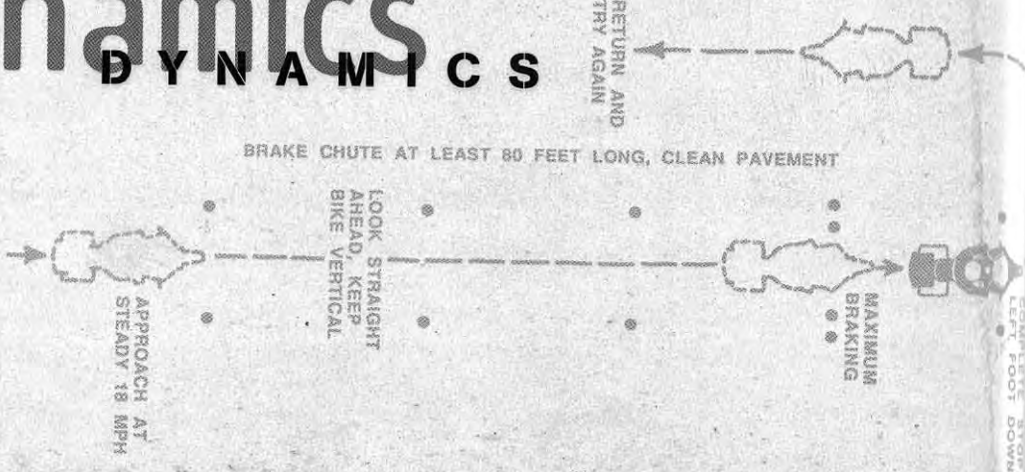

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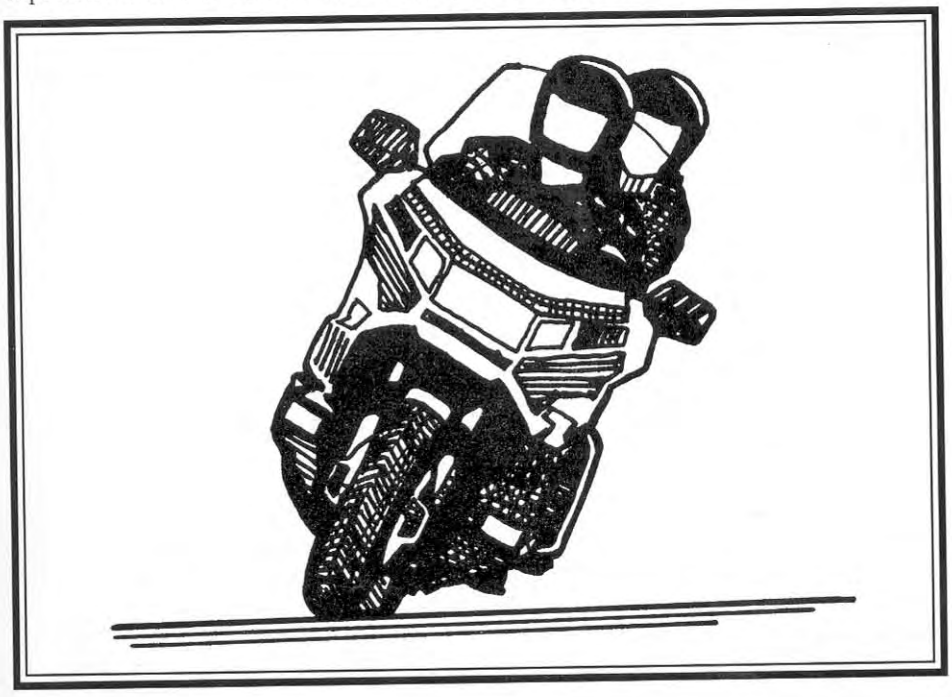
CHAPTER 3
DYNAMICS

Getting on the Gas

Interstate Al is motoring cross-country on his big touring machine. Al isn't one of those peg-scraping zoomie bikers who terrorize the canyons. He prefers to ease down the road in the center lane with the motorcycle vertical and the engine idling along in fifth gear. At such a modest pace he can smell the flowers, listen to the tape deck, and allow his mind to wander. Today his thoughts drift toward a question. *Why do some riders get so embroiled in meaningless details of cornering?* he ponders. Al has read about such concepts as delayed apex cornering lines and rolling on the throttle in turns, but frankly he thinks such stuff just isn't related to his riding style. Besides, his big touring bike is better suited to the superslabs where he doesn't have to worry about sharp turns.



It's time for a coffee break, and Al decides to take the next exit. But traffic in the right lane has suddenly closed up bumper-to-bumper, and he must somehow jockey through to get to the exit lane. Al doesn't like to dodge between cars. He breathes a sigh of relief when a space opens up in front of an old pickup truck. He

signals, rolls on the throttle to rocket the bike forward, pulls in ahead of the truck with room to spare, and banks off onto the exit ramp, a little fast, but under control for the curve he can see.

Al rolls off the gas as he leans into the off-ramp, but he is surprised when the ramp doesn't curve around in a nice constant circle as he had assumed it would. About halfway around, it suddenly tightens up into a decreasing radius. Al had been pointing the bike toward the inside of the curve, and suddenly he's headed for the outside. Al tries to heave the machine over but can't seem to get the bike to turn as quickly as the pavement, and his scraping footboards limit how far he can lean. With the machine drifting toward the outside curb, his survival reactions take over—he snaps the throttle closed and stomps down on the brake pedal.

In a flash, the rear tire breaks loose, and the bike goes down. The centerstand hangs up on the curb just enough to flip the machine into the concrete divider, and Al is mercifully high-sided into the bushes. Al is only bruised but will later discover that the bent metal and shattered plastic will add up to a total loss of his big road burner.

Consider this: If Al had trusted his tires and just pushed harder on the right grip to lean the machine over to its cornering limits, could he have made the turn without sliding out? If Al had entered the turn more from the outside, and pointed the bike more in the right direction, would he have had a better chance of turning it tighter as the road tightened up? And if Al had not jammed on the brakes while leaned over, would the bike have continued around the curve without sliding out?

Hopefully, Al will realize that his crash has answered his own questions. Serious motorcyclists get "embroiled in the meaningless details of cornering" because the world is full of strange corners, including superslab exit ramps. Good cornering habits are just as important for the touring rider as they are for those who seek out twisty roads for their sportbikes.

Let's consider how throttle control relates to cornering. We usually think of the throttle only as a speed control, but how and when we twist the throttle has a lot to do with traction, stability, ground clearance, and suspension. Conservative riders such as Al may feel that techniques such as rolling on the throttle in corners is something that belongs only on the racetrack, but good throttle control is all about managing traction, and conserving traction is just as important on the road as on the racetrack.

Changing Direction

Inertia makes a moving motorcycle "want" to continue straight ahead. To make the motorcycle change direction, we must force the front end into a curving path, overpowering centrifugal force with tire traction pushing against the road surface. By leaning the motorcycle, we balance gravity and centrifugal force with the position of the front tire.

So, front tire traction is used for both pushing the machine into the curve and for balancing. Rear tire traction resists centrifugal force and also transfers engine thrust to the road. Both tires also can use up traction for braking, but let's keep the situation simple by staying off the brakes for the moment.

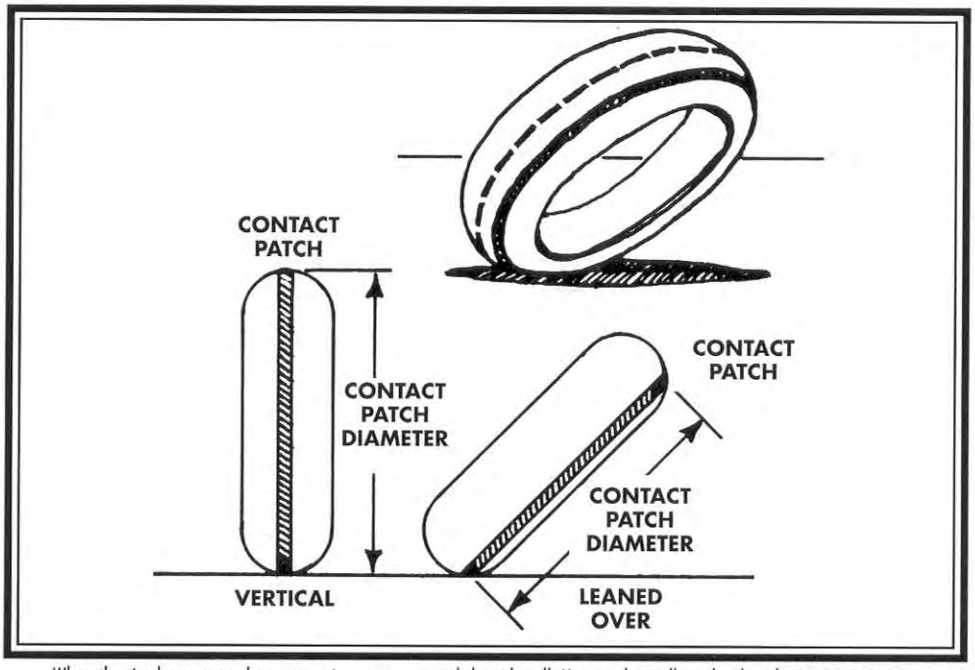
Weight Transfer

Think about this: Acceleration and deceleration shift weight. Rolling on the gas shifts weight to the rear. Roll on enough throttle, and you can lift the front wheel off the surface. Rolling off the gas shifts weight forward. And remember that weight on a tire affects available traction.

An unladen motorcycle at rest typically has 50 percent of its weight distributed on each of its tires. And since traction is related to the load on a tire, it might seem that coasting through corners would be ideal, balancing traction equally between the tires. But that isn't ideal for several reasons. First, the rear wheel needs to keep pushing the bike around the corner and overpowering centrifugal force, so we really could use more traction on the rear, say a 60:40 weight balance. Second, just rolling off the throttle isn't coasting—engine compression adds drag on the rear tire, which uses up traction. Keep in mind that it's nearly impossible to match engine speed exactly to bike speed. Even if you squeezed the clutch and coasted, at some point you'd need to get back on the power, with a resulting wobble and possible slideout as traction transferred front to rear. To achieve a wobble-free turn, maintain that ideal 60:40 weight balance and conserve traction. The technique is to be on the throttle when the bike is leaned over.

Roll It On

The ideal throttle technique is to ease on the gas as you lean over and gradually roll on a little more throttle all the way through the turn. *Oh, right*, you may be thinking. *Speed up and run off the road?* Well, let's think about that. Rolling on the throttle does make the engine speed up, but does that always make the bike accelerate? Remember that the contact ring of a tire moves toward the sidewall as the bike is leaned over. When leaned over, the contact ring is smaller in diameter. What this means is that if you aren't rolling on a little throttle as you lean the bike, you're using engine compression to brake the rear wheel, and that uses up rear wheel traction.

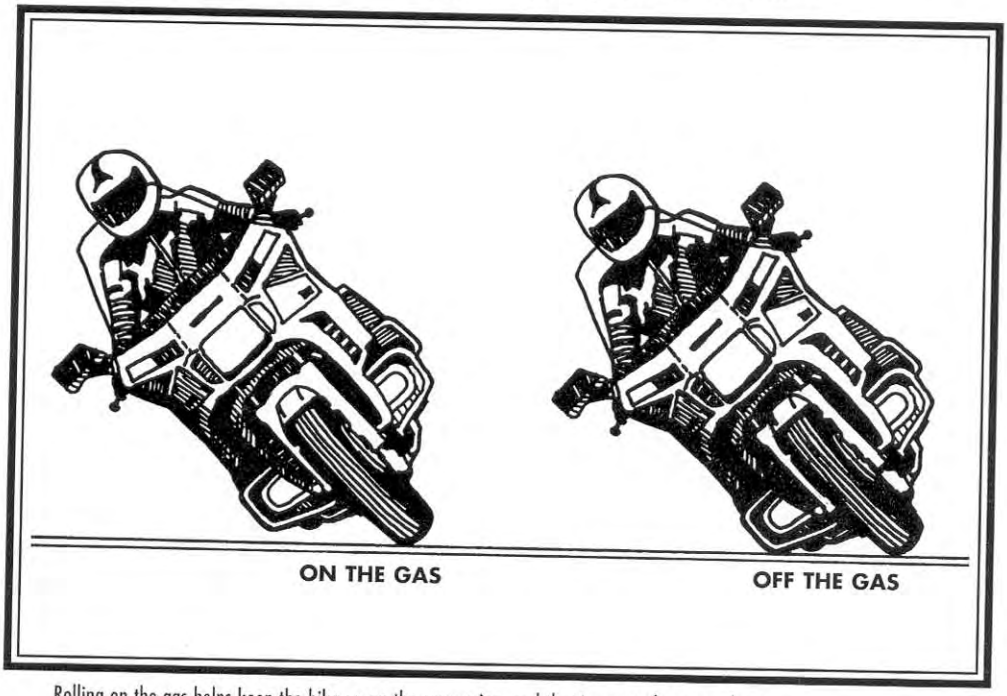


When the tire leans over, the contact ring moves toward the sidewall. You need to roll on the throttle just to maintain the same speed.

And Roll It On Some More

Rolling on a bit more throttle while leaned over happens to do some other helpful things. The added thrust from the rear tire, which helps maintain a desirable balance of traction between the tires, also keeps the front end up on its suspension.

On most shaft-drive machines, and many chain-drive bikes, the torque reaction of power to the rear wheel causes the rear end of the bike to rise. The results are that staying on the throttle while leaned over helps lift the bike up on its suspension at both ends, which increases ground clearance. And more ground clearance means a tighter turn is possible without levering the bike off the tires. Getting around a surprise decreasing-radius turn may require leaning over to the limits.



Rolling on the gas helps keep the bike up on the suspension, and that improves leanover clearance.

Since weight affects available traction on a tire, a weight shift toward the front reduces traction on the rear tire. When carrying a touring load or a passenger, there is plenty of weight and therefore traction on the rear. But when riding solo, any weight shift to the front takes away traction from the rear tire—traction that may be needed to push the bike around a turn. That's why it is important to avoid suddenly rolling off the gas or jamming on the rear brake while leaned over. Al had already rolled off the gas, so his bike had less leanover clearance. He didn't recognize the need to follow a delayed-apex line, so he wasn't prepared for the decreasing radius turn. And braking withdrew more traction than he had in the bank. This combination of bad habits sealed his fate.

Bumps and Dips

Suspension is also affected by throttle control. And how the suspension works is more than just a comfort consideration. Suspension allows the tires to maintain contact with the pavement when rolling over bumps and dips. If the suspension is bottomed out, it can't absorb a bump and will jolt that end of the machine upward. For example, when the front end is down on the stops under heavy braking, it can't absorb a bump. A bump can jolt the whole front end off the ground and cause the tire to skip. If the suspension is already topped out, the wheel can't extend any further down into a dip, and that tire will momentarily lose traction with the surface. Best traction—and smoothest ride—is with the motorcycle floating somewhere near the middle of its suspension travel.

What does throttle control have to do with suspension? Consider what happens to suspension when we twist the throttle. When we roll off the throttle, both ends of the bike drop, putting shock travel closer to being bottomed out. When we roll on the throttle, both ends of the bike rise, and if we roll on hard enough, the suspension can actually top out. In a curve, the suspension is compressed by the pull of gravity and centrifugal force. Get the point? Easing on the gas while leaned over into a turn helps keep the shocks in the middle of their range, assisting the tires in maintaining traction even when bouncing over bumps and dips. So, the ideal throttle technique while cornering is to smoothly and gradually roll on the throttle through the turn.

Roll It On Through the Curve

When approaching a curve, we need to decelerate. Of course that makes the front end heavy and reduces ground clearance, but that's okay in a straight line. The trick is to decelerate in a straight line toward the ideal point where you can simultaneously lean the bike, ease on the throttle, and be able to continue easing on the gas all the way through the rest of the curve.

Now, obviously, we can all think of situations in which rolling on the gas would be stupid. We wouldn't be gassing it during a steep downhill left-hander with a stop sign at the bottom, for example. But easing on the throttle in a curve is one of the keys to better cornering control. It's the best technique for conserving traction, whether you corner leisurely or swiftly. And it's a skill that we can practice while riding.

Next time you're out on your favorite motorcycle, practice rolling on the throttle as you lean into a turn. When approaching an intersection where you intend to turn, lightly apply both brakes while in a straight line, then get off the brakes, look through the turn, and roll on a little throttle as you lean over. If you have to shut off the throttle before you're all the way through the turn, it means you didn't slow enough before leaning. And don't forget to enter turns from the outside. That is, for a right turn, enter from the left side of your lane, unless surface hazards take precedence.

Getting more proficient with the throttle control is more than a way to ride faster. Developing good throttle habits is one of the ways we can expand our safety envelope. And good habits are the key to survival when we are suddenly faced with an unexpected hazard. Ask Interstate Al. He's a lot more interested in those "meaningless" details of cornering these days. He's thinking about better cornering lines and learning to roll on the throttle while leaned over. And he's a little more cautious—on his new bike—about bolting on highway boards that decrease the leanover clearance.

Delayed Apexing

Let's face it. Riding the superslab cross-country is pretty much a no-brainer. Fill the tank, crank up the wick, keep it between the lines, and try to stay out of truck convoys. It's on the twisty roads where we separate proficient riders from those who merely own a motorcycle. If riding the superslab can be compared to line dancing at the local tavern, cornering on a twisty back road is like Gene Kelly dancing in the rain: exactly the right speed for the action, powerful leaps forward at precisely the right time, dramatic lean angles, perfect balance, and an obvious enjoyment of the whole thing.

Road Racing vs. Road Riding

When we talk about cornering, the image that typically comes to mind is of a leather-clad road racer, knee puck scraping the tarmac, race bike leaned over to an unbelievable angle, fat tires drifting at the absolute limit of traction, with the rear end stepping out nervously and the front end twitching. Of course, the goal of racing is to beat the other guys around the circuit.

Risk Acceptance

You'll encounter a lot of other motorcyclists charging ahead aggressively on public roads, seriously captured by a road race mentality, always measuring their worth in terms of who passed and who got passed. Odds are 10 to 1 the road is clear, with no sleepy drivers wandering across the centerline, and no fresh boulders lying on the road halfway around a blind turn. Of course, on every sunny Sunday on twisty roads across America, a few of those daring riders with a higher risk acceptance lose the gamble. Blind corners are one reason aggressive riders don't make it to the biker café. Nine out of ten times you can ride faster than your sight distance and show those other riders your taillight. But when you do round a blind corner at a speed too fast to stop within your sight distance and then discover a hazard in the road, you may not make it to the café at all.

The point is that each of us has a different level of awareness about potentially hazardous situations and a different risk acceptance. There are a growing number of motorcyclists who measure their self worth in terms of their own skill and their personal enjoyment of the ride, not someone else's. As one grows older, it gets easier to understand why riding on public roads must have a very different focus from riding on a racetrack. We're out to have a good time, which includes not only arriving home with body and motorcycle parts unscathed but also enjoying the scenery and taking some satisfaction from having the motorcycle well under control. It isn't necessary to push the limits to have fun. There's tremendous enjoyment in riding a motorcycle at the right speed for the situation, getting the motorcycle in the groove, and knowing you have more performance in the bank should you need it or choose to use it.

Pleasure and Risk

For openers, I think you'll enjoy motorcycling more if you master a few important cornering skills. It can be tremendously satisfying to have your motorcycle completely under your control, knowing how it performs, and being able to make it do what you want it to do. But beyond the enjoyment, there is the matter of risk. Ask yourself this: Even if you ride at the same speed on the same road, will certain cornering tactics increase or reduce risk? Consider some risk concepts that relate to cornering lines:

- **The largest radius of turn demands the least traction for a given speed and therefore keeps more traction in reserve for dealing with unknown hazards such as loose gravel or wild animals.**
- **The risk of riding into unseen hazards is reduced by following a line that enters blind curves at positions that provide the best view ahead.**
- **The risk of collision is reduced by following a line that achieves maximum separation from other traffic at critical locations.**
- **The risk of falling on surface hazards is reduced by making the sharpest part of the turn on pavement already within the rider's view.**

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It should be pretty clear that cornering lines have a lot to do with the relative risks, whether your riding style is to putt along serenely or blitz the countryside at full chat.

Smarter Cornering Lines

One big hazard for aggressive motorcyclists is trying to adapt road racing lines to public roads. On the racetrack, riders don't have to be concerned about opposing traffic or deer leaping out of the trees or farm tractors chuffing onto the road. Racers can concentrate on the track, memorizing each corner and noting reference points for braking. Tire rubber on the pavement scribes an obvious motorcycle line. There may be distance markers to help adjust speed for upcoming corners. And racers know that they will be warned if hazards occur.

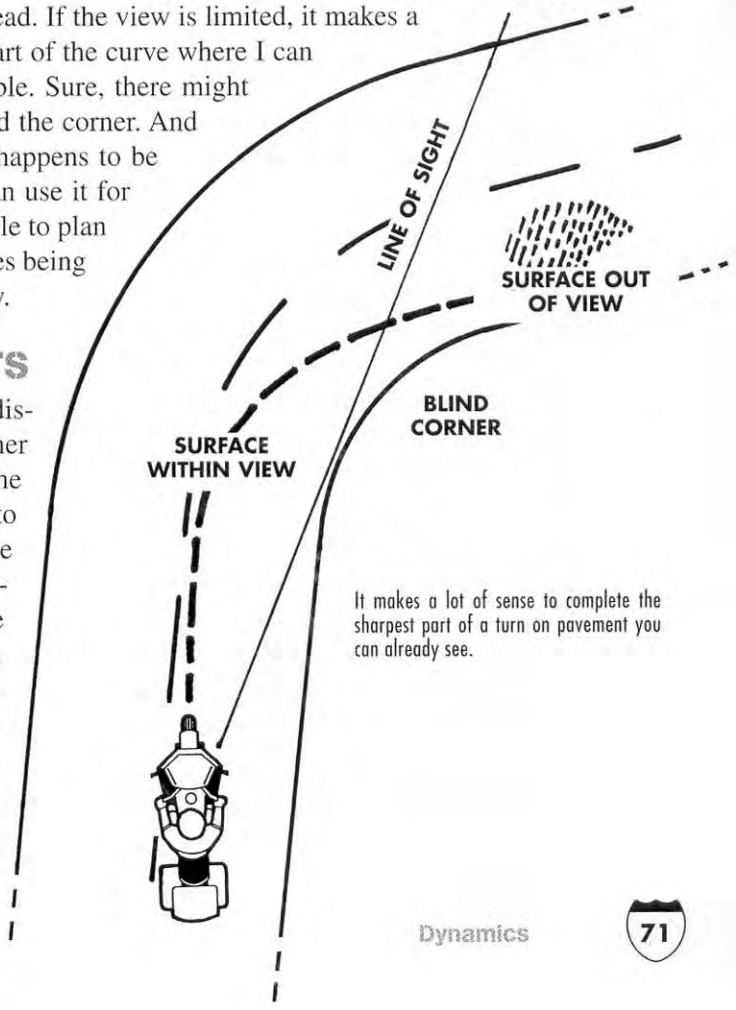
If you watch road racing on television, you'll get a lot of views from above, and you'll notice that generally the racing lines curve as smoothly as possible from apex to apex, like a springy board bent around posts at the inside of each turn. Racing lines maximize both traction and speed. But for public roads, we must give priority to the unknown. On a strange road, we have no idea of the curve ahead, or what hazard we might encounter just around the turn. So our cornering lines must be suitable for all manner of strange uphill, downhill, off-camber corners, and also give us the best chance to avoid unannounced hazards as they pop into view.

The View Ahead

Whether or not I can keep my two-wheeler upright often depends upon the condition of the road surface. I would prefer not to discover that the smooth, dry pavement I'm riding on happens to be submerged in fresh diesel oil or cow poop halfway around the blind turn ahead. If the view is limited, it makes a lot of sense to plan the tightest part of the curve where I can see that the pavement is acceptable. Sure, there might be even better traction just around the corner. And if the surface around the corner happens to be smooth, clean, and tractable, I can use it for accelerating. But it's a poor gamble to plan on the condition of unseen surfaces being better than what's already in view.

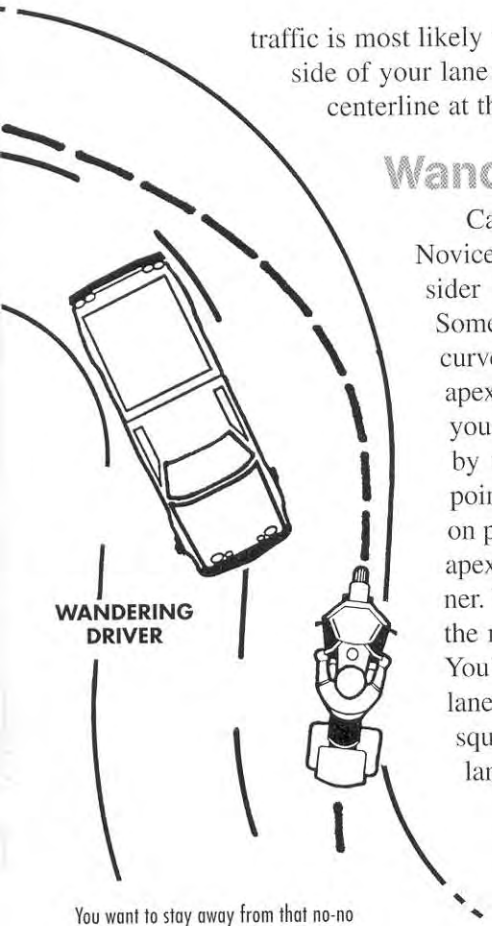
Wandering Drivers

When a car or truck driver discovers way too late that the corner is a little tighter than it seemed, the other vehicle ends up drifting onto the shoulder or over the centerline with tires squealing. The motorcyclist happening along in the opposite direction is at risk of a collision. A good tactic for avoiding such wandering drivers is to follow a cornering line that moves away from the centerline at the locations where opposing



It makes a lot of sense to complete the sharpest part of a turn on pavement you can already see.

traffic is most likely to drift over the line. It isn't necessary to hug the right side of your lane all the time, but it is important to stay away from the centerline at the critical locations—about halfway around the turn.

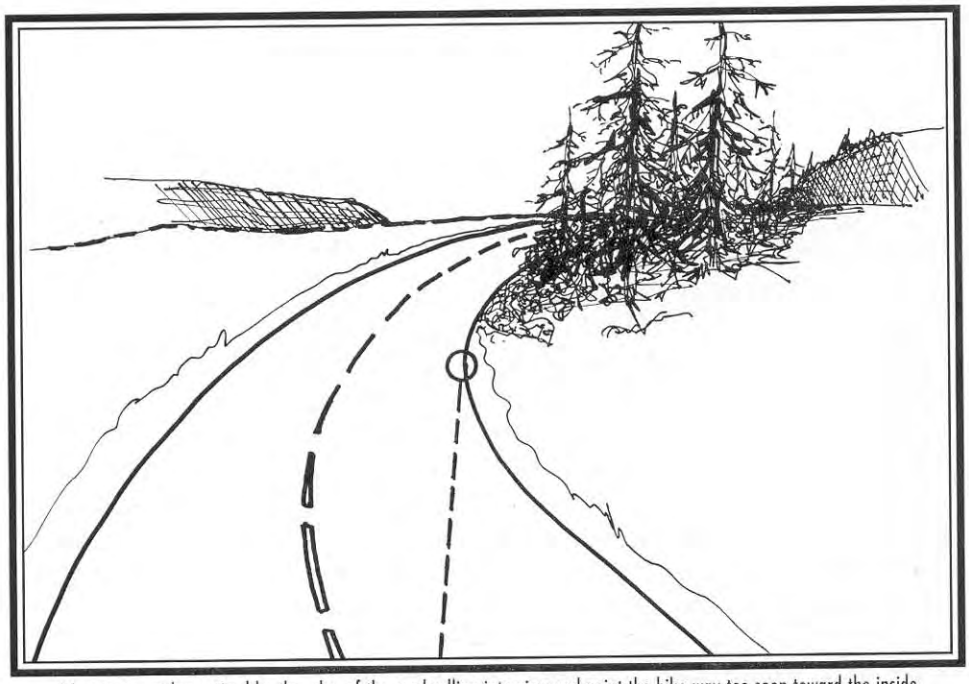


You want to stay away from that no-no area, where oncoming drivers tend to go wide across the line.

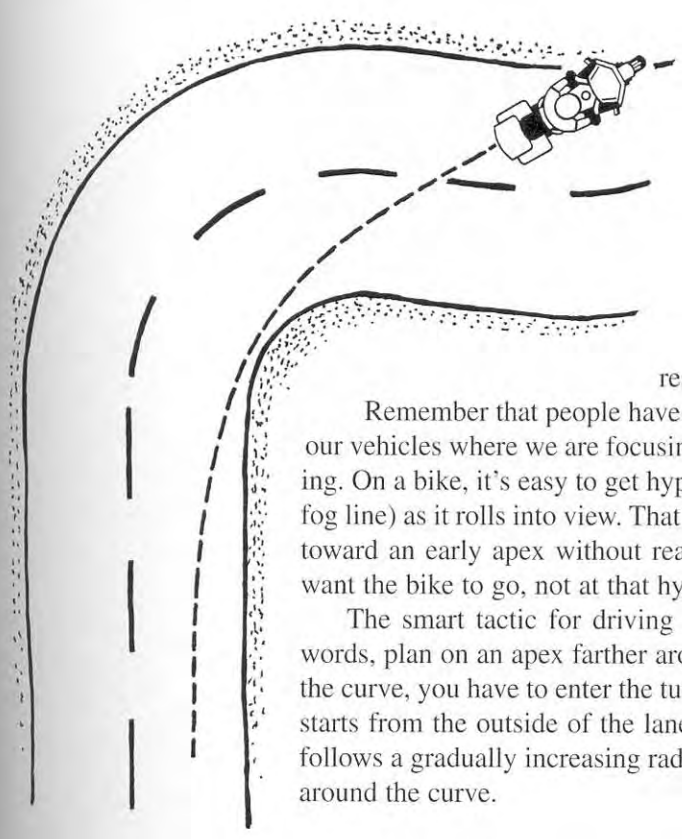
Wandering Riders

Car drivers aren't the only ones who drift out of their lane. Novice motorcyclists also tend to drift wide in turns. Let's consider how this happens. Visualize a corner coming up. Somewhere along the inside edge is the tightest part of the curve, the apex. It seems to make sense to point toward the apex, following a line similar to road racers. And whether you think about it or not, it's awfully easy to get hypnotized by the inside edge of the pavement rolling into view and point the bike toward the inside way too soon. The problem on public roads is that when a bike is aimed toward an early apex, it is likely to drift wide about halfway around the corner. When you suddenly realize you're running out of road in the middle of a corner, there aren't many options available. You'll either have to risk an excursion into the oncoming lane and gamble that no one is coming around the corner, or squander all available traction swerving back into the right lane and risk a slideout.

A lot of riders who might describe themselves as fast or good assume that frequent excursions across the centerline or onto the shoulder are just a part of aggressive riding, but the embarrassing truth is that drifting wide is a symptom of poor cornering tactics. And drifting wide isn't just a sportbiker



It's easy to get hypnotized by the edge of the road rolling into view and point the bike way too soon toward the inside.



If you apex too early, the bike doesn't get headed around the corner; and once the bike runs wide, you don't have a lot of options to get back to where you belong.

phenomenon. A lot of touring riders drift wide in turns, even at much slower speeds. Drifting wide isn't so much a matter of excessive speed as it is a result of allowing the bike to get pointed in the wrong direction at the wrong time.

If we look at a typical corner from an eagle-eye view, we can see what the problem is. Pointing too soon toward the inside of the curve, the apex points the bike too wide for the rest of the turn.

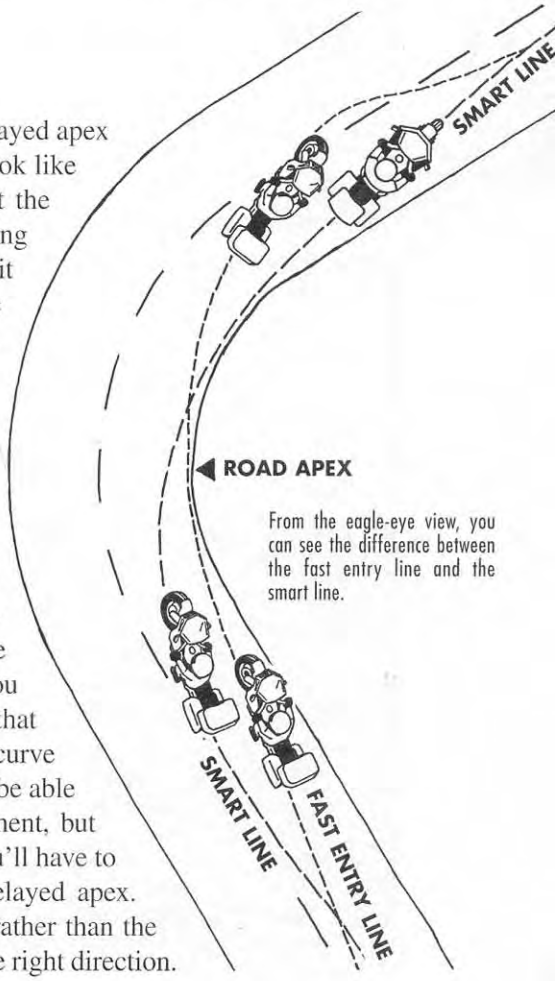
Remember that people have a target fixation characteristic. We tend to point our vehicles where we are focusing, even if that's not where we think we're steering. On a bike, it's easy to get hypnotized by the inside edge of the pavement (the fog line) as it rolls into view. That's one reason novice riders tend to point the bike toward an early apex without realizing it. It's important to focus on where you want the bike to go, not at that hypnotizing edge.

The smart tactic for driving on public roads is to delay the apex. In other words, plan on an apex farther around the curve. To reach an apex farther around the curve, you have to enter the turn more from the outside. The delayed apex line starts from the outside of the lane, turns tightest as the bike is leaned over, then follows a gradually increasing radius of turn, apexing about two-thirds of the way around the curve.

Delayed Apexing

Okay. Let's assume you want to follow a delayed apex line. How do you decide what the line should look like down at motorcycle level, and how do you get the bike to follow it? One big difficulty with following a delayed apex line is that we can't visualize it from the eagle-eye view. On public roads, we're never quite sure how tight the next turn is, which way it is cambered, if it goes uphill or down, or whether there's loose gravel just beyond. It's especially tricky because we're trying to figure it all out from a vantage point of four feet off the pavement with the world rushing toward us at warp speed.

One way to imagine a delayed apex line is to mentally slide the apex a little farther around the corner than you can see. In other words, as the corner rolls into view, decide about where you think the apex should be and then mentally push that apex farther around the corner. In a blind curve obscured by trees or rocks, you may not actually be able to see where that delayed apex is on the pavement, but that's not important. What is important is that you'll have to enter the turn wider to reach your imagined delayed apex. With your attention focused on a delayed apex rather than the fog line, you're more likely to point the bike in the right direction.



From the eagle-eye view, you can see the difference between the fast entry line and the smart line.

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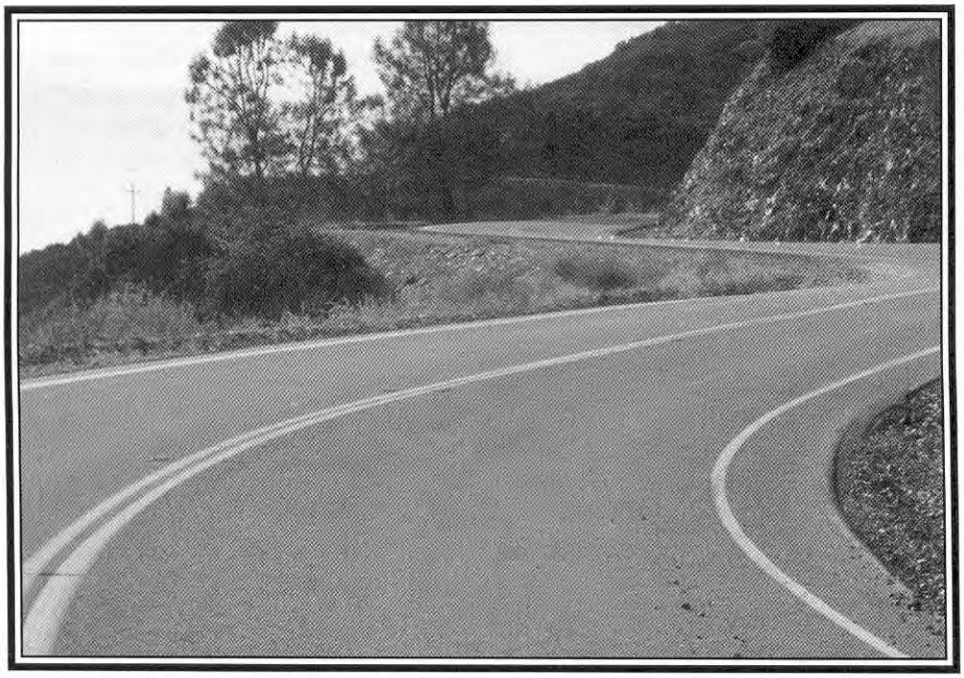
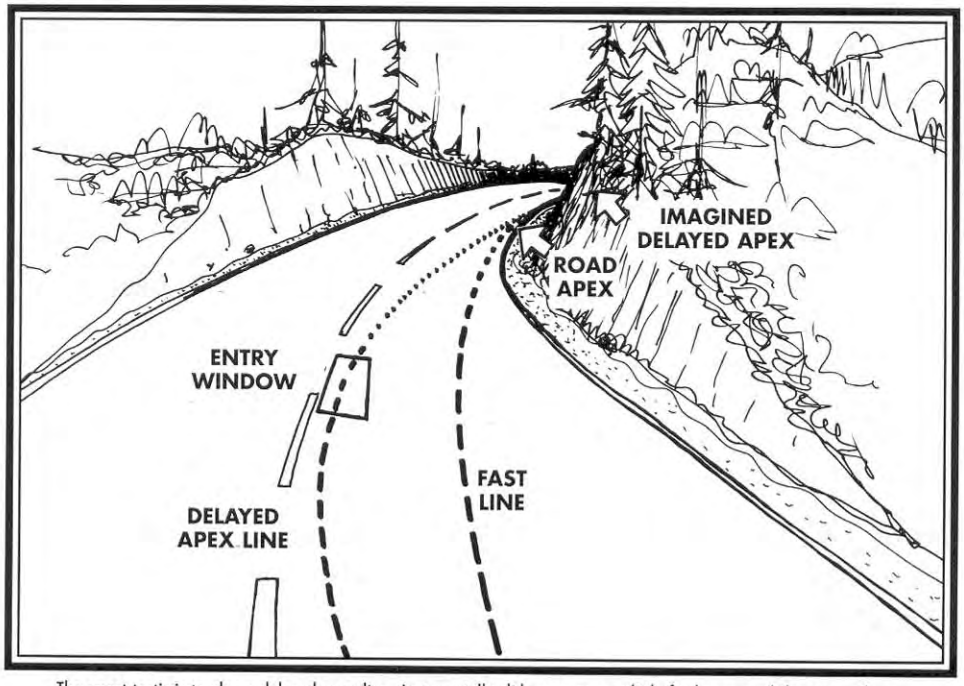


In a series of turns, you must plan the next turn while you're leaning over into the current one. If you can't get your cranial computer up to bike speed, then slow the bike down to your processing capacity.

Critical Windows

Many riders also find it helpful to imagine locations, or windows, on the pavement through which the bike must pass. For example, when approaching a right-hander, you might imagine an entry window way over toward the centerline. The entry window is the point where you actually start to lean the bike, roll on the gas, and get the machine stabilized in a smooth arc toward that delayed



The smart tactic is to plan a delayed apex line. Just mentally slide your apex a little farther around the corner than where you think the road apex is.

apex. Of course, if the entry window is where you actually lean the bike, you should also imagine the other steps that precede that. Critical windows include *getting off the brakes (Slow), looking as far through the corner as possible (Look), leaning the bike over to make it turn (Lean), and easing on the throttle as you lean over (Roll).* Try to imagine where these windows are as you approach a corner, and then visualize a continuous ribbon passing through them all.

One important reminder: *Slow* is where you get *off* the brakes, not where you roll off the gas and start squeezing the lever. Remember, the point of being off the brakes before we initiate any serious leaning is so that we're not using traction for braking when we need it for forcing the bike around the corner.

Cranial Computer Speed

On a twisty road where one turn leads into the next, it's important to keep your cranial computer working as fast as your speedometer. Once you've plotted the critical windows in the approaching corner, start scanning ahead toward the next turn and deciding where the next windows should be long before you get there. The sooner you select your line ahead, the smoother your riding can be.

If you don't think far enough ahead, you'll be making quick panic corrections as you suddenly awake to where the line should have gone. And quick corrections gobble traction. If you can't get your cranial computer up to bike speed, the other option is to slow the bike down to your processing capacity.

Homework

All right—it's time for practice. Get those tires pumped up to correct pressures, make sure your brakes are functional, and zip on your most durable crash padding. Find a really twisty road and practice following the delayed apex line. Don't concern yourself with throwing your body weight around just yet. Maintain a modest pace and concentrate on the techniques. Consciously countersteer to follow a smooth, continuous line through the windows. Push on the right grip to lean more right; push on the left grip to lean more left. Focus first on entering turns way out toward the edge of your lane and finding that delayed apex line. Then practice easing on the gas as you lean over. Next, concentrate on braking and getting off the brakes before you need to lean, and turning your head to look where you want the bike to go. In a series of turns, start thinking about the best line for the next corner while still passing through the windows of the current one.

Problems

You find yourself drifting wide in mid-turn: Either you didn't enter wide enough, didn't achieve correct entry speed, or you aren't pushing hard enough on the low grip to lean the machine over.

You find yourself making sudden steering corrections in mid-corner: Even as you round a curve, you should be looking toward the next turn, not down at the pavement rolling under your front wheel. Try to achieve one smooth steering input per corner. You'll have to trust us here: the bike will get to that next window where you are focusing your attention.

The bike wobbles when you try to get on the gas while leaned over: Roll on the gas as you lean over, not halfway around the turn. If you find yourself braking deep into the corner, you didn't initiate braking early enough, or you didn't achieve a slow enough entry speed.

You can't seem to get the bike to follow a consistent line: Consciously keep your eyes up and point your chin in the direction you want to go. Try keeping your eyes level with the horizon. Don't rush the corners. Concentrate on the critical windows.

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Enjoy the Ride

As you master accurate countersteering, smart cornering lines, and proper timing of the critical windows, you'll probably discover that you can corner much more swiftly than before yet still keep your risks within your tolerance level. The big payoff is that smarter cornering tactics give you a greater margin for handling whatever surprises you may encounter, whether you choose to dawdle along or engage warp drive.

The Lowdown on the Slowdown

All right. You've figured out basic cornering tactics, including accurate control of lean angles, positioning for the best view, planning smarter cornering lines, looking where you want to go, and rolling on a little throttle as you lean over. What else is there to know? Well, let's back up to that basic "slow" part of cornering, and take a closer look at hard braking.

Up on that twisty mountain road, hard braking is important. Yes, a lot of experienced riders think it's clever to ride a steady pace that doesn't require any braking, even when zipping along twisty roads. The idea is that smooth is good, and quick

speed changes are the opposite of smooth. But we also know that those back roads contain hazards such as farm tractors, wild deer, loose gravel, and mud-lubricated corners. You don't usually get much advance warning of such hazards, so you may have to do some hard braking at the last moment to avoid a disaster.

And that twisty mountain road eventually comes to a town. As you come off the hill and find yourself slogging through urban traffic, your biggest challenge may be avoiding a left-turning motorist, or a car dodging out of an alley. So, whether you ride conservatively or closer to the edge, hard braking should be a habit. Rather than thinking of smooth riding as never using the brakes, think of smooth riding as being able to brake right up to the limits of traction without upsetting the bike or getting excited.

Laying It Down

Back in the good old days, a lot of people got killed in motorcar and motorcycle accidents exacerbated by weak brakes. Lawrence (of Arabia) didn't die falling off a camel; he died crashing his Brough Superior into a stone wall as an alternative to plowing into some children who popped into view on the narrow English road. In the U.S., the standard quick-stop technique for yesteryear's motor officers was to throw the black and white on its side and hope it would grind to a stop on the axle nuts and crashbars. Many police academies still teach the technique of laying it down, even though officers may be riding machines with sticky rubber and ABS brakes, which can stop a lot quicker on the rubber than on chrome. Frankly, I've always considered laying it down to be a crash.

Smokin' the Tires

Have you ever heard a fellow rider describe a panic stop during which the tires were sliding? For example, here's Zoomie Zed explaining a near collision: *I'm cruising along minding my own business when this chickie babe in a Cherokee zooms out of an alley. I stand on the brake real quick. I'm braking so hard the rear tire is smokin' right to a stop. My engine stalls just as my front wheel ends up about two inches from her front door. You shoulda seen the stupid look on her face!*

Good news, bad news, Zed. The good news is that you didn't score another accident in your file, and you didn't drop the bike. The bad news is that your braking technique needs work. First, the front brake is the one that stops the bike. If you didn't already have your fingers curled around the front brake lever approaching that alley, you wasted maybe a second and 60 feet just reaching for the lever. You should know that cars pulling out of alleys account for almost 20 percent of motorcycle fatalities, so you should have been prepared to make a quick stop when you saw the car nosing out. And jamming on the rear brake too quickly caused the tire to skid, which tossed away another 5 feet of stopping distance, and could have resulted in a high-side flip. One more thing Zed: it helps to squeeze the clutch during a quick stop, so you can concentrate on the brakes and keep the engine from locking up the rear wheel.

Forward Energy

Let's think about how to make quick, painless, maximum-effort stops. A speeding motorcycle "wants" to keep speeding along pointed straight ahead, even if we roll off the gas. It gets a little complex trying to describe the forces in proper physics terms, so let's ask the physics experts to look the other way for a moment. Now imagine the machine's forward energy as a big invisible tow cable pulling on a center of mass, or center of gravity (CG), of the bike, rider, and load. The higher the

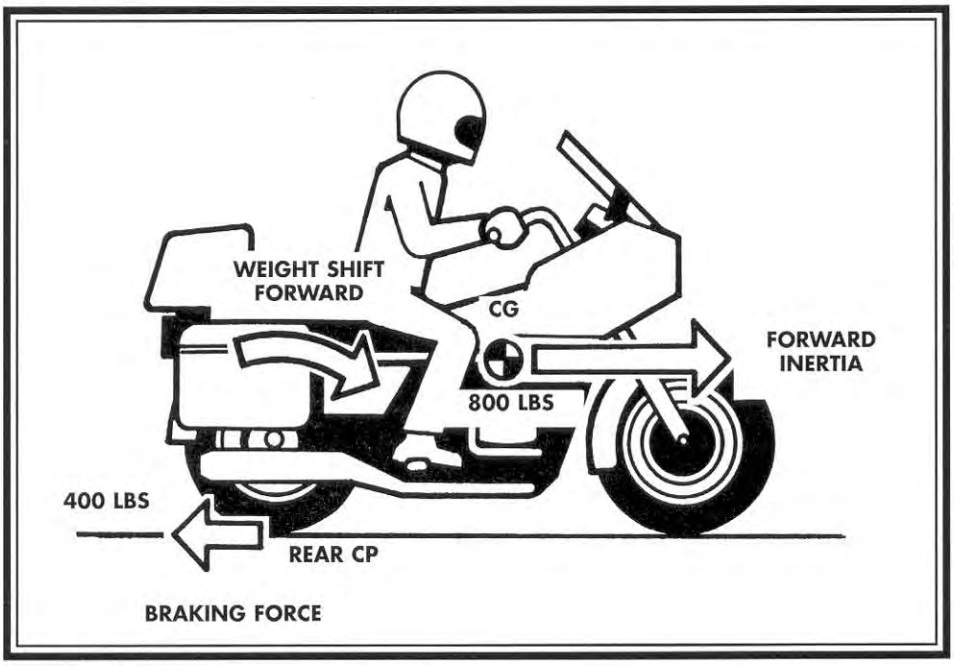
speed, the greater the forward energy. To slow down a motorcycle or bring it to a stop, we've got to overpower its forward energy.

Of course the bike will slow down if we just roll off the throttle. Wind resistance, rolling friction, and engine compression braking all help overcome its forward energy. But if we need to slow down more quickly, we've got to use the brakes.

Braking Forces

You may have noticed that rear wheel braking can make a lot of smoke and noise but doesn't slow the machine as much as the front brake. That's because the maximum braking force you can apply to a wheel depends upon traction, and traction is limited by the weight on the tire as well as the stickiness of the tire and roughness of the road surface. Braking the wheel to a stop doesn't necessarily stop the bike.

Theoretically, if one half of the total weight of the motorcycle, including rider and load, is carried on the rear tire, the maximum braking force you can get out of the rear tire is one-half the weight of the machine. So, if the total weight is 800 pounds, the maximum rear wheel braking force would be 400 pounds.

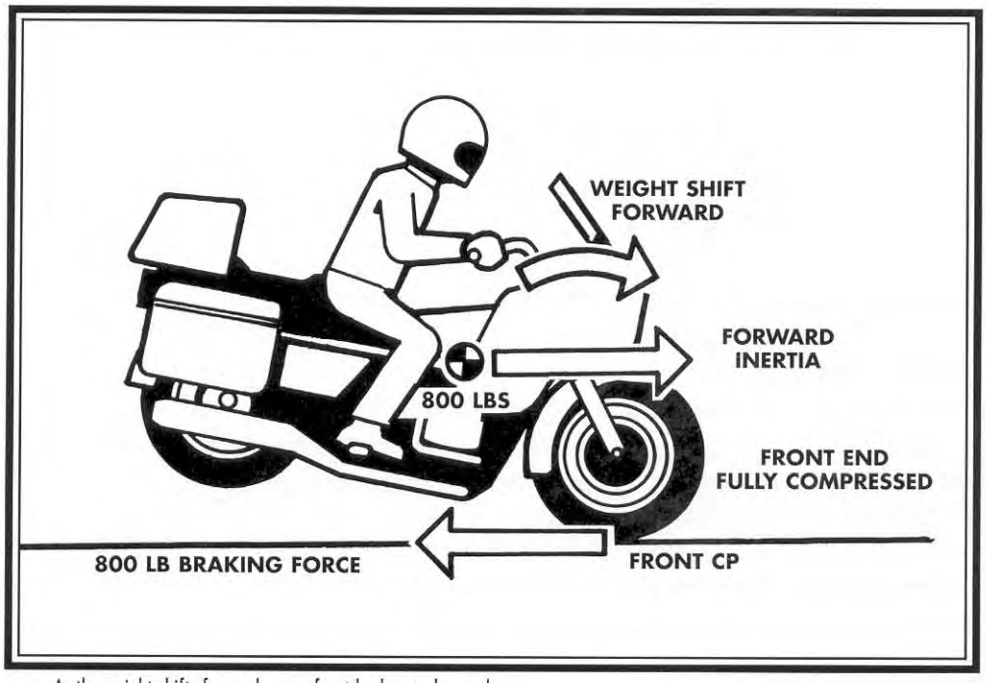


Braking force is proportional to the weight on the tire.

Front Wheel Braking

Now, consider that whether it is engine compression or brake friction trying to overcome forward energy, the braking force is applied way down at the tire contact patches, while the CG is much higher on the machine. The result is that the motorcycle pitches forward. This feels to the rider as if the weight had suddenly been shifted forward onto the front wheel.

Remember, the available braking force is determined by the load on the tire. As the machine pitches forward, there is more weight transfer onto the front wheel, so more traction becomes available on the front, and more front brake force can then be applied. Assuming tractable pavement and sticky rubber, it is relatively easy to brake hard enough on a light bike to do a front wheel stoppie with 100 percent of braking force on the front and the rear wheel in the air.



As the weight shifts forward, more front brake can be used.

Theoretically, maximum braking force on a tire is limited to the force of gravity pulling down on the wheel. An 800-pound bike should be able to generate 800 pounds of front wheel braking force, given smooth pavement with a perfect coefficient of friction of 100 percent (1.0). A motorcycle with good brakes should be able to make a maximum effort stop from 60 mph in something like 140 feet.

But if you check the stopping distances in the bike reviews such as those in *Motorcycle Consumer News*, you'll find 60–0 mph braking distances as short as 108 feet. Do motorcycles defy the laws of physics? No, it's just that in real life, the pavement isn't perfectly smooth. Obviously, an extremely smooth surface such as a shiny steel plate will never have traction greater than 1.0. But the little stones in the surface of typical concrete or asphalt pavement act somewhat like the teeth in a cog belt drive, boosting available traction well above that theoretical 1.0.

Endos

Some riders are cautious about braking hard on the front for fear the motorcycle will flip over the front wheel. That wasn't much of a problem in the good old days of harder rubber, but with today's sticky tires on short-wheelbase bikes, it's now the limiting factor. However, most of us could brake a lot harder on the front than we do, even in the rain. Our greatest concern with hard front braking should be smooth, progressive squeezing of the lever to keep the tire from sliding during the time it takes for the bike to pitch forward. It takes about one second for that weight transfer to occur.

High Siding

While many riders are paranoid about sliding the front tire, the greatest danger from overbraking is not on the front, but on the rear. The danger is flipping yourself into a painful high side if the bike slides sideways during a quick stop. If the rider overbrakes on the rear, and the rear end starts sliding out to one side, the unfortunate survival reaction is often to let up on the pedal to reduce the skid, but when the

tire spins up, it snaps the rear end back toward center so violently it can flip the bike over the high side.

High-side flips are simple to avoid. Just stay in the habit of using more front brake than rear brake all the time. Lightweight sportbikes are particularly susceptible to rear wheel skids because the weight bias is often more on the front wheel, yet the rear brake is typically a powerful hydraulic disc. When the rear brake is applied on a light sportbike with just a solo rider, it is easy to skid the tire. If you realize that your lightweight sportbike tends to slide the rear tire even with just a light dab on the pedal, ignore the rear brake and use just the front brake.

Directional Control

To keep the bike pointed straight ahead with the rubber side down, we don't want to use all of the available traction for braking. We need to squander a bit of tire traction to keep the rear end straight, and some of that front tire traction to keep the machine balanced. We maintain directional control by modulating, or adjusting, brake lever pressure to keep either tire from sliding at any point in the stop. That's the technique to strive for, whether your machine has integrated brakes, ABS, or linked brake systems. The best antiskid system, though, is still mounted between a rider's ears.

Modulating

During a quick stop, it's important to adjust pressure on the levers to apply maximum braking just short of a skid. It takes about 1 second for a motorcycle to pitch forward as the brakes are applied. During that 1st second, it is important to squeeze progressively harder until the weight transfer allows maximum front wheel braking.

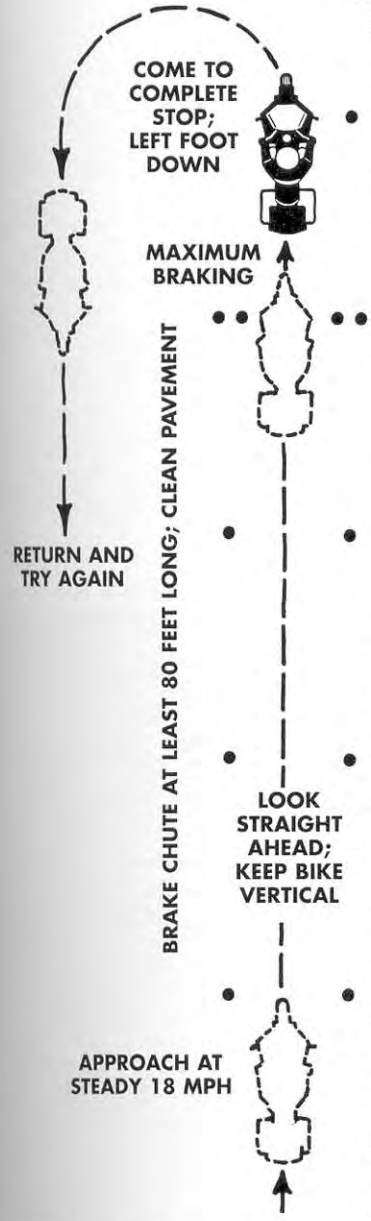
You can practice that right now. Make a pretend brake lever with the thumb and index finger of your left hand. Now, squeeze the lever while counting out loud *one-thousand-and-one*. If you are full on the brake before you're through counting, that's too fast.

Toward the end of the stop, as forward energy dissipates, it's necessary to ease up on the brake slightly. If the tires cross a slippery spot such as a plastic arrow or an oil slick, it's important to ease off the brakes momentarily as the tires cross the bad surface. In the rain, or if carrying a passenger, more rear brake can be applied because there will be comparatively more weight on the rear wheel.

The Ideal Quick Stop

Let's put all of the details together now and describe an ideal quick stop. You've been enjoying a twisty back road and arrive at a small town. The locals are hurrying around to the various stores and seem to be more focused on getting their shopping done than watching for motorcycles. Entering town, you check to be sure you aren't being tailgated, cover the front brake lever, and watch for pedestrians who might dart across the street and other vehicles that might swerve across your path. Approaching a busy shopping center on your right, you observe a farm truck in the opposite lane that could turn left. You shift down a gear, squeeze lightly on the front brake to reduce speed and prepare for a possible quick stop, and scrutinize the front end of the farm truck for clues the driver is beginning to turn. The hood of the truck dips slightly as the preoccupied driver decides to turn into the shopping center without looking ahead for other vehicles. Then you see the front tire turn in your direction as the truck begins a left turn across your path. You squeeze the clutch and apply both brakes simultaneously, pressing lightly on the

rear brake pedal, but squeezing progressively harder on the front lever as weight transfers onto the front wheel. The left-turner suddenly wakes up to the potential collision and jams on the brakes, stopping the truck halfway across your lane. Concentrating on a quick stop, you maintain maximum braking on the front just short of a skid, and shift to first gear just before you bring the motorcycle to a stop with your right foot still on the rear brake and your left foot on the ground. You glance briefly in the mirror to be sure you're not about to be rear-ended, signal the driver to go ahead, then ease out the clutch and continue on your way. You've taken charge to turn a potential nasty accident into a minor inconvenience.



For braking practice, find some clean, level pavement you can borrow for a while. Start your runs at 18 mph and increase approach speed as you gain confidence.

Quick Stop Practice

Quick stops require skill and experience with the machine you are riding. That's especially important if you are riding a different bike from your usual mount. The only way to build braking skills is to practice the right techniques until they become habits.

I'm not talking just quick slowdowns from 80 to 60 here, I'm talking quick stops from road speed to zero, with no smoking tires, no fall downs, and no high sides. If you intend to ride fast on public roads, you should be as good at hard braking and quick stops as you are at cornering lines and rolling on the gas. Riders of ABS equipped machines are not excused from the drill.

Find a long, smooth, tractable piece of pavement you can borrow for an hour or so. An abandoned section of road will do if it's reasonably clean and dry. Perhaps you have a nearby parking lot that is vacant early in the morning. It helps to set up some cones or markers to define a braking chute, but all you really need is a long strip of clean level pavement. One little caveat: Before you try any skill practice on your bike, do us both a favor and climb into your best crash costume. If you do it all right, we're happy, too. But if you don't get it right, we're not going to be there to point out bad habits or help you pick up the pieces.

Get the machine stabilized at about 18 to 20 mph in second gear. Trust me here, don't try your first run any faster. Maintain speed right up to the braking point. Keep your head up and look forward to where you intend to stop. Avoid glancing down at the instruments or levers. When your front tire passes the braking point, squeeze the clutch, roll off the throttle, and simultaneously apply both brakes, progressively squeezing harder on the front as you count out *one-thousand-and-one*. Stop as quickly as you can without skidding either tire. Toward the end of the stop, shift into first gear. Come to a complete stop with your right foot on the brake pedal and your left foot supporting the machine. The habit of shifting to first prepares you for a quick getaway in case you need to avoid a rear-end collision. Return to the end of the chute and repeat the exercise. See if you can better your previous distance without skidding. As you gain confidence in your front tire traction, bump your approach speed up another 2 mph on each subsequent pass.

Skids

An impending front tire skid makes the front end feel rubbery. If the front tire does start to skid, immediately release the lever to regain traction (and balance). Be aware that as speed increases the rear tire is more likely to skid due to the increasing

inertial forces. If you should accidentally skid the rear tire, my best advice is to stand on it and slide to a complete stop to avoid the possibility of a high-side flip, then make a point of using less rear brake next time. If you can't seem to avoid skidding the rear tire, rest your right foot on the passenger peg and try stopping with the front brake only. A machine with a longer wheelbase has less tendency to lift the rear wheel.

When practicing hard braking, it's helpful to have another rider watching your technique. If you have a buddy to practice with, one rider can signal the other when to stop, to add some spontaneity to the drill.

If you're a little fearful about practicing maximum-effort stops right at the limits of traction, take a rider training course. You'll get practice in straight-line stops, braking in curves, and combinations of swerving and braking, all under the watchful eye of a certified instructor.

Whether you practice on your own or during a training course, the most important part of the drill is to stay in the habit of front wheel braking for all stops, and using the brakes as part of your cornering sequence. Your habits determine what you will do in an emergency.

Taking the Panic out of Panic Stops

Roger Rider is out for a spin in the country. It's a beautiful day, the weather is comfortably warm, and the bike is running sweetly. The road twists and turns

predictably, dipping down into tree-shaded hollows, and climbing back up to snake between the farms and meadows. It's too nice a day to hurry, but Roger isn't loafing, either, because it just feels right to roll on the gas exiting the corners and accelerate through the flickering shadows and sunlight.

But Roger's fun is about to end for the day. Just as he crests a hill, he is startled by a brown object rising up from the roadside ditch and pivoting in his direction. Roger instantly recognizes the two big ears of a mule deer, and hopes it will just freeze there as he rides on by. Without thinking about it, his right hand rolls off the gas, and his left hand nudges the bike over to a course farther away from the deer.

But the deer doesn't just freeze. As Roger gets within 30 feet, the deer suddenly springs to action, bounding onto the road and clattering along in graceful leaps. The deer tries to zigzag away from the motorcycle, and Roger tries to swerve around the deer, but they both guess wrong. Too late, Roger makes a panic grab for the front brake lever. The front wheel slides out, deer and motorcycle careen off each other, and both sprawl onto the pavement. Fortunately, neither rider nor deer is seriously injured, and both manage to stagger back onto their feet after a few seconds. The deer limps off into the trees. Roger limps over to look at his bike, now a mess of broken plastic and bent metal.

Whether it's a deer alongside the road, a stalled hay truck in a blind corner, or a left-turning car at an intersection, a quick stop is often the best tactic for avoiding a collision. Sometimes we call a maximum-effort quick stop a panic stop, because the situation calls for immediate action. Of course, *panic* means sudden, unreasoning terror, and certainly Roger reacted in panic when the deer jumped in front of him. But what Roger really needed was deliberate, reasoned, and correct evasive action. Let's see what we can do to take the *panic* out of panic stops.

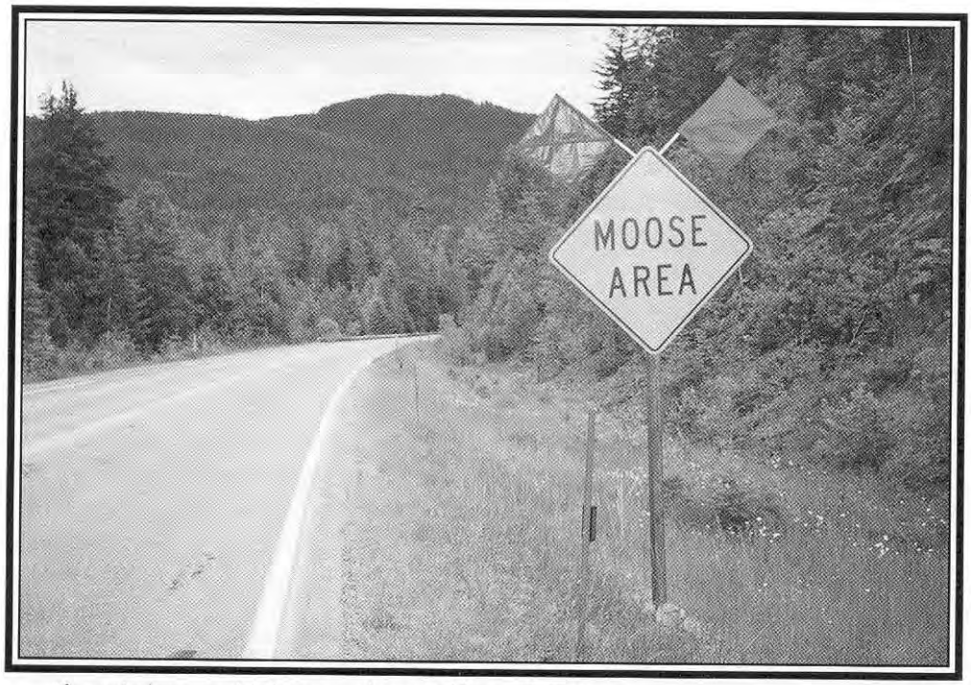
Is a Quick Stop the Best Maneuver?

Now, you may not agree that a quick stop is the correct evasive maneuver for a deer suddenly springing into your path. Wouldn't it be better to maintain speed so as not to startle the deer or to speed up to get by the deer quicker? Maintaining speed or increasing speed assumes you can predict what the animal is going to do. Braking reduces forward energy, so a quick stop gives you a good chance to avoid a collision if the deer does get in your way.

When faced with a potential collision on a slick road, would it be smart to toss the bike on its side and let it slide? For example, let's say I have just realized on a rainy morning that the pavement is coated with diesel oil, just as a garbage truck is starting to turn left across my path. Should I try to do a quick stop, or should I toss the bike on its side?

My experience with slick surfaces is that you won't have to make a choice—the situation will decide for you. I intend to stay on the rubber and brake to a stop. My reasoning is that rubber has more traction than metal or plastic, even on oil-slick pavement. In most situations, the bike will stop faster with the rubber side down. You do the best you can, and if you can't keep it upright, you fall. Once the bike is down and sliding, you've lost control.

I'm sure I could think of other scenarios where the best tactic would be to gas it or try swerving around the hazard. But there is only a limited amount of traction, so you shouldn't attempt to swerve and accelerate simultaneously. If you choose to accelerate, it pretty well cancels out the other options. Maintaining speed and attempting to swerve is sometimes the best option, but you need to guess right about which way to swerve. When faced with a deer leaping onto the road, the odds are that



After you've been warned, isn't it smart to be prepared for a quick stop?

When you know farmers are busy, it shouldn't be a surprise when a tractor snorts out onto the road.

you're not going to be successful second guessing which way it is going to leap next.

Hard braking has several advantages over either accelerating or swerving. One big advantage of straight-line hard braking is the potential of stopping short of a collision. The brakes on today's motorcycles are typically more powerful than the engine. More often than not, a quick stop is your best collision avoidance tactic.

If it isn't obvious, the first step in taking the panic out of quick stops is being prepared for them. A big part of that is actively searching the road for clues, and predicting hazards that you can't yet see. When you are riding through a forest at

dusk, you shouldn't be surprised when a deer or two leap out of the roadside bushes. In farm country, after you've noticed haying crews mowing, it shouldn't be a big shock when hay trucks snort across the road on the way from the field to the silage pit. If you see a sign warning of moose on that twisty Montana road, wouldn't it be clever to get that logging truck off your tail? Wouldn't it be smart to get out from behind that bus where people can't see you and you can't see what's happening ahead?

Passing through a string of busy intersections in the big city, you shouldn't be amazed to encounter a few car drivers making quick left turns across traffic. Out in the suburbs, wouldn't you expect cars to back out of driveways, kids to ride skateboards out into the street, and dogs to chase motorcycles? If you've got your head in the ride, you'll not only be searching for problems but you'll be thinking well ahead of your front fender.

Once you recognize a hazardous situation, you can get yourself prepared for a quick stop. For example, as you round a blind turn with a barn roof in the background, you should already be covering the front brake lever, and getting yourself psyched up for a quick stop.

The big mistake Roger Rider made was assuming that if he just kept his motorcycle under control, everyone else would stay out of his way. He didn't brake when his sight distance closed up approaching the crest of that hill, because he assumed the road was the same ahead as behind, even though he couldn't see over the hill. And when he did finally spot the deer, he assumed it would stay put while he continued on by. He could just as easily have collided with a wandering cow, or a hay truck entering the road. It isn't sufficient just to keep your own vehicle under control and expect others to get out of your way. You've got to be prepared to get out of the way of other users, whether they are wild animals or other drivers.

A couple of years ago I was having a discussion with a young rider who was limping around in a leg cast. He'd been knocked down in a merging lane by a driver who didn't yield the right of way.

Young Rider: "I can't believe he hit me! He was supposed to yield!"

Me: "Did the driver get injured?"

Young Rider: "Heck no. But I got a broken leg!"

Me: "So, why did you let him get you?"

Young Rider: "He should have stopped. I had the right of way!"

Me: "Does your leg hurt?"

Young Rider: "Sure it hurts."

Me: "So, why did you let him get you?"

It doesn't make any difference whether a motorcyclist has the right-of-way or not, the rider is the one most likely to get hurt. The way to avoid the pain and expense is to get out of the way. My father used to repeat a little ditty on the subject:

He was right, dead right, as he sped along.

But he's just as dead as if he'd been wrong.

If you wait until the last second before making the decision to brake hard, whatever you do is going to be in panic. It's important to get on the brakes early, when you first see or predict a potential collision. When sight distance closes up or another vehicle gets into a position where it could turn across your path, you should already be on the brakes, scrubbing off a bit of forward energy and heating up the discs.

If the other driver doesn't yield or makes a sudden swerve across your path, you can just squeeze a little harder and make a quick stop to avoid a smash. If the

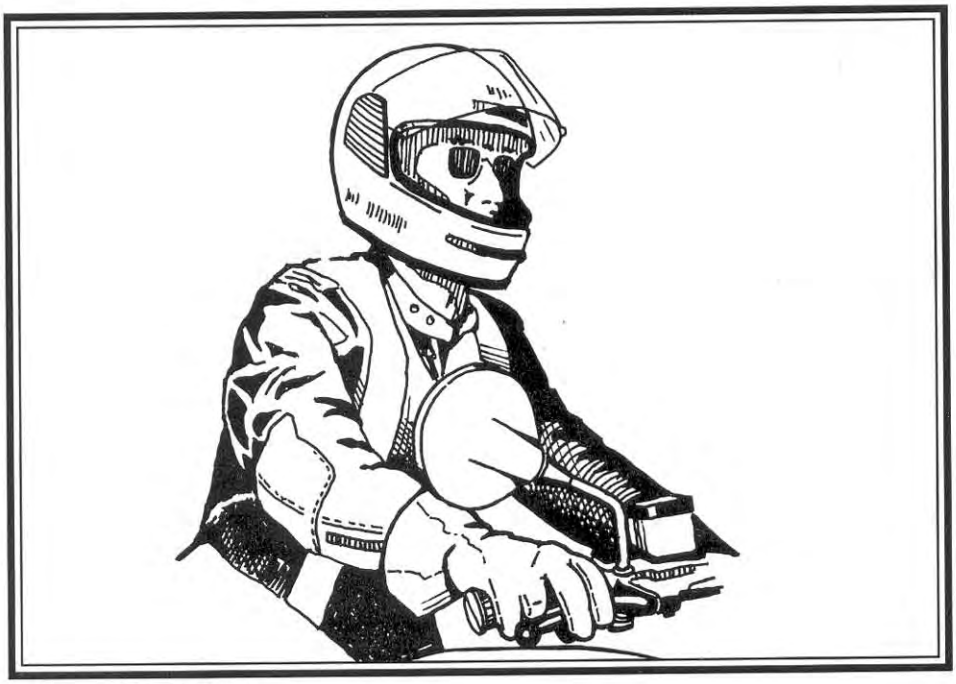
other guy stops after all, you can ease off the brakes and get back up to speed without a lot of fuss. You don't have to make quick stops every time you see a problem, but you should be prepared.

Okay, let's say you're riding a busy urban arterial with many confusing intersections and a lot of cross-traffic. You are predicting the possibility of other drivers making sudden moves. You've passed that creeper car with the out-of-state plates, you've moved out from behind the view-blocking bus, and you've changed lanes to let that aggressive cabby get on by. You are scrutinizing the road surface for slick spots and edge traps, observing the hoods of oncoming cars for potential left-turners, and glancing at the tops of front tires to get the first indication of cars beginning to pull out from side streets. What more can you do?

Veteran Tactics

Let's review six veteran techniques for making successful quick stops with a minimum of panic.

- **Get in the front brake habit. Stay in the habit of using the front brake every time you brake, even if your machine has integrated front/rear brakes or antilock brakes. There is a reason the front wheel has the big stoppers: in a quick stop, it is the front tire that gets pushed into the pavement. It is tempting to fall into the habit of just rolling off the throttle, or using just the rear brake and believing that you can reach for the front brake on those rare occasions when a quicker stop is needed. The trouble is very few of us can out-think our habits. In an emergency, we will do whatever we have been in the habit of doing, then think about it after the fact. If you get in the front brake habit, you'll use the front brake in a crisis without even thinking about it.**
- **Approaching turns, use your brakes. Braking should be part of your cornering sequence. Sure, rolling off the throttle slows the bike but, remember,**



Stay in the front brake habit.

Approaching turns, use your brakes.

engine compression functions as a rear wheel brake only. Adding a touch of front brake to help decelerate prior to leaning over into corners makes two-wheel braking part of your habit pattern. If you're in the habit of braking when approaching turns, you will automatically brake harder when you realize the curve ahead is a little tighter than you thought or when you spot a gravel spill at the apex or the view suddenly gets blocked by roadside trees and bushes or a pedestrian steps off the sidewalk as you make your turn.

★ **Brake early.** When you approach a hazardous situation such as a busy inter-

Brake early when approaching a hazardous situation.

section, get on the front brake to reduce both reaction time and stopping distance before you are faced with an impending collision. All of us require a half-second or more to make the decision to brake and another half-second if we have to reach for the lever. Reaction time can eat up a lot more distance than you might think. At 40 mph, you are covering almost 30 feet every half-second. And even if you are quick enough to reach for the brakes in only a half-second, it takes at least another half-second of progressive squeezing to get the front end loaded before you can get full on the brake. One wasted second at 40 mph eats up about 60 feet of critical road space—just about the same distance it takes to brake to a stop from that speed.

If you are already on the front brake lightly to get the discs heated up and transfer a little weight onto the front tire, it shouldn't take more than a half-second to squeeze harder and initiate a maximum effort stop. Getting on the brakes early can make the difference between stopping 5 feet short of the car fender or bashing into it at 30 mph.

Slow down 10 mph for problems.

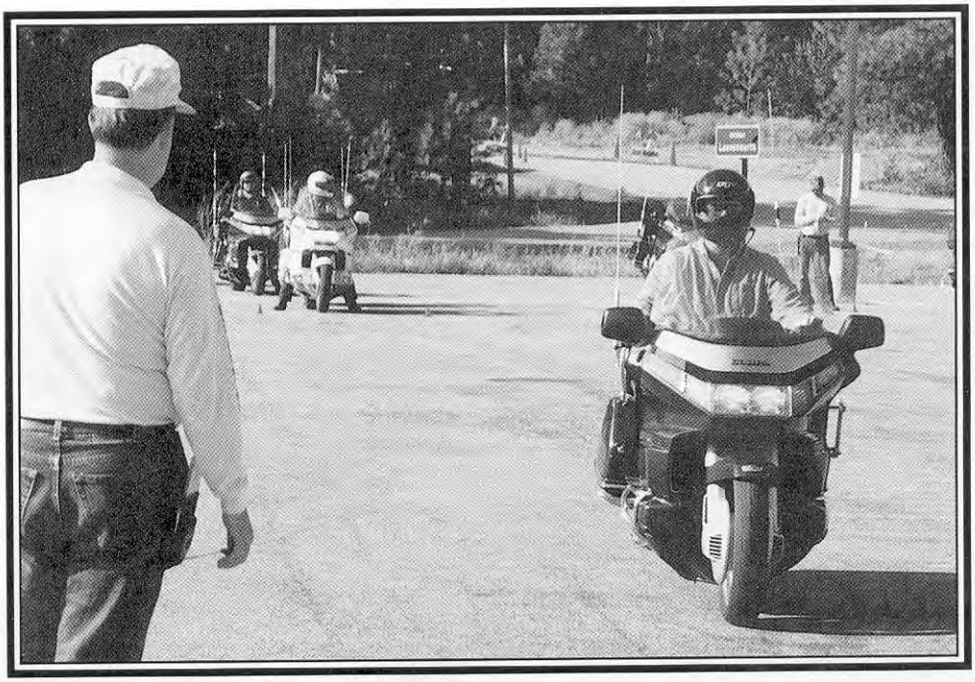
★ **Slow down 10 mph for problems.** As you approach a hazardous area such as a busy intersection with a car waiting to turn left or a driveway with a bumper sticking out, ease on the brakes and decelerate just 10 mph, shifting down as needed to keep engine revs up. Typical urban intersection speeds are 30 to 40 mph. Slowing just 10 mph, from 40 mph to 30 mph, reduces forward energy by almost half. That means the same brakes and tires can stop the same load in half the distance.

★ **Reduce speed to sight distance.** There is a tendency to settle into a steady cruise speed, rather than speeding up or slowing down for changing conditions. One accomplice to that is an engine with a narrow power band, which encourages the rider to maintain speed comparable to the torque band rather than shift up and down constantly. But your view of the road ahead changes dramatically as you ride along. And when the view closes

Reduce speed to sight distance.

up, it is important to immediately shed speed, so that you can always bring the bike to a complete stop within the roadway you can see.

What that really means is that when your view ahead is suddenly blocked, you should immediately get on the brakes and scrub off speed. That's especially important on any twisty road where you can't see around corners or over hills. And the faster your speed in the straights, the more important it is to brake hard approaching blind situations. The more you are assuming where the road goes even though you can't see all of it, the



At least once each year practice your quick stops.

more you are hanging yourself out. If you are interested in being quick on public roads, remember that crashing really ruins your average speed.

★ **Practice. Reading is okay to improve your mind, but you've got to practice on the bike to hone your skills. If Roger had practiced a few quick stops, maybe he would have been able to stop short of that deer collision without dropping the bike. At least once each year, practice maximum-effort stops to sharpen your skills.**

The goal of quick stops is decelerating from traffic speed to zero in the shortest distance, without losing control. Even if your favorite road burner has integrated brakes or if you spent the big bucks for ABS, don't excuse yourself from practicing the skills. You must be able to separate braking from swerving quickly, and be able to do a quick stop on dry pavement or in the rain, pointing uphill or down, in a straight or in a corner. All of the veteran techniques we've suggested work equally well for riders of ABS machines.

Less Panic

Once you make those veteran tactics part of your own riding habits, you may discover that you are encountering fewer and fewer sudden hazards, and it may seem that you have more time to deal with the problems that do occur. That's because we almost always have more than 3 or 4 seconds prior to impact to take evasive action. Most of those victims in motorcycle accidents offer the excuse that they didn't have time to react, but that's really an admission they weren't monitoring the road far enough ahead.

By predicting hidden situations, looking farther ahead, being prepared, and practicing the tactics we've mentioned, the skilled rider will do a perfect quick stop without wasting any time, then marvel about it afterwards.

Right Pace, Right Place

A few months ago I was getting a quick tour of the back roads north and south of San Francisco. A couple of local motorcyclists were showing me some really fun secondary roads that snaked over the hills and down into canyons shaded by giant redwoods. We even stopped for lunch at Alice's Restaurant, the famous biker hang-out on Skyline Boulevard, and checked out the fancy sportbikes in the parking lot.

Every sunny weekend, the Skyline is a steady toccata of high-strung motorcycles. And tow trucks. We passed by one shiny yellow Ducati being winched uphill out of the trees. All we could see of the bike was the rear end being hoisted back over the edge, but we could recognize the exhaust pipes sticking out under the tail cone.

There was no obvious reason the rider should have crashed here. The location wasn't a blind intersection or a decreasing-radius sucker corner. The pavement wasn't littered with tree needles or wet leaves. It wasn't raining. We didn't see any deer. There were no cars nearby with dented passenger doors. As near as I could figure, the Ducati rider had been flirting with the laws of physics and gotten slapped. He'd probably been a little hot, started to drift wide, panicked, did something dumb, and sailed over the edge into some heavy-duty tree trunks. We didn't stop—this sort of thing happens all the time up on the Skyline.

If you believe the covers of today's motorcycling magazines, the purpose of motorcycling is to ride as fast as you can and lean over in the curves until your knee sliders get hot. Road racers are held up as our heroes, and race-replica sportbikes are what you really want. Of course, today's sports machines really are good. If you could roll most any box-stock contemporary sportbike off the showroom floor and into a time machine, transporting it back just ten years, you'd have a faster, better handling motorcycle than the big buck factory race bikes of the day. And that's really a dilemma for today's motorcyclists.

I have this image of me on a high-zoot sportbike, passing every other motorcyclist on the road, half Mike Hailwood and half Joey Dunlop. But I don't ride the track. The dreamy perfect racer image gets pushed aside by the nightmare of a gravel truck chugging out of a hidden driveway, a horse escaping from a pasture, the sudden odor of

Attempting to keep a race replica bike under control on public roads is a challenge many of us aren't up to.

spilled diesel oil, or a rusty pickup truck weaving across the line as the driver flings an empty Jack Daniel's bottle into my path. Sure, I'd like to think of myself as a good rider, but I'd like to stick around for a while longer. And I can't escape the knowledge that public roads are full of hazards that can quickly and permanently end my motorcycling. There are a lot of riders like the guy on that yellow Ducati who are willing to push the envelope on public roads, but they seem to have very short riding careers. For most of us, jacking up the risks of a ticket or a crash is unacceptable. I've also discovered over the years that what's important is to enjoy the ride, and only a modest part of that enjoyment relates to speed.

If you find that your bike often seems to have a mind of its own or you often get a panicky feeling that you aren't really in control of the situation, those are clues that the bike is too much in control of the ride, and you're just going along as baggage. There are a couple of messages here, if you choose to listen. First, think about your machinery. Those shiny 100-horse sportbikes are sinfully seductive parked in front of Alice's, but attempting to keep a 170 mph race replica bike under control on public roads is a challenge many of us aren't up to.

We can imagine the scenario for that Ducati rider. He's pushing his limits heading up Skyline Boulevard, his head swimming in adrenaline but scarce on high-speed skills. He goes into the curve a little too hot, and somewhere in the middle of that sweeper, his brain registers that those trees are approaching awfully fast, and the bike isn't turning as tight as the road. He panics. His right hand slams the throttle closed, and his right foot nails the rear brake lever. Adios, baby.

The Right Machine for the Ride

My first motorcycle was a 150cc. A year later, I moved up to a 305, then a 450, followed by various 500, 750, 800, 850, 900, and 1000cc bikes. A couple of years ago I added a 350cc dual-sport to my stable and have rediscovered how much fun a smaller motorcycle can be, both offroad and on pavement. On that San Francisco trip, I took the 350. It turned out to be the right machine for those twisty back roads around San Francisco, and for slipping through downtown traffic. *A little 350*, you might be wondering, *running with the big dogs in the canyons of California? Didn't you get blown into the weeds?*

Yes, I did get some funny looks from the other riders. Before one ride, the leader asked about maximum speed and fuel range. I'm not sure he believed me when I said it would cruise at 70 mph, with a fuel range of 200 miles. What was more surprising to the other riders was that once we hit the back roads, the 350 could maintain the same pace as the group, and even leave some bigger bikes behind. A lighter bike can corner as quickly as a heavier bike, and with less risk of making a mistake. The 350 was a lot of fun to ride on the twisty little roads and highways. I'm not sorry I didn't take my 1000cc fire-breather on that trip.

If you're thinking about buying a different machine, or adding another bike to your fleet, don't overlook the dual sportbikes in the 350cc to 650cc range, or 600cc sportbikes. Sure, if you normally carry a passenger, cruise the superslabs from coast to coast, or carry big loads of camping gear, a big 1200 or 1500 tourer is the right tool. Just don't forget that mid-sized bikes can be a lot of fun. Whatever your choice of machine, the same general riding skills apply. Let's consider some cornering tactics that will help you stay out of trouble and enjoy the ride more.

The Right Pace

Most of us enjoy the performance of a high-powered bike. We like the feel of leaning a massive machine over into curves and the kick in our pants as we accel-

erate down the straights. But, somewhere between road racer and plonker, there's room for spirited riding, and if we do it right we don't have to jack up the risks to unacceptable levels. That's really what *Proficient Motorcycling* is all about.

Most of the time, we're talking about techniques. Steering. Braking. Throttle control. Cornering lines. But motorcycling also involves rhythm. A large part of the enjoyment of motorcycling comes from setting the right pace for the right place.

Consider a musician who plays every piece the same way: loud and fast. A galloping allegro tempo might be fun for something like the *Flight of the Bumblebee*, but it would be silly to rush through the blues, or country/western, or an anthem. The mood of the piece determines an appropriate tempo. That's the way it should be with motorcycling. The road, the situation, the bike, your companions, the weather, and your attitude all help determine an appropriate riding pace. It's up to you to find the pace—the right tempo—for today's ride. That's not simply a matter of road speed, but of the rhythm at which you approach a corner, apply the brakes, lean the bike, or roll the throttle.

For example, the force you apply at the grips determines how quickly your motorcycle leans into a turn. Shove hard on the inside grip, and the motorcycle snaps over. Push gently, and it eases over. Push hard enough, and you can slide the front tire out from under you. Push too lazily, and you can run into the weeds before you get the bike turned. Different corners demand a different pace. As you experiment with different cornering lines, you also need to adjust the tempo.

Braking Tempo

If the number one survival skill in traffic is maximum-effort braking, the number two survival skill is being able to set an appropriate corner entry speed without having to brake hard or late. Road racers may talk about late braking, or trailing the rear brake deep into corners. But late braking on the road has a way of eating up too much cornering traction and pushing the bike wide, either of which can bring your riding career to a sudden end. Timing is an essential part of braking.

When braking, how quickly do you squeeze the lever? How firmly do you squeeze? How quickly do you release the lever? Isn't the tempo for getting off the brakes just as important as how you apply them? If you are full on the front brake with the suspension compressed, and you suddenly let go of the lever, the front end will jump back up, upsetting the bike and changing the traction equation. Smooth *on* the brakes; smooth *off* the brakes. Remember, you should be squeezing progressively harder over one full second as weight transfers onto the front wheel. Now release the brake over one full second and ask yourself when you should be off the brakes. The bottom line is that you really don't want to be squandering traction on braking when the bike is leaned over. The wise rider sets cornering speed early, and gets off the brakes before leaning the bike into the curve. Adding a little rear brake while leaned over (trailing brake) is basically a technique for keeping the engine pulling smoother without increasing speed. Late braking is a hint you didn't achieve the correct corner entry speed.

At this point, you might be wondering what's wrong with just riding along at a modest pace and controlling speed with the throttle. A lot of riders do that, but then a lot of riders end up bashing into hazards because their survival habits didn't include braking. If you expect to be able to brake hard someday to avoid a hazard that suddenly pops into view, you should stay in the front brake habit, and use both brakes as part of your cornering sequence, even if you just lightly touch the levers.

Cornering Tempo

We've suggested the importance of finding the right entry speed for corners. The only good guideline for entry speed is what happened in the last corner. If you had to roll the throttle closed or brake after you leaned over, you didn't go in slow enough. Your target entry speed should be whatever speed will allow you to roll on the throttle smoothly through the rest of the curve. You'll also get some clues from a series of bends. If you discover that you're a little late and a little wide in turn two then drifting even wider in turn three, and headed toward the gravel in turn four, that means bike speed is faster than your thinking speed. Slow down a bit more entering corners, get the bike under control, and enjoy the ride at a more relaxed tempo that matches your thinking pace.

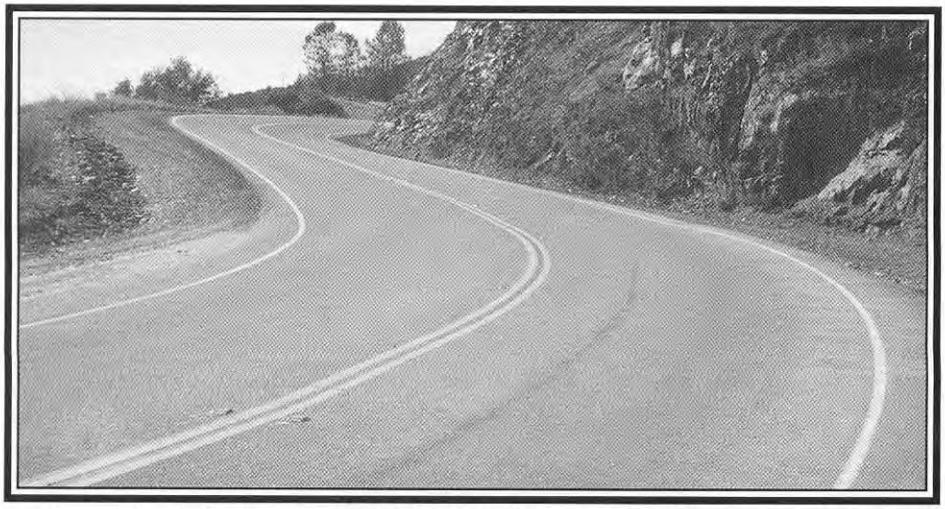
Throttle Tempo

We've asked this before, and we'll ask it again: When do you roll on the throttle during a curve? Do you roll off the gas and let engine compression slow the bike halfway through the turn? Do you wait until you lift the bike up again before rolling on the gas? Or do you ease on the throttle as you lean the bike over? Unless it's a really strange downhill turn, the correct time to ease on the throttle is when you lean the bike over, long before you pass the apex.

If you get the bike slowed to the right entry speed, then lean the bike over into a nice stable arc and simultaneously roll on a little throttle, everything will feel a lot smoother and more enjoyable. We're not talking a sudden burst of power here, just a smooth roll-on all the way through the turn. If you find yourself panicking in the middle of curves because the bike is drifting wide, think about your cornering lines and what you're doing with the throttle.

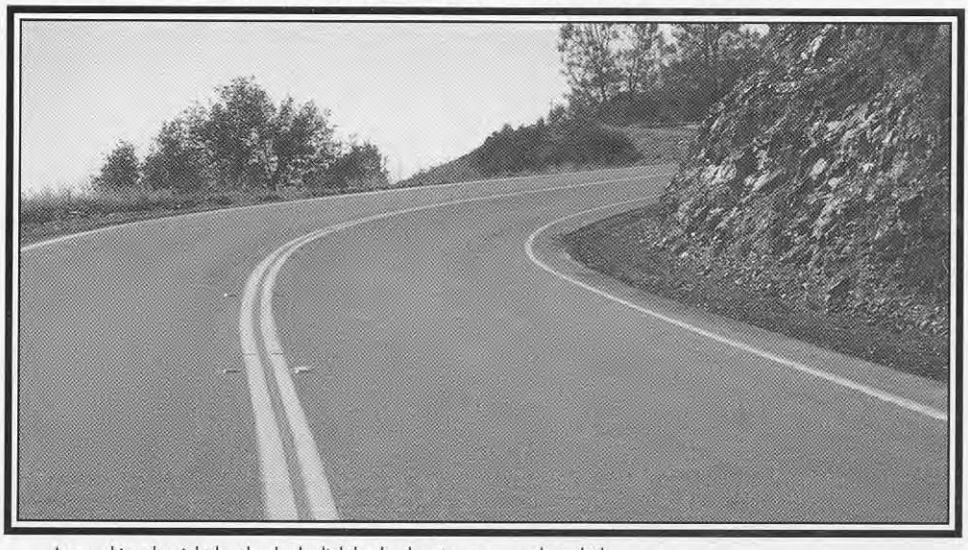
Leaning Tempo

You don't want to lean the bike too early because that points the bike toward the inside of the lane, and then it's pointed too wide at the apex. Delay the turn-in slightly, keeping the bike closer to the outside of your lane, then smoothly and forcefully lean the bike over, pointing toward a delayed apex. It's better to push firmly on the low grip and hold it a little longer than to slam the bike down with a quick, hard push because a smoother, longer push results in less chassis wobble as the machine

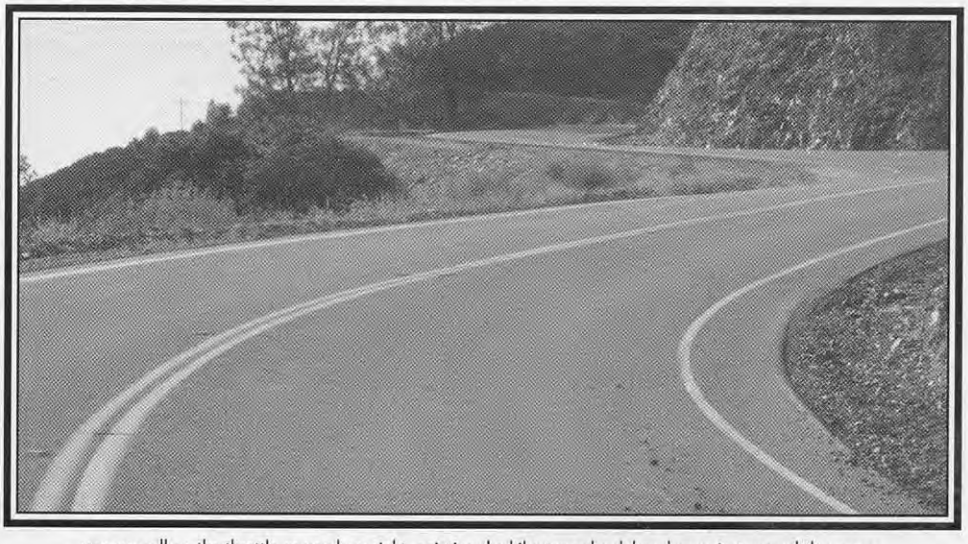


Start the left-hander from the far right side of the lane, braking lightly to a speed at which you can roll on the throttle as you lean left.

Starting wide while approaching that right-hander ahead points the bike toward the center of the road.



Approaching the right-hander, brake lightly, decelerating to a speed at which . . .



. . . you can roll on the throttle as you lean right, pointing the bike toward a delayed apex just around the corner behind those rocks.

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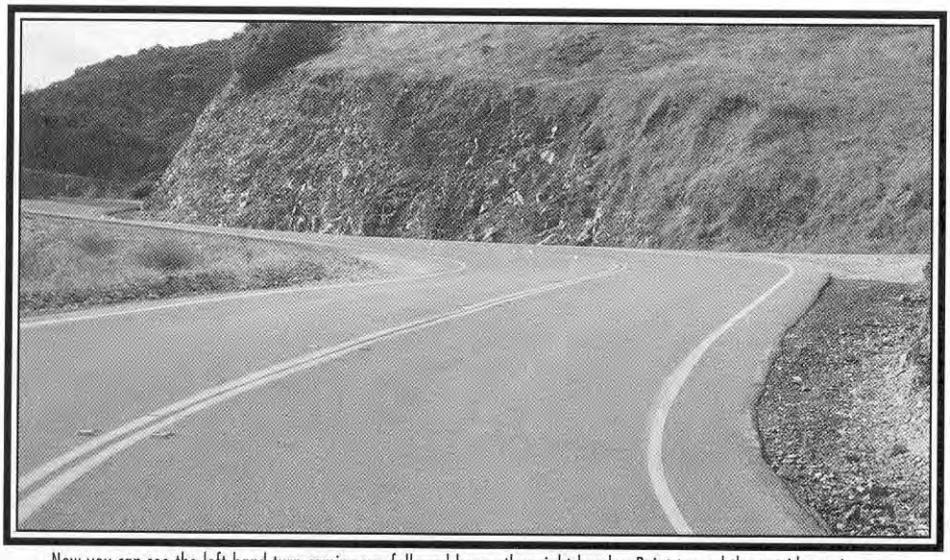

Now you can see the left-hand turn coming up, followed by another right-hander. Point toward the outside again . . .

settles into its cornering line. The smoother you are at leaning the bike, the more traction you'll have for cornering, with the least risk of a slideout.

At the tail end of the corner, it's time to straighten up the bike. There is no advantage in pushing hard on the "up" grip to suddenly straighten the bike, unless you have to swerve around a hazard. Just roll on a little more throttle and let the bike lift itself up as it follows a smooth arc toward the outside of the curve. Unless there's another vehicle in the way or a surface problem, you can use all of your lane. Okay, let's put it all together, riding through a series of corners.

. . . and decelerate to a speed at which you can roll on the throttle as you lean the bike left. As soon as you can see the next turn ahead, you should already be planning your critical turn windows and lines.

Enjoying the Ride

The point of all this is that you might enjoy the ride more when the emphasis is on perfect control of the motorcycle rather than on what the speedometer says. And finding the right timing is the key to better control. What many riders discover, to their amazement, is that the right pace results in higher cornering speeds as well as better control. For many of us, a brisk but controlled ride down a favorite twisty road on a good handling bike is a most enjoyable way to spend an afternoon.