Begin with the end in mind

When riding the racetrack, everything that we do comes down to a single limiting factor – traction. If traction were unlimited, we could literally just ride faster and faster until the g-forces got so high that we literally could not hold ourselves up on the bikes anymore. In our world, everything that we do **on** the motorcycle, **with** the motorcycle and even **to** the motorcycle eventually works through the limits of our tires. Herein lies the both the challenge and the beauty of motorcycling.

For those of us who feel the need to compete (numbers on your bike are NOT a prerequisite) we fight a constant battle of give and take. The fastest rider around the track is most often simply the rider who has the largest average throttle opening around the track. More time wide open = faster lap times. Since we all are capable of full acceleration down the straights, this boils down to the rider who can open the throttle the earliest and leave it on the longest.

None of this is new information, but I often find it helpful to remind myself of the basics. Often, it's the simplest concepts the prove the most useful. In that light I thought that it would be helpful this month to discuss how the first and last 5% of your control inputs help to maximize traction. Our end goal will be to use that grip to hold the gas on a little longer and then open it a little earlier. Before we expand on that idea, let's look at a couple baseline principles.

The first is that tires react very well to smooth inputs. If you find bike on the asphalt sitting on a rear stand, take your foot and put a steadily increasing amount of side load on the front tire. Most people are not strong enough to make the tire move at all. Then take the same tire and give it a good kick. With measurably less force you can "shock" the tire and cause it to slide. Without the time to bite the asphalt, tires break free much more easily.

Second, we should note that traction is directly proportional to the amount of weight that pushes the tire down into the ground. Side load consumes grip, but weight on the tire (known as the "normal" direction) creates it. A simple experiment to illustrate this is to kick the front tire of a bicycle by tiself and then again with rider sitting in place. The more weight on the tire, the more force it takes to make the front end "slide". The basic physics formula for the amount of force (F) to overcome friction is $F=Mgu_s$. In this formula M=Mass, g is the gravitational constant and u_s is the coefficient of friction. Since g and u_s are constants, physics says that the force needed to slide is in direct 1:1 proportion to the weight pushing the tire into the ground.

When a motorcycle moves up and down through the travel the springs compress and extend. If you were to put a scale under the front tire, this would show a constantly changing amount of weight on the tire. This makes it impossible for a rider to determine how much force the tire can take at any given moment. In addition, an unsettled chassis makes for constantly changing rake and trail, which greatly affects the amount of bar effort to initiate a turn.

In order to lengthen the straights both entering and leaving each corner, we need time that we spend transitioning from fully upright to maximum lean to be as short as possible. The give and take is that we need this to happen over the shortest length of racetrack without upsetting the chassis. It's amazing what a fraction of a second can do here. For example, if the turn in for a given corner begins when you are traveling 60 miles per hour, that equates to about 90 feet per second. If you can go from upright to full lean 0.3 seconds quicker

(many riders can shave more time) then you get to extend your straightaway by 27 feet (about 4 bike lengths). This is a big deal when it comes to dropping your lap times!

When it comes to initialing turns quickly and precisely, riders need to first have an early and clear vision of their trajectory at the apex. Moving your eyes and scanning ahead helps immensely. Together with this vision, riders must have the confidence to physically turn the bike with precision (as opposed to a slow roll into the turn). To create this confidence, the motorcycle must have completely stable chassis geometry. Without a stable front end, riders cannot accurate gauge the amount of force the front end can take. This is where your initial inputs really come into play.

At the end of the straight, the brake and throttle should be treated as a single control. Just like we don't want to "kick" the tire, we similarly don't slam the throttle shut or grab the brakes. As the throttle is rolled off the brake should be applied at the same time. This eliminates gaps between throttle and brake and creates the fastest/smoothest transition from acceleration to braking. This is all done without upsetting the chassis, and it's all over in the first few tenths of a second. This simultaneous roll off and brake application should be a part of your riding tool box that is consistent in every entrance.

As long as you get this first 5% correct, the rest of the brake zone is easy. If you stab the controls too quickly, the forks start wallowing and you suffer from inconsistent grip and varying chassis geometry. If you apply them too slowly then you'll consume too much of the true braking zone and will have to start the whole process earlier in order to make the apex. This is the give & take that riders must consider. Riders need to create a repeatable process that they use every time.

The last 5% of the major braking zone is equally important, and the same principals of keeping a constant load on the tires and stable chassis geometry apply. As we approach the turn initiation point, we again use our controls in pairs. This time, as we release the brake lever we simultaneously initiate the turn with the bars. These two actions are again completed as if they were a single control. In a perfect world you will replace every pound of force that you release with the brake lever with an equal force consisting of a combination of bar input and cornering load.

A common mistake is for riders to fully release the brake and then to initiate the turn. This causes several problems. With the brakes released, the front end rides high and requires more effort to turn. In addition, as the springs extend there is less weight on the front tire (and less grip). Finally, the forks are the softest at the top of the travel. This softness causes the front end to react with greater magnitude to every ripple in the pavement and input from the rider. There is a better way.

The major part of your brake release should come during the first 1/3 of the lean; when you are using the bars to initiate the roll into the corner. The remainder of the brake release comes in the final 2/3 of your trip to full lean as your arms completely relax and the bike arrives at full lean. By the time you get to max lean angle, your traction is allocated almost completely for turning, with only a small portion allocated to whatever trail braking is left and your very light "guidance" input on the bars. The give and take is to complete this process over less and less distance, until the amount of force needed to turn the bike causes the rider to wait before applying the throttle.

In the end, smooth is always fast. Practicing your control inputs in pairs will make every lap smoother, faster and help create that feel for traction that you've always wanted.

Until next time, ride fast – ride safe!