Cornering - “Slow, Look, Lean, Roll”

There are three specific areas of special interest when cornering your motorcycle, Line of Sight (LOS), Turn Apex, and Speed. Let’s take each briefly so that we understand them, then put it all together.

I. Line of Sight (LOS) and Speed

A. When approaching a corner you need to decide an acceptable line and an appropriate speed. In addition, you need to determine what sort of corner it is:

1. Sharp?
2. Sweeper?
3. Single or series of turns?
4. Constant or radius change?
5. Street defects or road hazards?
6. Conflicting traffic?
7. LOS restricted (trees, hillside)?

B. So how do you do this? You begin by gathering information.

1. See as much of the corner as possible.
2. Maintain an aggressive search with a 12 second travel lead (desired).
3. Constantly work to maximize your LOS.

C. The general rules for LOS in corners are:

1. “The exit is where you want to go”.
2. Until you see the exit, you don’t know what sort of corner it is, or what will happen after the corner.

D. Until the exit is in sight you should:

1. Stay wide, keeping as close to the outside of the turn as practical.
2. Limit your speed, like not “overriding your headlights,” and riding a speed that will allow you to react to situations as they come into view.

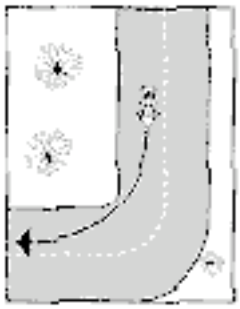
E. When selecting a path to travel, try to maximize your tire traction reserve. This minimizes your tire side loading and ensures you have traction in the event it is needed. For any given speed, the greater the turn radius the smaller the tire side load, and the greater the traction reserve. This means you should choose a line through a corner that tends to maximize the turning radius (consistent with road conditions, of course).

II. Turn Apex

This is the point along the path through the corner that is *closest to the inside boundary* of the turn.

A. Constant Radius turn (no obstruction to LOS). We will use this as the reference point for the rest of the discussion.

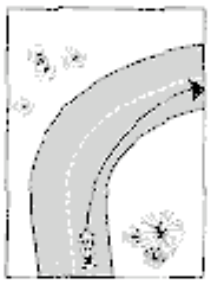
Constant Radius (e.g. a 90 degree turn):



B. Increasing Radius:

1. Not particularly challenging.
2. To arrive at the greatest practical radius, place the apex prior to the midpoint of the turn, that is, an early apex.
3. A normal apex would make an overly sharp initial radius (sharper initial turn), and make poor use of the extra room available during the last part of the turn

Increasing Radius (e.g. a less than 90 degree turn):



C. Decreasing Radius

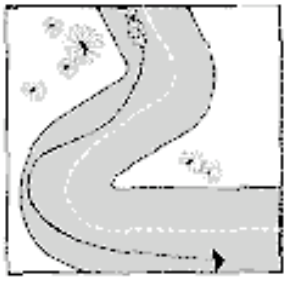
1. This is the opposite end of the turn spectrum.
2. It is a difficult type of turn to negotiate because the tendency is to pick an apex too early in the turn, and it requires an adjustment in line and/or speed to prevent running wide at the exit.
3. It requires an apex which is beyond the center of the turn to achieve the greatest practical radius

Since this is the most difficult of the three turns, it is the prudent prediction that the rider should make when approaching a blind curve.

Decreasing Radius (e.g. a greater than 90 degree turn):

D. Multiple Radius Turns

These occur when one turn leads into another, then the selection of lines and apex differ. Initially setting up for one kind of turn may put the rider in the wrong place for the next turn. It is very important to SEARCH well ahead and to PREDICT what is going to happen before ACTING when it comes to selecting a path and apex.

Multiple Radius Turn: 

E. Apex - Summary

When approaching a turn the rider should select the path that tends to maximize the LOS until the exit becomes visible, then follow the path that results in the maximum effective turn radius through the exit.

C. Speeds of Cornering

1. Approach speed - the speed of travel when the rider first perceives the corner. It can be any speed consistent with the conditions and the rider's skill and preference.
2. Entry speed - the speed at which the rider makes the steering input to begin the turn. It is the most critical because it determines how safely and smoothly the turn can be made.
3. Exit speed - the speed the bike leaves the turn and enters the ensuing straight section, or another turn.

D. Putting It All Together

So, how do we put this together to make the best turn we can? By practicing the simple cornering rule of "Slow, Look, Lean, Roll" you apply the basic principles of safe corning.

SLOW/ Approach

1. The approach speed is reduced to entry speed prior to the turn.
2. The SLOW part involves rolling off the throttle, using both brakes, and down shifting, as appropriate.
3. The entry speed should be consistent with rider abilities and existing conditions.
4. The speed should allow for the worst-case scenario of responding to both predicted and unpredicted occurrences as they arise.
5. The upper limit of the entry speed is the speed that will permit a gradual roll on of the throttle from the entry point (or the point where the exit becomes visible) through to the exit.

LOOK - the next step

1. This should involve *not* just movement of the eyes but a turn of the head (not your shoulders) so as to "face" the exit and the intended path after the turn.
2. Gradual turns involve a minor head turn with sharper turns requiring an exaggerated head turn.
3. The reason for this technique is it provides what is called "visual directional control," in addition to searching more effectively.
4. This means that the mind tends to "automatically" make the control inputs necessary to make the motorcycle go where the rider is looking. It also tends to discourage looking down, which causes balance problems.
5. The eyes should be kept level with the horizon to prevent disorientation of some when the head is tilted and turned simultaneously.

LEAN

1. The two Ideas to get across here are (a) the motorcycle must lean to turn, and, (b) the lean angle is most quickly, effectively, and precisely controlled through the use of pressures on the handgrips (to lean the motorcycle, push on the handgrip in the direction of the turn, the old "push left - lean left - go left, push right - lean right - go right routine).
2. Higher speeds and/or tighter turns require the motorcycle to lean more.
3. The motorcycle needs to lean for two reasons. (a) By leaning, the tires produce much of the cornering force necessary to make the bike turn, and, (b) to maintain balance you must shift the CG (weight) "into" the turn to counteract the centrifugal force (CF) of the turn.
4. Because of the forces acting on the motorcycle while turning, the most effective means of initiating a turn is through steering input, then weight shift to "zero out" the CG vs. CF.
5. Weight shifting alone is relatively ineffective in turning the bike (on a straight-away, try removing your hands from the handgrips and attempt to turn the bike with weight shift only).
6. Weight shifting after the turn is established helps to "fine tune" the balance.

ROLL (on the throttle)

1. This is based on the needs to stabilize the motorcycle on its suspension, and to prevent any sudden changes in the distribution of traction between the two tires (remember that acceleration/deceleration shifts the relative loading on the tires and suspension because of weight shift).
2. Any abrupt throttle inputs can cause a rapid change in traction between the two tires (e.g. deceleration causes the traction to shift away from the rear toward the front).
3. Speed changes during the turn cause the suspension to extend or retract (this changes the ground clearance and steering geometry).

Note: Solution to ROLL

- Try to avoid abrupt speed changes in a turn.
- Remember that greater ground clearance and extension of the front suspension will tend to add to overall stability and control.
- A gradual ROLL on of the throttle to produce a steady speed (counteracting the natural slowing due to additional traction requirements of the turn) or a gentle acceleration is preferable to a deceleration.