Track Braking Mistakes and How to Avoid Them

by Bill Gilbert for the NNJR Chief Instructors

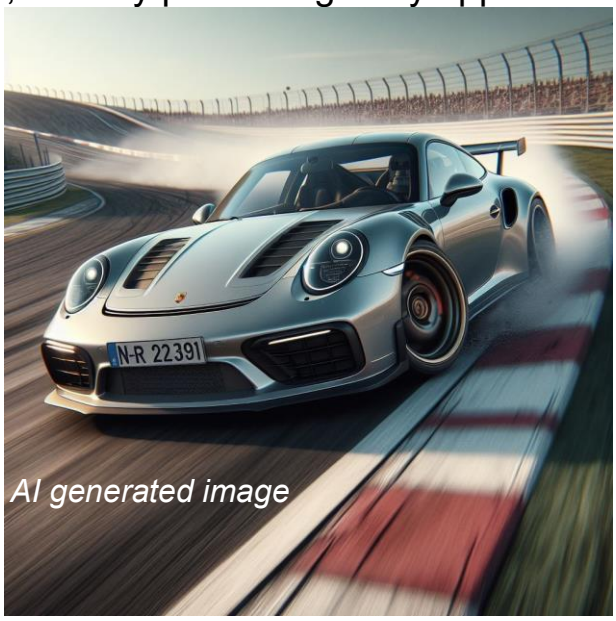
Why do so many experienced drivers[1] mess up heavy braking zones and even go off track? Obviously their braking process needs to be improved. This article describes proper track braking technique which will keep drivers on track…and lead to safer, more consistent (and faster) results.

Summary (TL;DR)

- Out of shape early and mid-corner? Focus on “Slow in, fast out.”
- Inconsistent entry speed? Almost off track under braking? Focus on braking earlier with the right technique.
- If your braking delays WOT, you made a mistake.

[1] This article is written for DE drivers with substantial experience. Student drivers may find parts useful but student drivers tend to make different braking mistakes! Plus, in this article, I assume the driver knows and consistently drives the proper line.

Mistake 1: the “too busy” brake zone
Intermediate and some advanced drivers often put too much braking into the last part of the braking zone, resulting in the car being out of shape mid corner, thereby preventing early application of the gas.



- If you find yourself fighting the car entering a corner, working up a sweat and waiting a long time to get to the gas, time to reset. Brake earlier with only a light amount of brake at turn in. Focus on positioning the car so that you can get on the gas at the apex and go to Wide Open Throttle (WOT) quickly. In other words, “slow in, fast out.” You will be surprised what a difference this makes!
- It might seem obvious, but <u>in a brake zone, job #1 is braking</u>! Drivers in manual cars often are not polished with heel-toe and, when they fumble a downshift, still try to get into the lower gear—and completely mess up the turn. Drivers either drop the clutch and upset the car, stand on the brake pedal at End of Braking (EOB) or miss the turn-in altogether. Catch up to a blown downshift after your braking is done and before you go WOT. Or stay in the higher gear and focus on being smooth.
    - *“Think of the brake zone in 3 sections: the first is for slowing the car, the second is for downshifts and the third is for coming off the brakes.” (Gunnar Jeannette)*

Mistake 2: Braking too late

But what if you aren't making Mistake 1 above? (Be honest with yourself!). You are probably making Mistake 2: braking too late. If you find that your braking isn't consistent, i.e. entering the corner fine one time, too fast the next time, etc. or you feel that you can barely get the car slowed down, listen up. A very common mistake is when drivers pick a late braking point, then struggle to consistently enter the corner—or find themselves off track! Solution:

- Brake earlier (maybe) with the right technique.

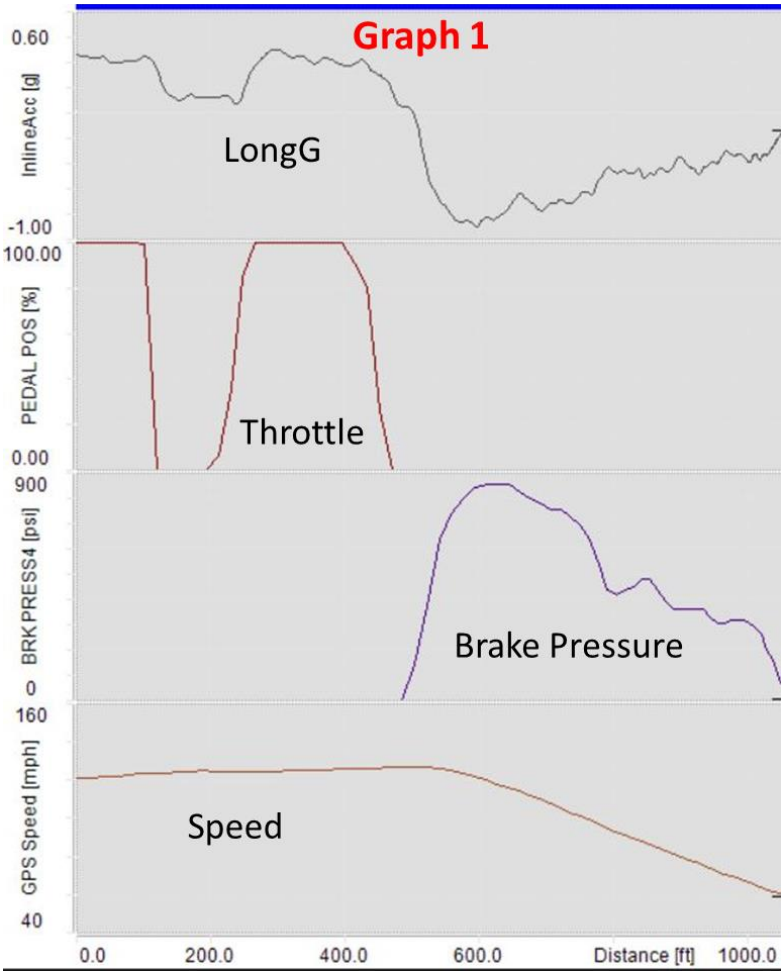
The "Corner Priorities" section below explains why the following technique works and what we are trying to achieve. I encourage you to read it after the 5 steps, then come back and read through the 5 steps again.

Here are the 5 braking steps in any brake zone. I've used a typical heavy braking zone as an example. Follow these steps and you will be faster and stay on track!

1. Accelerate to Point (ATP).
2. One, **two** brake application.
3. Modulate in a straight line.
4. Modulate for turn in.
5. Timing and rate of release.

1. **Accelerate to Point (ATP)**

You've no doubt heard the term "Beginning of Braking" (BoB). But Peter Krause has educated us to strike that term and use ATP instead. The logic is clear. Whatever point we choose, our foot should be full on the gas until it goes full on the brakes. But many of us don't execute this very well. Consider the braking zone in Graph 1.

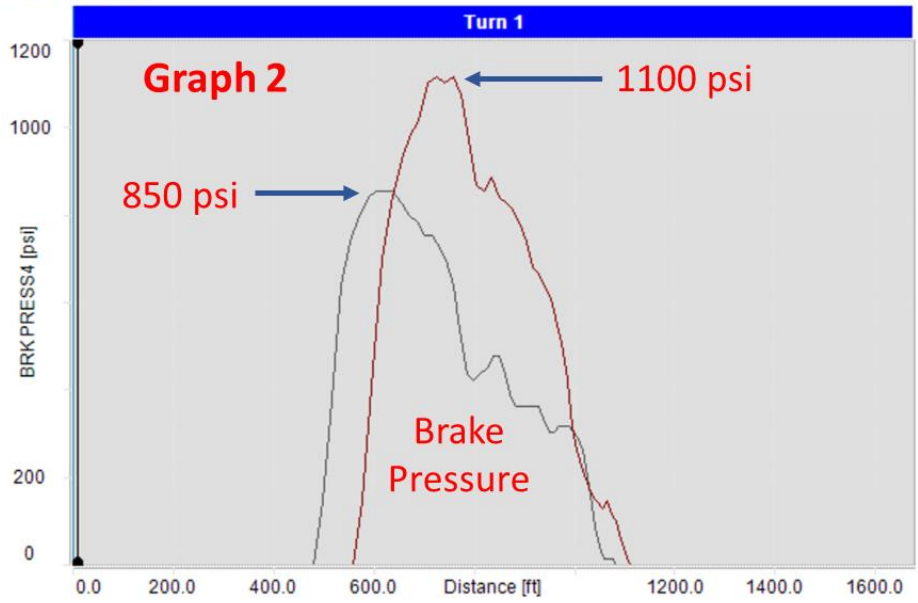


Note how I lifted for some 80 feet before getting back on the gas, then a second lift before braking. If you look carefully, you can also see that my second lift wasn't abrupt: it should look like the first one.

Setting aside my mistakes here, you can see that the car travels some distance between when you lift and when you begin to brake. In this example, some 30+ feet. This illustrates the complexity of the brake zone once we dissect it.

2. One, Two Brake Application

Everyone knows that modern Porsches have phenomenal brakes. It is less well appreciated that they require substantial pedal effort to use their full potential, especially the GT cars. As a result, I've coined this "One, **Two**" phrase to describe the proper technique. Unless you are driving a race car, your initial brake application needs to be quick but somewhat gentle. I often describe it as "press the brakes until you feel pressure, then push hard." That initial "hesitation" allows weight to transfer without upsetting the car. When you see the nose of the car "drop", you know weight transfer is happening and you can push the brake pedal harder. A hard slam on the brakes will put all the weight forward. What I've learned with my GT4 is that the "push hard" part is serious! Graph 2 shows an example.



Note that both braking sequences start the same way and finish at almost the same time (EOB) but the taller trace has a later ATP…without changing the trail braking. (This is an example where, after experimenting with and finding the right amount of corner entry speed and brake, I did move the ATP later.) But I should point out that this harder effort generally isn't needed for older cars: it would have put me in the ABS on my 968.

Speaking of ABS, if you regularly engage ABS on brake initiation, try waiting until you see the nose of the car drop before applying full pressure.

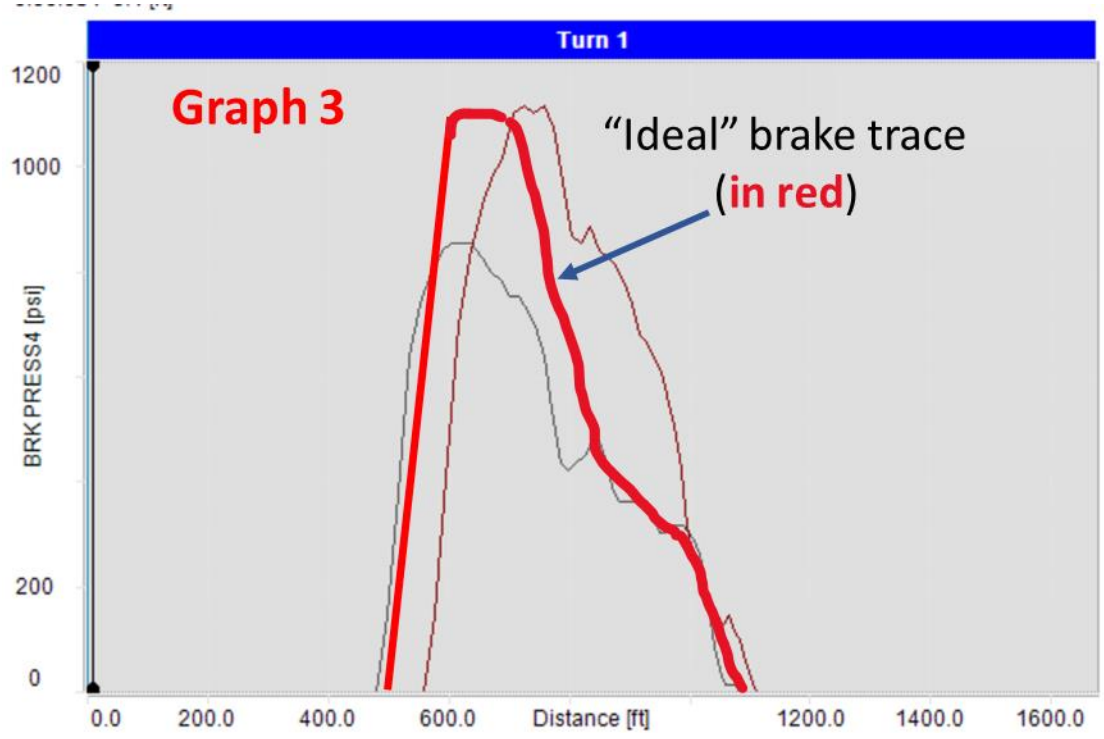
If you want to know more about the sophistication of modern Porsche braking (and related) systems, check out this article by Doug Holcomb.

3. **Modulate in a Straight Line**

In any heavy brake zone, we want strong initial brake pressure, as you see in the graph above. But this brake pressure needs to bleed off since less is needed as the car slows (as in the graph above). As we near the end of the straight line braking, we need to be able to fine tune the brake pressure to have just the right amount at turn in. This doesn't mean a slow corner entry: use the modulation to roll entry speed.

- *"Two thirds of the braking is in the first third of the brake zone." (Ross Bentley)*

A tip: if you are having trouble modulating, try braking a bit earlier. Braking 30-50 feet earlier costs almost nothing in lap time and can pay big dividends in consistency. Case in point: the later braking in the example above was actually slower than the earlier braking because I overslowed, probably because I couldn't modulate carefully enough. An ideal brake trace would look more like Graph 3.



4. **Modulate for Turn In**

This should be a natural flow from the straight line braking. It's important to remember that the primary reason for trail braking isn't to slow the car, it's to help it turn. Most corners don't need a lot of brake pressure at turn in. The key is consistency. And remember that trail braking benefits only accrue when the car is close to/at the limit.

- *"The reason we trail brake is to keep our right foot away from the gas pedal." (Randy Pobst)*

5. **Timing and Rate of Release**

This is where the magic happens! (Thanks to Ross Bentley for the "timing and rate of release" terminology). Exactly how much brake we carry into the corner and our timing for releasing it, along with the rate (fast, slow); and the amount/pace of steering input; each of these affects how well the car turns. In a perfect world for an advanced driver, the car will rotate (but not in high speed corners!). This happens when we have more grip/weight on the front than the rear and the car actually rotates a few degrees as in the photo below, helping to carry speed and to get the car pointed around the corner. You can think of this as controlled oversteer if you like, though most of us think of oversteer as something that is undesirable (more rotation than we want) vs. induced rotation which we want. Think about using the trail braking to control the amount of front vs. rear grip.

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To figure out the proper timing and rate of release of the brakes requires experimentation. Pick a corner and try earlier and later EOB. Slower and faster brake release, etc. Remember, this is the magic part of the corner.

- *“I spend more time coaching drivers on their brake release than anything else.” (Ross Bentley)*

I hope you’ve found some tips here that help the next time you are on track. Follow these steps and you will be faster…and stay on track! And I really hope that you now see why a focus on braking late is counterproductive!

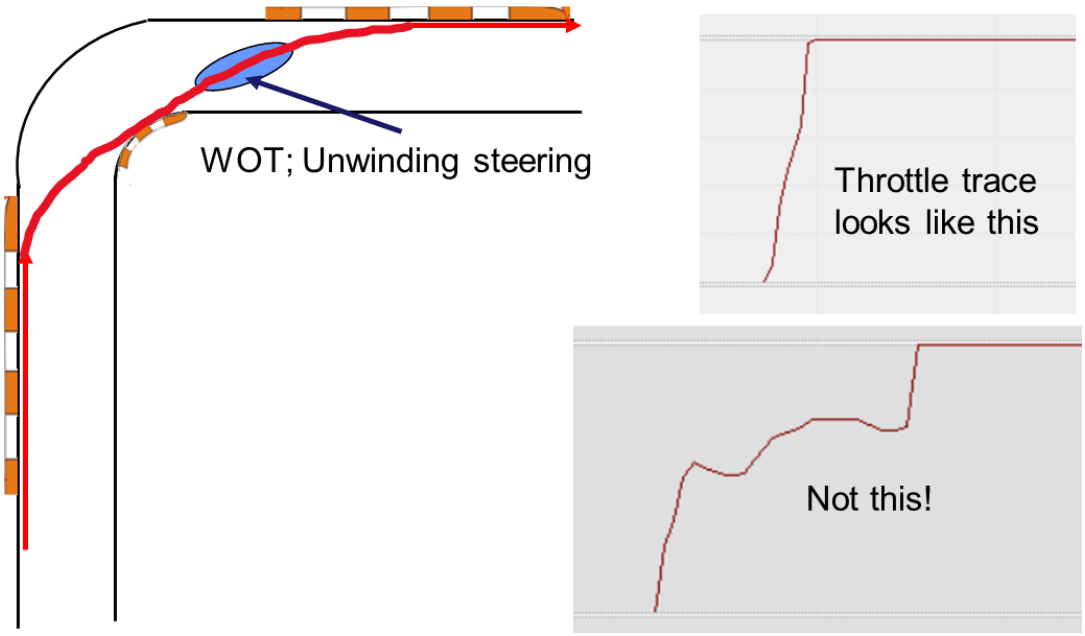
For more tips and an explanation of why these techniques work, keep reading. Then re-read the 5 steps.

Corner Priorities

To understand why the braking techniques described above work, a brief review of the basics (experienced drivers have heard this many times but it's amazing how many don't apply it!).

- We all know that lap time comes from straightaways (see *Driving Faster*, *Speed Secrets* or your favorite driving reference). Where does straightaway speed come from?
  - Corner exit speed.
- The priority for every corner that leads to a straight[2] is exit speed. Where does exit speed come from?
  - Answer: getting on the gas as early as possible and, more importantly, getting to WOT as soon as possible. See Diagram 1.

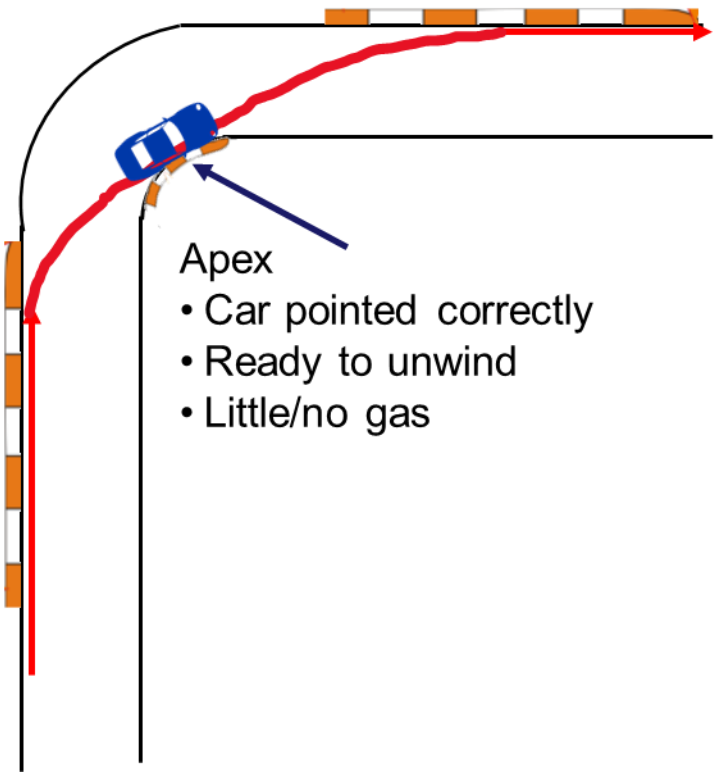
Diagram 1



[2] Type 1 corners (see Alan Johnson "Driving in Competition") lead onto a straight; Type 2 corners end a straight; and Type 3 connect corners. Type 1 are far more common than the others.

- How do we do that?
    - We have the car pointed in the right direction at the apex and have the steering ready to unwind. See Diagram 2. Seems simple, right? But not if we've over-driven the first half of the corner!

Diagram 2

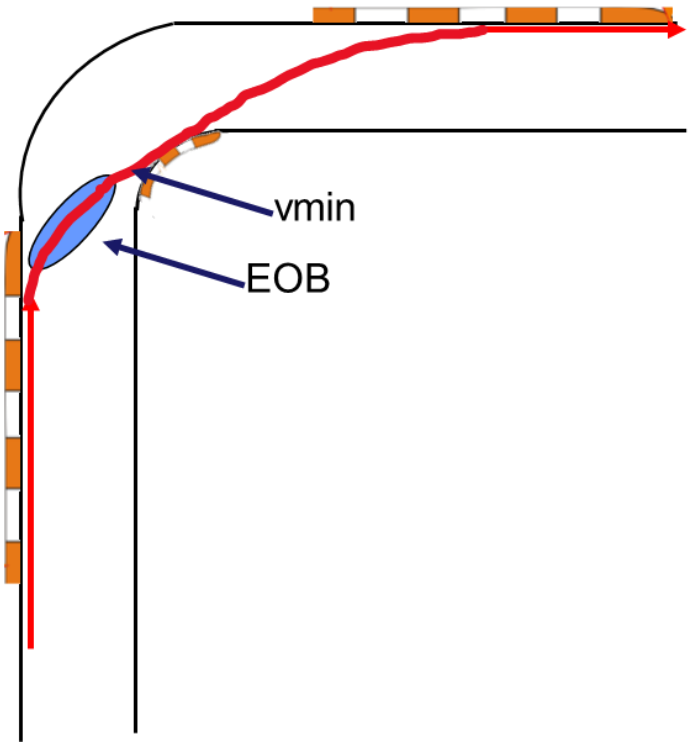


So what does that mean for braking? Let's continue working backwards. At the apex[3]

- Our priority is to have the car pointed properly and ready to accelerate: this means we are done slowing (Minimum speed or Vmin should be just before the apex) and ready to open the steering wheel.
- Our foot should be off the brake and (barely) on the gas or ready to get on the gas.
- Depending on the corner, your car and your driving style, you may have come off the brake much earlier or just before Vmin (see "Timing and Rate of Release" above). Regardless, the objective is to have the car balanced at the apex, ready to accelerate.

If we are to come off the brakes consistently, we need a reference point, namely EOB. If you don't have a solid EOB reference, picking one is the next step! See Diagram 3. EOB needs to be both visual and one that tells you how fast/slow brake release is. In all but the fastest corners, EOB is after turn-in. Long corners and slow corners will generally have a later EOB, noting that EOB is somewhat car dependent.

Diagram 3



[3] Actually, in some corners a bit before the apex, in some a bit after, depending on camber, banking, etc. For this article, I've simplified it to the apex.

Now let's consider corner entry. We know where we need to be off the brakes (EOB). "How much entry speed can I carry?" Is the wrong question. The right question is "How much entry speed can I carry that allows me to consistently hit my EOB?" (because if I don't hit my EOB, my exit will be compromised). Hence, the right way to learn is to make small increases in corner entry speed. One note here: I'm assuming that you have good entry speed, so that the car "has some energy in it", as Ross Bentley puts it. If the car is on rails, you probably aren't rolling enough speed in.

- Here is a good check used by pros and coaches. If you go to the gas before the apex, that means you didn't carry enough speed into the corner. If you are carrying enough speed so the tires are at their cornering limit, you won't feel like you can go to gas at this point. Going to the gas early in a corner (even a little bit) will cause understeer and delay WOT. It also fools many drivers into thinking they have as much entry speed as possible. Sneak up on entry speed until you feel like you can't go to gas before the apex.
- For some turns and some higher horsepower cars, there is a benefit from a brief delay between trail-braking and throttle application. Think about it as giving the car a few moments to settle, which will allow you to commit to WOT sooner. Turn 1 at Watkins Glen is an example where Ken Ernsting releases the brake, rolls speed a bit and then goes to WOT (in his Cup car).

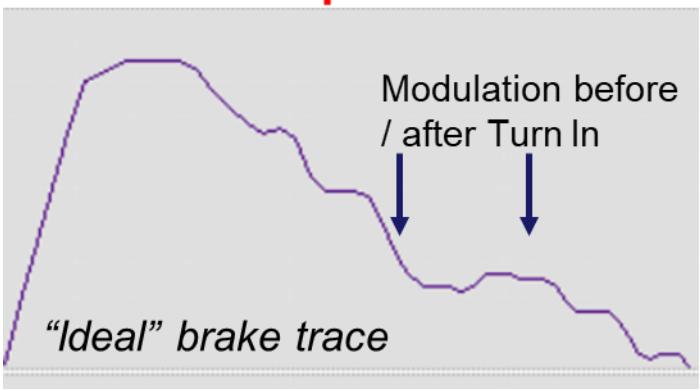
So we know we want to enter the corner at a consistent speed, which means a consistent brake pressure. We also know that we would like to be able to increase speed slightly to fine tune corner entry speed. How do we do that? We make sure that we can modulate brake pressure in the last part of the braking zone to achieve exactly what we want at turn in.

- It should be obvious but this means, if we are using every bit of the brakes in the brake zone by braking late, we will not be successful.

- The amount of trail braking (i.e. the amount of brake pressure after turn in) varies by corner. The slower the corner, the more trail braking will be required. Less trail braking in fast corners (e.g. Mid-Ohio Turn 1) or no trail braking (EOB before turn in, e.g. Watkins Glen Turn 10) will keep your car well balanced and allow you to carry more speed than you might otherwise think.

In other words, we need to brake early enough that most of the slowing happens well before turn in, allowing us to modulate the brakes before and during turn in so as to achieve a consistent (quick) speed at turn in and a consistent EOB. See Graph 4.

Graph 4



Does this mean braking earlier? Yes, until we've worked our way up to a fast entry speed that doesn't compromise EOB or WOT. Only if we have a consistent quick entry speed and exit speed (no WOT compromise) can we experiment with a later ATP.