When & How to Teach Trail Braking

A White Paper

by

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Important Stuff

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All of the material in this document is mine. In other words, it's copyrighted. However, in my strong desire to help high-performance driver education be consistently better, I encourage you to share this white paper with as many instructors and interested parties as you'd like. It's free to share. All I ask is that since it's my content, do not take credit for it (because then you'd also be responsible for any unintended errors in it!).

Keep learning and having fun!

Ross Bentley

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INTRODUCTION

The purpose of this white paper is to share my thoughts regarding *when* and *how* to teach trail braking to high-performance and race drivers.

I started teaching high-performance and race drivers in 1980, while in my second full season of racing a Formula Ford. Since that time, I've taught thousands of performance and race drivers – probably tens of thousands. I've instructed for a variety of schools, both professional and volunteer organizations, from Skip Barber to BMW CCA and PCA clubs, and from my own ProFormance High Performance Driving School to DirtFish Rally School. Additionally, I've trained thousands of drivers throughout the world, and consulted to dozens of schools and events through my Speed Secrets resources and programs.

Over the past 40-plus years of training drivers, my approach to teaching trail braking has changed, as I learned through experience what worked and didn't work. The thousands of drivers I've trained have been the perfect "test subjects" for me to learn when and how to teach trail braking.

Let's start by getting clear and consistent on exactly what trail braking is and isn't. The term "trail braking" is used to describe the *technique of continuing braking while turning into a corner – by gradually reducing the brake pressure while increasing cornering*. Trail braking is when you gradually release, ease, or "trail" your foot off the brake pedal while turning into a corner. If you've completed your braking entirely and your foot is off the pedal at the point you begin to turn into the corner, then you have not trail braked at all. If you have even the slightest amount of brake pedal pressure on while turning into the corner, then you are trail braking. Sometimes, your foot will finally be completely off the brake pedal within a foot or two past the turn-in point, and other times it won't be until you're practically at the apex. Either way, you're trail braking.

While braking to the apex would be trail braking, you don't have to brake that far into a corner to be trail braking. In fact, if your foot is still applying any amount of brake pressure after turning into the corner, then you're trail braking.

Trail braking is also not necessarily done with the left foot. In other words, you can trail brake with either your left or right foot.

There's also a difference between what some refer to as "brake-turning" or "rotating the car into the turn," and trail braking. The intention of "brake-turning" is to help rotate the car into the corner – to help change its direction more dramatically – by inducing a greater slip angle on the rear tires than the fronts. While trail braking can be used for the same reason, and therefore is synonymous with "brake-turning" in that case, that's not the only reason for trail braking.

Ultimately, trail braking is used to maximize the use of the tires' grip capabilities. While turning into a corner and building up to the tires/car's maximum lateral grip capabilities, the braking forces – and therefore, the longitudinal g-loads – are being reduced, trading off braking for cornering forces. In this case, the slip angles of the front and rear tires can be the same, with no additional slip at the rear to induce rotation.

Understanding the Friction Circle concept is essential to fully understanding the purpose for trail braking.

At this point, I should probably explain the difference between "rotating the car" into a corner versus oversteer. While both have a greater slip angle at the rear tires, rotating the car is something that the driver does intentionally, while oversteer is what the car is doing. You can think of it as rotating the car being *what the driver is doing to the car*, while oversteer is *what the car is doing to the driver*. Rotating the car is deliberate, and oversteer is what the driver has to deal with.

Why is it important to understand the difference between rotating the car and oversteer? Because many drivers confuse the act of trail braking as only being used to induce rotation, while that is not necessarily

the case. As stated already, trail braking is the act of combining braking and cornering; trading off braking for cornering forces to ensure that the tires' full traction capabilities are being used.

To recap, there are two reasons for trail braking:

- It helps you use all of the tires' traction throughout the corner. If you get to the turn-in point and suddenly take your foot off the brake pedal as you turn in, there will be a fraction of a moment when you are not using up all of the tires' traction - you could be using more and carrying more speed.
- It keeps load on the front tires so the car will turn into the corner better – it will change direction better.

A side benefit of trail braking (although this shouldn't be considered the main reason for using it) is that it often allows you to begin braking later, since you're ending the braking later.

Should trail braking be used in every corner? No. There are turns, especially very fast ones, where a driver should be applying throttle about the time they're turning into the corner, since this helps the car's balance and the overall grip level. As a general rule, the slower and tighter the turn (and therefore, the more change in direction that is needed), the more a driver will use trail braking to help rotate the car; the faster and more sweeping the turn, the less trail braking will be used.

* * *

I've written this white paper with the high-performance driving instructor in mind, as both reader and end-user. A goal is to build consistency amongst schools, HPDE programs, and instructors by establishing consistent vocabulary, as well as curriculum for the teaching of trail braking.

Finally, I have to be clear that everything in this document is my opinion, based on many years of experience – my own and that of many other drivers, trainers (instructors, coaches), and engineers who have shared their teachings, thoughts, and perspectives with me. As with every opinion, it should be questioned, and not taken as absolute fact. Still, when opinion is based on as much experience as I have presented here, I feel that what's included here is accurate.

> *"To me, braking is the single most important skill in road racing. I personally don't practice the old adage about braking only in a straight line. I like to cut the corner early and get the car set up early – even with the brake still on… When you get off the brakes is just as important as when you get on them."* – 2-Time Formula One World Champion, Jim Clark, from an article he wrote in 1964 for the Double 500 at Bridgehampton race program titled *Braking… Key to Better Lap Times*

> *"The more things change, the more they stay the same."* - French writer, Jean-Baptiste Alphonse Karr, 1849

WHEN TO TEACH TRAIL BRAKING

Imagine this: fifteen 4- and 5-year-olds are in a kindergarten class, and the teacher holds up an image of a dog while asking what it is. Excitedly, there is a scream, “Dog.” The teacher then holds up a photo of a cat and asks what it is. When the kids yell out, “Cat,” they’re told “No, it’s a dog.” Then a photo of a bird is held up; when the teacher asks what it is, only about half the group cautiously replies, “Bird.” Once again, the teacher says, “No, it’s a dog.” This goes on with images of elephants, fish, spiders, and snakes; in each case the kids are told that the animal they’re seeing is a “dog.”

What’s going on? The teacher has decided that these young minds are not smart enough to be able to hear the truth, to know the real name of each animal. Instead, the teacher has decided that the kids will be told that all animals are called “dogs,” and at some time in the future, “when I’ve decided they’re ready,” they will be told what each of the animals really are.

Silly, right?

Now, imagine this: fifteen adults, ranging in age from 25 to 65, are sitting in a classroom at a race track, listening to the instructor at a High-Performance Driver Education (HPDE) event talk about “How to work a corner.” The gray-haired instructor (I can say that because I’m one of them) says, “Coming down the straightaway, approaching a corner, start braking early enough that you can finish and take your foot off the brake pedal before you turn into the corner. It’s important to finish braking before turning the steering wheel.” Essentially, “You’re not ready to learn the right way to drive, so we’re going to teach you the wrong way, and then someday you’ll have to learn the right way.”

How is this any different from telling kids that all animals are called “dogs,” only to have to correct them when they get older?

Many drivers who are relatively new to track driving have a habit of releasing the brake pedal quickly, almost popping their foot off the brakes. Why? Because they’ve developed that habit from driving on the street, where the consequences of doing so are non-existent. So, telling them to get their foot off the brake pedal before turning into the corner is reinforcing this bad habit. What they should be taught in this classroom session – and everywhere - is to “smoothly, ease your foot off the brake pedal as you turn into the corner.” No mention of a thing called “trail braking” is needed at this time. Nor do they need all the details of how this easing off the brake relates to something called the Friction Circle, weight transfer, or anything else. But, teaching them the right technique is what’s needed.

All experienced, even remotely fast high-performance and/or race drivers – and I mean every single last one of them – trail brake to some extent, in most corners. Not all corners, but most. Some drivers trail brake more than others, but they all do it. That is, if they’re even somewhat quick. I’d argue that if they don’t trail brake, then they’re not fast, and for sure should not be instructing other drivers because they do not understand why trail braking is necessary. Yes, I’ve had drivers tell me that they don’t trail brake, only to watch them turn into a corner with the brake lights still on, or see from their data that they do, in fact, trail brake – they were unaware of it (again, I’d question whether this person should be an instructor if they’re that unaware of what they’re doing).

> *“This whole issue of trail braking or not trail braking is bullshit because every quick driver trail brakes, whether they talk about it or not. On fast racetracks, like you find in Europe, you might do it less, but in the States you have more tight turns where you have to carry the brakes in there to help point the car and to gain an advantage by going deeper. There should be no question about it. That’s that.”* – Robbie Buhl, 1992 Indy Lights Champion, Indy Racing League race winner (*Going Faster*)

I’m all in favor of teaching concepts and techniques in steps. That’s why I’ll sometimes coach a driver to begin improving their braking and corner entry speed by simply braking a little bit lighter. That’s easier and less intimidating than braking later. After getting comfortable with carrying a couple of MPH more speed into the corner by braking with less pressure, the driver will almost naturally begin to compress the

brake zone by braking harder and later. That's a progression of doing the right things. Telling a driver to deliberately get their foot off the brake pedal before turning into a corner is teaching them the wrong thing. It's teaching them to quickly release the brake pedal.

Remember this: *the super-trick advanced stuff that the best drivers do is nothing more than doing the basics better*. There are no super-trick techniques. Just things like releasing the brake pedal smoothly, done even better.

This applies to other aspects of driving, just as it does to trail braking.

If an instructor believes that new and newer drivers to the track are incapable of learning to release the brake pedal smoothly - even easing off of it while turning into corner – even though they themselves are, maybe this is a case of either the instructor needing to learn to control their own ego, or having too low of expectations for their students. Or, they don't have the necessary understanding and knowledge to be an instructor.

How do I know that novice drivers are capable of learning to ease off the brakes – to essentially trail brake (even though they may not know they are doing so) – without any major risk of spinning and crashing? Because I've taught thousands of drivers to do so. And get this: there was a time where I would encourage drivers to finish their braking before turning in. Yes, I taught them the wrong thing. But then I decided to give novice drivers the benefit of the doubt, and expect them to have success. Guess what happened? They learned more in less time, without having to go back and correct what I'd taught them wrongly in the first place, and without any – absolutely no – additional risk or danger.

Let me address the belief that some instructors have that learning to trail brake is more dangerous. It's not! Super-late braking may be; continuing to turn into a corner with a lot of brake force being applied may be. But smoothly easing off the brakes while turning into a corner is not. In fact, since the car will be better balanced, it is a safer approach. I've seen just as many drivers get into trouble in a corner from taking their foot off the brakes before turning in (the driver almost in a panic mode to "finish all your braking before turning in") than I have from turning in with too much brake on.

If drivers are taught what trail braking is, and what it isn't (even if they're not necessarily taught the term "trail braking" yet), and the importance of smoothly easing their foot off the brake when initiating a turn, it's as safe a technique to learn as beginning to squeeze on the throttle exiting a corner. And it's critical to build the right habits from the very beginning.

> *"Our philosophy is that it is easier in the long run to learn the skill and sensitivity required to brake and turn right from the beginning rather than learn a technique that will then have to be modified at a future date. If you choose to continue braking past the turn-in point, be it 150 feet or two feet, we call this 'trail braking.'"* – Carl Lopez, Skip Barber Racing School (*Going Faster)*

Some instructors and schools refer to trail braking in different ways, such as "transition braking," "trade-off braking," or "brake-turning." I understand why this is being tried. However, when a term like trail braking is so baked into the sport as it is (it's the Kleenex of brake release!), I see no benefit in doing so. I also see confusion with multiple terms, even when "brake-turning," for example, is more nuanced – and possibly more accurate. Heel and toe is a term that's not accurate today, and yet it's so ingrained in our vocabulary that there's no reason to change it.

In the mid-70s, Skip Barber coined the term "trail braking." Then, in the 90s, his school and instructors began using "brake-turning" to emphasize using trail braking to help rotate or turn the car, particularly in tighter/longer corners. So, when looking for different ways to explain trail braking, and coaching a driver to improve their existing trail braking technique, this is a great term to *enhance* your vocabulary around the topic (but not replace it).

Ultimately, trail braking describes perfectly accurately the act of trailing one's foot off the brake pedal. Also, when looking at a data trace of brake pressure, there should be a "tail" on the curve. Let's call it what it is: trail braking.

* * *

Back in 1978, before I started racing, I attended a 5-day competition driving course at the Jim Russell Racing School at Willow Springs Raceway. There, I was taught to complete all of my braking before turning into every corner. When I did my first few road races, I did what I was told… and lost. After some self-reflection (I didn't have data and in-car video at that time), along with watching some other drivers, I noticed something: they seemed to be able to carry slightly more speed into corners without it negatively impacting their exit speed.

I had also just finished reading Jackie Stewart's books, where he claimed the reason he won more Grand Prix races in his day than anyone else was because of the way he took his foot off the brake pedal. Since everything he preached about driving was around smoothness, I figured I needed to release the brake pedal smoother. When I then read Mark Donohue's *Unfair Advantage* book, where he introduced me to the Friction Circle concept, I knew I needed to learn to ease my foot off the brake pedal while turning in. More importantly, I understood why. To be honest, I don't even remember whether I knew that what I'd figured out was that I needed to "trail brake"; I don't know if that phrase was in my vocabulary yet.

I spent weeks driving on the street, practicing releasing the brake pedal smoothly, while turning into corners. I would go out and drive my street car every evening, exaggerating how far into intersection and freeway off-ramp corners I was before finally releasing the brakes. I would trail brake deep into every corner on purpose, focusing on smoothly releasing the pedal. When I next raced, I got my first Formula Ford win, and I knew it wasn't a coincidence. Trading off braking for cornering grip was the way to drive fast.

Shortly after that, I recalled a conversation I had had at the Russell school with my instructor. He said something along the lines of, "This technique of doing all your braking on the straight before the corners will do for now. The school hopes that you'll come back for more advanced training, and then I can show you how to drive even faster. The school loves it when drivers come back to learn more!" It hadn't been obvious enough to me at the time that they'd taught me the wrong way to use the brakes, in the hope that I'd spend more money with them to learn the right way in the future.

* * *

When should trail braking be taught to performance/race drivers? From the very beginning, even if the details of why, or the phrase "trail braking" is not used. It doesn't matter whether the driver is a novice in an HPDE program, or someone being trained at a professional racing school to become the next World Champion, it's the same thing. Drivers of all experience levels should be taught to smoothly ease their foot off the brakes. Teach it now and forever – as I'll outline in the next section.

HOW SHOULD TRAIL BRAKING BE TAUGHT

For a high-performance or race driver to learn trail braking, the appropriate amount and timing of both classroom/theory and in-car/practical instruction is needed. Because almost every training program – the curriculum - for high-performance and race drivers is different, I can't tell you exactly when drivers of all levels should be taught trail braking, both in the classroom and on the track. Instead, I'll provide the basic desired outcomes for novice, intermediate, and advanced drivers, and leave it to the instructor to integrate this with their curriculum.

GENERAL OVERVIEW OF THE TEACHING OF TRAIL BRAKING

Novice

With novice drivers, I do *not* recommend using the term "trail braking" at all. The only thing needed to be taught at this level is to smoothly release the brake pedal. For some drivers, this will only be reinforcing a habit they already have; for other drivers, it will be the start of replacing a bad habit with a good one.

There is no need to go in-depth with discussions about weight transfer, or the timing of when the smooth release of the brakes should occur. There is, however, a need to introduce the idea of "slow in-fast out," and how it's important to get most of one's braking completed on the approach to the corner. Stressing the idea that most of the braking is done prior to turning into the corner is also a good idea (I like to say that two-thirds of the braking should be done in the first third of the brake zone). But leave it there. Keep it simple.

For the in-car instructor, it is important to be aware of how hard the initial application of the brake is, and how smooth the release. In most situations where an inexperienced driver is accused of having a spin or off-track excursion due to trail braking into a corner, the real reason was that the driver did not apply enough brake pressure early in the brake zone. In other words, not hard enough initial pressure of the brakes. In this situation, the driver is entering the corner with "panic braking," and not trail braking, because they didn't take enough speed off before turning in. As with many mistakes, the real reason for it was at least two or three steps back (it may have even been caused by the driver getting a better exit out of the previous corner, resulting in an approach to the next brake zone with more speed than ever before).

Inexperienced track drivers typically don't brake hard enough at the beginning of the brake zone, then quickly release the pedal when they get to the corner. As an instructor, it's critical to identify this immediately, and begin the process of changing this behavior. Helping the driver to "flip the brake pressure curve around" with a hard (but still smooth) initial application, and then a smooth release, is the habit (mental program) needed. It is the foundation of good fundamentals, of good braking technique. Everything else builds on this.

Learning Outcomes for Novice Drivers -

- Demonstrate smooth brake release on track, and have a basic understanding of why this is important.

Intermediate

Intermediate drivers should definitely have an understanding of weight/load transfer, and the most fundamental knowledge of what the Friction Circle tells us. For example:

- Tires can only do 100% of one thing: braking, cornering, or acceleration.
- If you release the brake pedal quickly before turning into a corner, there will be a time when the tires are not being used to their full capabilities.
- As you turn into a corner and you need 10% of the tires' grip to turn the car, you can only use 90% for braking; then you'll ease off the brake to 50%, giving 50% to be used for cornering; then 25% for braking and 75% for cornering; and eventually 0% for braking and 100% for cornering. This is generally referred to as the "100% tire rule."
- The "string theory" can be introduced at this time: Imagine a string tied from the bottom of the steering wheel to the top of the brake pedal. When the driver is braking hard, the string is tight and the steering wheel is pulled straight; as the driver begins to turn into a corner, the string will

pull up on the brake pedal, easing the pressure off of the brakes; when the steering wheel is turned fully for the corner, the brakes cannot and should not be applied at all. Of course, this theory should also be applied to the application of the throttle, but for this document, we're focusing on the braking and corner entry portion of the track.

Learning Outcomes for Intermediate Drivers -

- Understand why releasing the brake pedal smoothly is important to driving fast, with control.
- Demonstrate smooth and deliberate release of the brakes while entering a corner
- Understand the Friction Circle, at least to the point of comprehending and using the "100% tire rule."
- Introduced to, and fully understand Begin-of-Braking (BoB) versus End-of-Braking (EoB). When driving, they should be visually and mentally aware of the EoB, encouraging them to look further into the corner during the approach.

Advanced:
By this point in the driver's education and experience, learning about and practicing trail braking should not be anything new. Now, it should be about a deeper understanding prior to fine-tuning the technique on the track.

Learning Outcomes for Advanced Drivers -

- Fully understand how to use trail braking as a tool, as a technique, to help them be consistently faster, with control. They may not have it mastered, yet; in fact, this may be the main area of their driving that they're working on improving.
- Fully understand the Friction Circle concept, particularly why the shape of it is not actually a circle.
- Manage both their BoB and EoB in a deliberate way, and be working towards fine-tuning brake pressure throughout the brake zone, and particularly the timing and rate of release of the brakes when entering a corner.

SPECIFIC TEACHING OF TRAIL BRAKING
Classroom/Theory
Topics that should be presented in a "classroom" setting are:

- Inverting the typical road driving braking technique (introducing a smooth/hard initial application with a smooth release)
- Begin-of-Braking (BoB) versus End-of-Braking (EoB)
- What trail braking is and isn't
- Why trail braking is used
- The 100% tire rule
- The timing and rate of release of the brakes
- Load transfer, balance, and the impact on handling

When each topic is presented is dependent on the number of sessions drivers will experience, how much time is available, and the past experience of the drivers.

As with anything that involves a complex and timing-critical physical technique, the more drivers can get a clear mental image of what's required, the more likely it is they'll perform on track. Simply talking about what trail braking is, why it's used, and what doing it actually looks like is not enough. Illustrations, videos, and physical experiences in the "classroom" (mental imagery/visualization, physical movement), whether in-person or online, will help drivers turn theory into practical ability. The specifics of these learning tools are not the purpose of this document.

In-car/On-track
With less-experienced drivers – novices and perhaps low-level intermediates – the focus on-track should be solely on releasing the brakes smoothly, and not popping off the brake pedal. Stay away from using the term "trail braking," while reinforcing a smooth end to the brake zone.

Help drivers picture braking for every corner as a process, and a zone – not merely a point where one begins braking. There's a beginning, a middle, and an end that makes up the brake zone.

Begin to introduce reference points for BoB, but ensure the driver understands that these are places to "index" the beginning of braking, and not an exact "you must brake here" points. They need to know that the BoB will change, as often as lap-to-lap, based on the speed the car is at when reaching the brake zone (and even weather and tire condition).

With more experience, drivers should be focused on the Turn-in and EoB while approaching the BoB, both visually and mentally (that's what they're thinking about).

As drivers move to the Intermediate experience/proficiency level, deliberate practice of trail braking can be introduced. There is no big need to worry about drivers spinning when practicing trail braking, if they have an understanding of what it is, and why it's used. It shouldn't be so extreme that there's extra risk. Trail braking, at this stage, is simply a more purposeful use of a smooth brake release. Whether the term "trail braking" is introduced at this stage is dependent on the overall curriculum, and more importantly, a driver's readiness.

When specifically introducing and having a driver practice trail braking, pick a corner where it will be a benefit, such as a relatively tight radius corner that requires changing direction of the car a fair amount. It's best if the corner has relatively lots of runoff on the outside of the turn, as that will help from the comfort level perspective.

Have the driver start by doing laps solely focused on where their EoB (End-of-Braking) point currently is. If it's right at the point they turn into the corner, or 10 feet past it, halfway to the apex, or whatever, it doesn't really matter – other than you wanting them to become aware of it. They might find that they're already trail braking more than they thought. Have them do enough laps to the point they're able to be fairly certain as to where they currently release the brake pedal – the EoB (think of it as the point where you'd notice their brake lights going off if you were following them).

Now, have them do some laps where all they focus on in one or two corners is being slower with the release of their brake pedal. In doing so, they'll notice that their EoB is now a bit later, and they're trail braking more – without any big drama! If they find that the car is now rotating or changing direction a little more easily (turning in quicker), then the trail braking is helping. If they find that it isn't rotating, then the slower release is probably just over-slowing the car, and they don't have enough corner entry speed for the trail braking to really have much effect on the rotation. In that case, they need to move the whole brake zone in. In other words, make their BoB and EoB later – shift the entire brake zone in. By doing so, they'll enter with a little more speed, trail brake a little longer, and the car will rotate more.

When I say "move their brake zone in," I don't mean by 100 feet! Start off with one car length later, and see what that does. If there still isn't much rotation, move it in another car length; then another, if needed. At all times, they should be aware of the EoB. In fact, as they approach the brake zone, they should be looking to the EoB, and only notice the BoB with their peripheral vision.

This is a step-by-step process. First, be aware of the EoB, then slow the brake release, then move the brake zone in (if necessary) – but in "car length" steps.

> *"Bring your foot off the brake pedal gently and progressively. The whole sequence should be one gentle, sensitive, flowing movement. You want the nose of the car to come up gently and undramatically… Oh yes. It's not when you brake but when you take them off that counts. Most people don't understand that."* – Sir Jackie Stewart

With advanced drivers who want to fine-tune their trail braking, and make more deliberate use of it, the main drill or exercise that I use when coaching drivers at this level is getting them to spend an entire practice session just on experimenting with the *timing and rate of release of the brakes*. Entering a

corner, the driver can begin releasing the brakes before they start turning the steering into the corner, at the exact same time, or after they begin turning in; then, they can release the brakes slowly, quickly, or somewhere in between.

When I said “an entire practice session,” that doesn’t mean that this is a one-and-done deal. No, drivers should do this every now and then, and continue to fine-tune their braking.

There are a multitude of timings and rates of release of the brakes. Many drivers use the same timing and rate of release in all corners, but that can’t be right. Some corners reward an early and fast release, others a late and slow release, others an early and slow release, and so on.

The better drivers get at adapting the timing and rate of release of the brakes, the faster they’ll be in all corners, and not just the corners that suit their current brake release style. So, the drill is going on the track and experimenting with varying the timing and rate of release in a very deliberate way.

- Spend a couple of laps with an early and slow release
- A couple of laps with an early and fast release
- A couple of laps with a late and slow release
- A couple of laps with a late and quick release.

Have the driver mentally make note that when they do “this” (i.e., release the brakes late and slow), the car does “that” (i.e., rotates a lot); and when they do “that” (i.e., release the brakes early and quickly), the car does “this” (i.e., understeers). Help them build a mental matrix of “if… then…” scenarios, so when they want the car to do “that,” for example, they’ll know what to do.

This has been one of the most effective exercises ever for the drivers I’ve coached. They come away not just being a bit faster, but more consistently faster because they’re now better at adapting to what the corner and car needs.

For many drivers, the biggest and brightest “Aha!” lightbulb moment is when they truly understand how they can use trail braking in a purposeful way that enables them to move the brake zone in, carry more minimum corner speed, and begin accelerating out of the turn earlier than ever before!

> *"It is amazing how many drivers, even at the Formula One Level, think that the brakes are for slowing the car down."* – Mario Andretti

EMBRACE TRAIL BRAKING

High-performance and race drivers the world over will tell you that the most challenging and enjoyable part of driving a car at, or near, the limit on a track is the braking and corner entry phase. Certainly, figuring out the ideal line, and accelerating out of turns is a blast. But approaching a corner, braking, downshifting with the tires at their limit, the car twitching to jump out of line… turning in to carve an arc towards the apex as you release brake pressure with subtle ankle and toe flexure in a perfectly coordinated blend of longitudinal and lateral forces, managing the car's load, emphasizing grip on the chosen tire(s), rolling the "just right" speed in, sensing the car's rotation around the slightest additional slip angle of the rear tires compared to the fronts, clipping past the apex, the car begging for throttle and accelerative thrust… That's why we do what we do.

The true magic of driving a car at the limit is in the timing and rate of release of the brake pedal as you enter a corner at speed. That is trail braking. While it is a magic feeling, it is a fundamental skill that must be learned from the very beginning. Do not deny yourself or others of this thrill.

> *"Driving a car at the limit exiting a corner is like tight-rope walking; entering a corner with the car on the limit is like jumping onto a tight-rope blindfolded."* – Mark Donohue

Embrace trail braking!

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If you'd like to share your thoughts with me, or you have questions, contact me at info@speedsecrets.com.