BFGoodrich Tires

PERFORMANCE DRIVING GUIDE

WITH ROSS BENTLEY

In collaboration with Ross Bentley

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WHERE PASSION MEETS PERFORMANCE

BFGoodrich is proud to say that we've been passionately performance-driven since the start. From the deserts of Baja to the 24 Hours of Le Mans, our rich heritage of successful performance racing helps ensure that your vehicle is ready for any challenge, at any time.

We've faced much adversity through the years in on- and off-road racing, which has taught us many important lessons about the way tires perform. Our engineers have applied this knowledge to every product in every segment.

So, no matter what type of driving fuels your passion, you can be assured that our tires are up to the task.

CONTENTS

PERFORMANCE IS IN OUR DNA

1870
BFGoodrich is founded

1896
First U.S.-Built pneumatic tires

1903
First cross-country trip

1914–15
First brand to win the Indy 500 two years in a row

1927
First tires to cross the Atlantic

1969
First 60-series Radial T/A tire

1970
First street tire to top the podium in Trans-Am

1972
Turning heads at Circuit de la Sarthe

1981
First tires to leave Earth

1984
Conquering Le Mans

1985
Mastering IMSA with Porsche

1999
g-Force KDW tire launches

2009
g-Force is the official MX-5 Cup tire

FOR MORE THAN 150 YEARS, BFGOODRICH HAS BEEN ENGINEERING CATEGORY-DEFINING TIRES.

From being the first company to bring radial tires to North America to dominating IMSA and even building the first tire NASA trusted to go on its space shuttles, we've used the world as our proving grounds in our never-ending pursuit of better engineering.

MILD TO WILD, BFGOODRICH HAS YOUR TIRE NEEDS COVERED

G-FORCE COMP-2 A/S PLUS

G-FORCE PHENOM T/A

G-FORCE RIVAL S & RIVAL+

TAKE THE ROAD & MAKE IT YOURS

ALL SEASON

G-FORCE COMP-2 A/S PLUS

OUR BEST ULTRA-HIGH PERFORMANCE ALL-SEASON TIRE EVER

- EXCELLENT WET & DRY PERFORMANCE
- GOOD TREADLIFE
- CONTROL IN ALL SEASONS
- 45,000-MILE TREADWEAR LIMITED WARRANTY
- STANDARD WARRANTY (6-YEAR LIMITED)

COMP 2 A/S

BFGoodrich Tires

SUMMER

G-FORCE PHENOM T/A

SUMMER TIRE DELIVERS ULTRA-HIGH PERFORMANCE IN WET AND DRY CONDITIONS

- OPTIMIZED FOR EXTREME HANDLING
- EXCELLENT WET & DRY PERFORMANCE
- STANDARD WARRANTY (6-YEAR LIMITED)

BFGoodrich Tires

200 TREADWEAR

G-FORCE RIVAL S & RIVAL+

EXTREME SUMMER PERFORMANCE TIRES FOR TRACK AND STREET

RIVAL S is quick to warm up with maximum dry performance for autocross, time attack, or time trials.

RIVAL+ delivers long lasting performance and wet handling capability, for endurance-based track events.

- ULTIMATE GRIP
- DOT-LEGAL COMPETITION TIRE
- STANDARD WARRANTY (6-YEAR LIMITED)

BFGoodrich Tires

RESPONSIBILITY & DRIVER SAFETY

RESPECT THE LIMITS

As in all forms of driving, there is a level of risk involved in high-performance driving.

With risk comes responsibility.

With responsibility comes an understanding of vehicle dynamics, cornering abilities, mindset, and decision-making.

DRIVE RESPONSIBLY

The purpose of this guide is to give you a foundation from which to build your knowledge and experience. But ultimately, the responsibility to use this is in your hands (more accurately, in your mind).

Everything we present here is meant to be used within the letter of the law, and more importantly, within the laws of physics. Your tires are at the core of this, and we ask you to respect their limits — as much as we at BFGoodrich do in building them. Respect the limits of the roads, tracks, and fellow drivers around you, at all times.

SAFETY CHECK

Before you hit the road, make sure you are safe and prepared.

WEAR YOUR SEATBELT

Always wear your seatbelt and stay buckled up. This applies to both street driving and, of course, on the track.

AVOID DISTRACTIONS

Stay focused on driving and avoid distractions such as using mobile phones, eating, or adjusting in-car entertainment systems while driving.

OBEY ALL TRAFFIC LAWS

The fundamentals discussed in this guide can also apply to driving on public roads, but always within the limitations of the law. There's no room for driving aggressively or in violation of the law on public roads.

BE AWARE OF CONDITIONS

High-performance driving can be significantly affected by weather conditions. Avoid driving in extreme weather such as heavy rain, snow, or ice, as these can compromise tire grip and vehicle control.

NO DRUGS OR ALCOHOL

Do we really need to say this? Please always follow the law when operating a vehicle.

ELECTRONIC DRIVER/SAFETY AIDS

Modern cars have an abundance of safety systems and “electronic driver aids” to help keep you safe. From ABS and Traction Control, to Emergency Brakeforce Distribution and Stability Control, these systems are all meant to assist you, and not make up for a lack of driver inputs.

There’s no doubt that the vehicles we drive in the future will only get more technologically advanced, with more and more safety-, convenience-, and efficiency-focused devices and aids. Still, until we as drivers are replaced entirely by autonomous vehicles, the responsibility is ours to drive within our limits.

Ultimately, what any safety system does is help keep your car — and at the core, your tires — within the limits of the laws of physics, when you, the driver, unintentionally exceed them. Respect these limits.

LIMITATIONS

These controls, systems and designs are undoubtedly improving overal vehicle safety. However, the downside of this technology is that it can lead to complacent (or even wildly over-confident) drivers on the road. After all, they’re able to make a vehicle go around a corner very fast, and they feel completely in control, when it’s really the safety systems that are controlling things. Add in the distractions that come with other forms of technology (texting, email, entertainment systems), and there’s no wonder that despite safer vehicles, the number of crashes on our highways each year are not reducing as much as they could.

Know what driver and safety aids your vehicle has, how they affect your driving, and what their limitations are. But never forget that you, the driver, are in control of these limitations.

TAKE CARE OF YOUR EQUIPMENT

Paying close attention to your vehicle and its components goes a long way:

PRIORITIZE VEHICLE MAINTENANCE

Your vehicle needs to be in top working order and should be maintained in accordance with the original equipment (OE) service intervals, using high-quality parts that meet or exceed OE standards.

CHECK TIRE PRESSURE REGULARLY

Make sure your tires are inflated to the recommended pressure levels. Under-inflated or over-inflated tires can affect vehicle handling and increase the risk of collision.

INSPECT TIRES FOR WEAR AND DAMAGE

Regularly check your tires for signs of wear, damage, or punctures. Replace tires that are worn out or damaged to maintain optimal performance and safety.

PRE-TRACK CHECKLIST

Here are some specific things to remember before going out on track:

CONSIDER A SIM

Simulators are used by top racing teams for a reason. They are a relatively low-cost and risk-free way to practice and drill fundamentals, learn new techniques, explore new tracks, etc.

KNOW THE TRACK RULES

If you're driving on a track, make sure you're familiar with and adhere to all track rules and regulations. This includes understanding flag signals and following the instructions of track officials.

USE APPROPRIATE SAFETY GEAR

In addition to wearing a seatbelt, consider using other safety gear such as helmets, gloves, and fire-resistant clothing, especially during track events. Check with your sanctioning body to ensure your safety gear meets or exceeds their requirements.

UNDERSTAND YOUR VEHICLE'S LIMITS

Every vehicle has its own performance limits. Familiarize yourself with your vehicle's capabilities and avoid pushing it beyond its designed limits.

TEST NEW TECHNIQUES OUT IN INCREMENTS

Don’t go full send when trying out heel & toe rev-matching or left foot braking for the first time. These advanced techniques are meant to be eased into, starting with the basics and gradually working up towards the limit of the driver and vehicle’s capabilities.

JOIN THE "NO ACCIDENTS" MOVEMENT!

High-performance drivers take responsibility for their actions, whether at fault or not. And they're committed to changing the way others drive by using the proper language.

THERE ARE NO ACCIDENTS

You will noticed that we never use the word "accident" in this guide. An accident is "an unavoidable act of fate." A meteor falling out of the sky and crushing your car is an act of fate. Two cars crashing into each other is not.

There is a movement within our high-performance driving world, one that we'd like you to help promote: Eliminate the use of the word "accident" when describing a crash.

Help change the world by eliminating the use of the word "accident" to describe car crashes.

The moment we use "accident," we absolve the driver or drivers involved of a sense of responsibility. "It was an accident. There was nothing I could do..."

Remember what we said about taking responsibility for what happens when we're driving, no matter whose fault it is. When we take responsibility for our actions, and even for what others do, we reduce the number and severity of crashes. And that's not a bad thing.

WHAT IS HIGH-PERFORMANCE DRIVING?

Chris Gill / WestBoundary Photography

While there is no "official" definition of high-performance driving, think of it as performing everything behind the wheel at the highest level possible.

You can maximize your performance in all areas of driving, from parking to cornering on a race track, from smoothly progressing in rush hour traffic to making smart decisions. Yes, to be a high-performance driver, you don't even need to drive on a race track, but you do need to perform at a high level.

We want to make one thing very, very clear. When we talk about high-performance driving on the road, we do not necessarily mean driving fast. We do not mean breaking the law in any way. This is not just some legal disclaimer. We mean it. There is no need to drive illegally on the street to enjoy high-performance driving, or to be a high-performance driver.

WHY CHOOSE HIGH-PERFORMANCE DRIVING?

A FEW REASONS YOU MIGHT WANT TO BE A HIGH-PERFORMANCE DRIVER:

- The satisfaction of controlling a vehicle, and knowing you are doing something others can't or won't
- The thrill you experience while sensing and using a vehicle's limit (and its speed)
- The feeling of being in the moment — present with the act of driving
- The simple enjoyment when you work with the controls to make the car do what you want it to do
- The pleasure and delight of continually learning more about and improving your driving

USE YOUR ROAD DRIVING TO MAKE YOU A BETTER TRACK DRIVER — LEGALLY!

You drive more on the street than you do on the track (unfortunately!). So, take advantage of that time. Again, you don't need to drive fast to practice high-performance driving techniques. But, you can build "muscle memory" by driving the right way on the road.

Part of being a high-performance driver is knowing when and where it's safe and appropriate to drive fast — which is on the track. But you can practice a lot while street driving that will make you a better track driver, and you can do that without driving fast. Be smart, and program your performance driving techniques.

PROGRAM THE "RIGHT" TECHNIQUES ON THE ROAD. PRACTICE.

Of course, driving on a race track can also make you a better driver on the street. Everything we talk about in this guide is meant to help you with that, too.

> This guide is not about racing, per se. You don't need to race to be a high-performance driver. The line between performance and race driving is the competition aspect.

High-performance driving is not about beating another driver, there are no "results," no trophies, no winners or losers. The competition in performance driving is internal — competing with yourself to improve or beat your personal best. If you want to compete wheel-to-wheel, door handle-to-door handle, then we strongly recommend you go racing.

And, this book can give you some basics. After all, the first step in racing is driving fast and well, and that's one of the goals for this guide.

So, whether you only drive on the street and highway, or whether you also head to a race track to drive every now and then, this guide is for you.

But you don't learn to drive a car by reading a book! You learn by doing, by being behind the wheel and actually practicing. However, a guide like this will help you learn more in less time behind the wheel. It'll prepare you to make the most of every second you spend driving, and it will help put what you experience into perspective. It will help things "click."

HABITS — YOUR MENTAL PROGRAMMING

You'll see a theme in this guide: You do what you do because you're mentally programmed to do so (you have habits).

Also, you sometimes don't do what you want because you either don't have the mental programming (habit) to do it, or, every now and then you access the wrong program (you make a mistake).

Some habits, or mental programs, are good; some are not.

Driving with two hands on the steering wheel is a good habit, while holding the wheel with one hand at the 12 o'clock position is not. Smoothly releasing the brake pedal is a good habit; snapping or popping your foot off the brakes is not.

Your goal, then, is to break bad habits and build good ones. To do that, you first need to be aware of which ones are good, which ones are bad, and how to change them. It's really the purpose of this guide.

SPEED READ

BREAK THE BAD HABITS
GROW THE GOOD HABITS

TECHNIQUE

The following high-performance driving techniques apply equally to driving on the road and track. Since the ultimate use of them is when driving on a race track, we will demonstrate many of them there.

TIP #1

The most advanced driving techniques and skills used by the best drivers in the world boil down to one thing:

DOING THE BASICS BETTER THAN EVERYONE ELSE. THAT'S REALLY IT!

Chris Gill / WestBoundary Photography

STEERING WHEEL

Hold the steering wheel at 9 & 3 o'clock. Simple as that. You should be able to drive almost all corners without moving your hands from this position.

The less you turn the steering wheel, the smoother and faster you'll be. The less you move your hands on the steering wheel, the smoother you'll be.

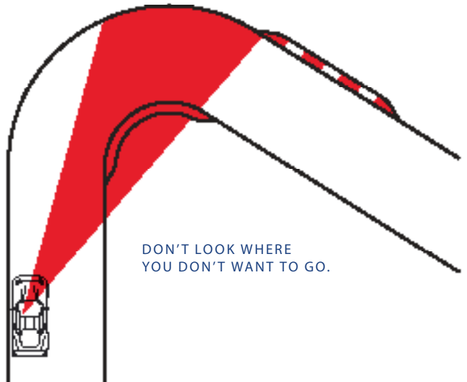
SPEED READ

THE LESS YOU MOVE YOUR HANDS, THE FASTER AND MORE IN CONTROL YOU'LL BE ABLE TO DRIVE.

VISION

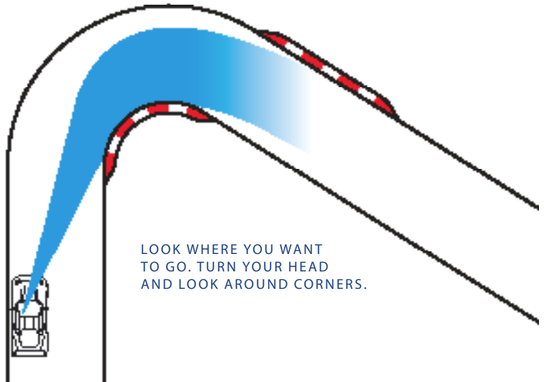
You use three senses to drive a car well: sight (vision), sound (auditory), and touch (kinesthetic).

Since vision is what gets us to where we want to go, it may be the most important (although feeling and hearing are critical to sensing the limits of your car).



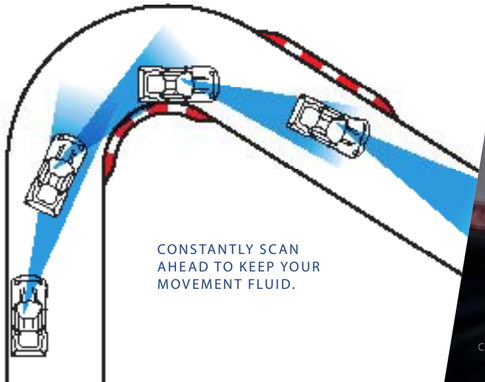
STEERING TECHNIQUE

- Look ahead, as far as you can.
- Look where you want to go, and not where you don't want to go.
- Turn your head and look around corners.
- Think around corners as you look through them.



Your hands follow your eyes, so look where you want to go, and your hands will turn the steering wheel appropriately to follow.

Here's another way to look at what to do with your vision: Constantly scan and look further ahead, keeping your eyes moving in a smooth, flowing movement.



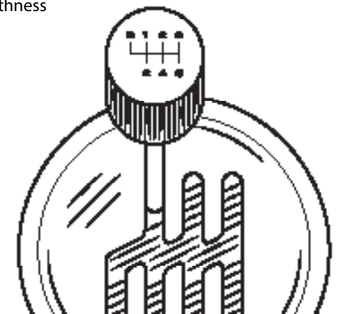
Chris Gill / WestBoundary Photography

SHIFTING

Whether you drive a manual, paddle, or automatic transmission vehicle, shifting gears is part of high-performance driving.

THERE ARE TWO CRITICAL ASPECTS:

1. Timing of upshifts and downshifts
2. Smoothness



Getting the timing of upshifts is relatively easy — use the tach to find the best RPMs for maximum power, or let the engine's computer do the work for you. But downshifts, whether you're using a clutch and moving a shifter, or clicking a paddle, finish any downshifting for a corner BEFORE turning the steering wheel. A downshift while cornering can, and mostly likely will, upset the balance of the car, increasing your chances of losing control.

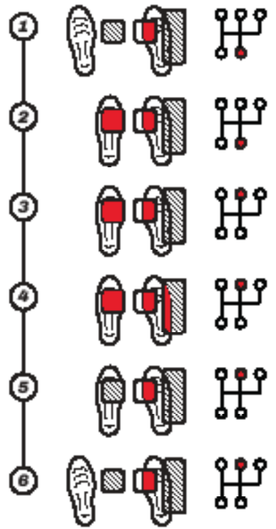
If you're driving a manual shift car, then being smooth with downshifts is more challenging, and that's where a "heel and toe" technique comes in. With it, you're braking and quickly revving the engine to match RPMs with the driving wheels, so that you can't actually feel that moment when you release the clutch while you downshift.

HEEL & TOE DOWNSHIFTING STEP BY STEP

The technique's purpose is to allow you to brake fully, while "blipping" the throttle (your right foot operating both the brake and gas pedals simultaneously) so your downshifts are smooth (not upsetting the balance of the car). You'll never be as good a high-performance driver as you can be until you master heel & toe downshifting. And even if you drive a car with a paddle/semi-automatic or automatic transmission, you should still understand the why and how behind heel and toe.

WHY DOWNSHIFT?

To get your engine in the best RPM range for maximum acceleration out of a corner. Notice that it's not to slow the car down. That's what the brakes are for. When approaching and driving through a corner, though, use the tallest/highest gear possible. It may feel and sound fast to downshift to a lower gear, but often that over-slows you for the corner, as well as upsetting the balance of the car (more about this shortly).



VEHICLE DYNAMICS

TIRES

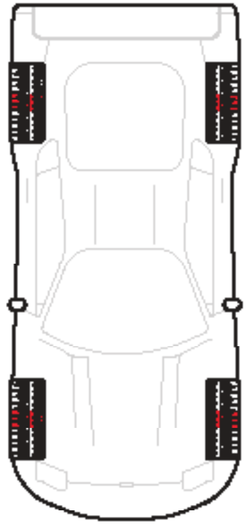
Everything you do with the controls of your car — the steering wheel, gas and brake pedals, transmission — affects the amount of traction your tires have.

It is important to note that the only thing connecting you and your car to the road/track are the four tires — and specifically the “Contact Patch” of each tire, which is the small area of the tire that is actually in contact with the road/track surface.

WEIGHT TRANSFER & TRACTION

Assuming a car has equal weight distribution — front to rear — when it's moving at a constant speed, each tire has about the same amount of traction. The car is balanced.

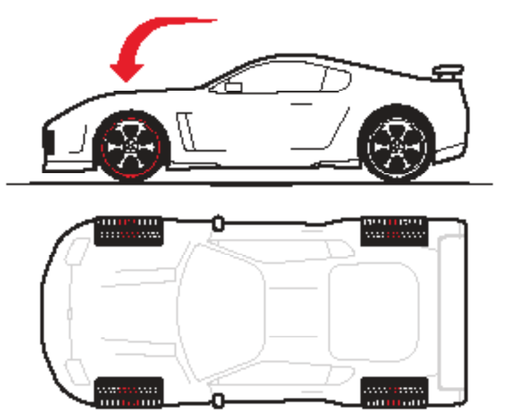
When a tire has more load or weight placed on it, the Contact Patch expands slightly, increasing the traction on that tire.



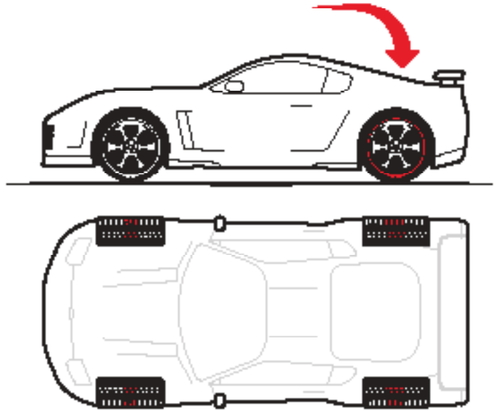
THINK ABOUT IT

PUSH DOWN ON A RUBBER ERASER AND PUSH IT ALONG A PIECE OF PAPER. THIS IS HOW TRACTION WORKS.

When you brake, weight transfers forward, putting more load on the front tires, and giving them more traction than the rears (which have reduced traction because they've had load taken off them).

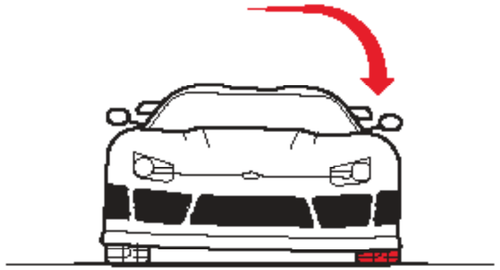


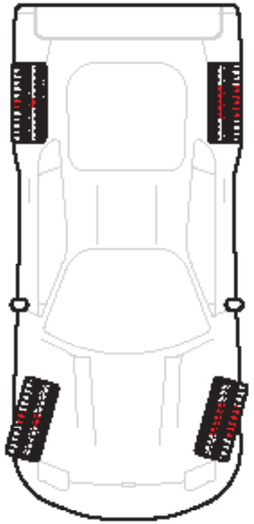
When you accelerate, weight transfers to the rear tires, and they now have more traction than the front tires.



Weight transfer also happens when going around corners.

Weight transfers to the tires on the outside of the turn, causing them to have more traction than the inside tires. As the outside tires have more load put on them, they gain traction; as the inside tires have load taken off them, they lose traction.

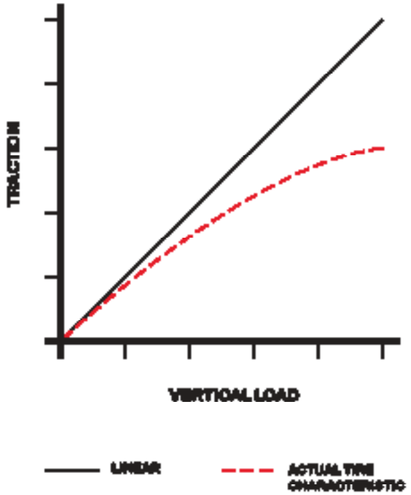


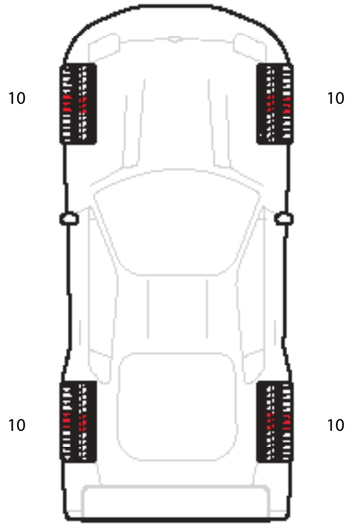


But here's the big thing: As this graph shows, the more load on a tire does not result in a corresponding increase in traction.

It's not a linear relationship — they gain grip, but not at the same rate as the load increases.

When looked at from the perspective of all four tires on your car, the tires that gain more grip from the extra load don't gain as much as the tires that are un-weighted lose. So, just when you need the traction the most — when going around a corner, for example — you actually have less traction. This has to do with the physics of how rubber tires interact and grip the track surface (which is a step beyond the scope of this guide).





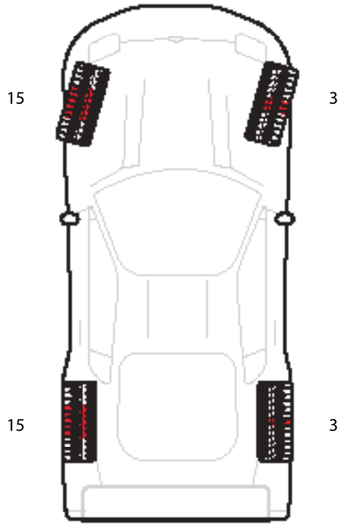
TRACTION UNIT NUMBER

To help you better understand how traction and load work, let's use a "model" or analogy, and call it the Traction Unit Number concept (as shown in the illustration to the left).

If you could measure the amount of traction each tire has when the car is balanced and traveling at constant speed down a straightaway, you would see that each tire has 10 "units of traction" (again, this is a model, a concept, and not something that you can actually measure like this).

SPEED READ

EVERY MOVE THE CAR MAKES RESULTS IN LESS TRACTION THAN WHEN IT'S BALANCED AND STEADY.



But as you turn through a right-hand corner, weight transfers to the outside, or left-side tires. They gain grip, resulting in 15 units of traction. But the inside tires have lost traction, resulting in only 3 units of traction each. Overall, when the car is cornering, it has 36 units of traction (3+3+15+15=36), instead of the original 40.

Every time you brake, turn the steering wheel, or accelerate, you cause some amount of weight transfer, resulting in less traction than when the car was steady and perfectly balanced.

The smoother you brake, turn, and accelerate, the more precisely you move the weight to the different wheels, meaning you have more traction to work with. That is why smooth is fast!

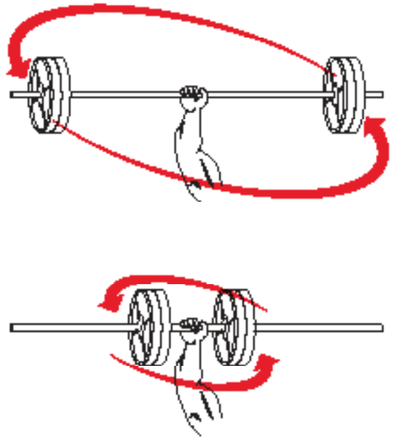
SMOOTH = FAST.
BALANCE IS EVERYTHING.

ENGINE LOCATION

Where the engine is located in your car will have some impact on the dynamic weight transfer when driving. Think of holding a dumbbell with 10 pounds on each end. You're holding it above your head with one hand. You rotate it, twisting your arm, stop it, and rotate it back in the other direction. As you can imagine, with that much weight out at the very ends of the dumbbell, stopping the twist and changing direction takes a lot of effort.

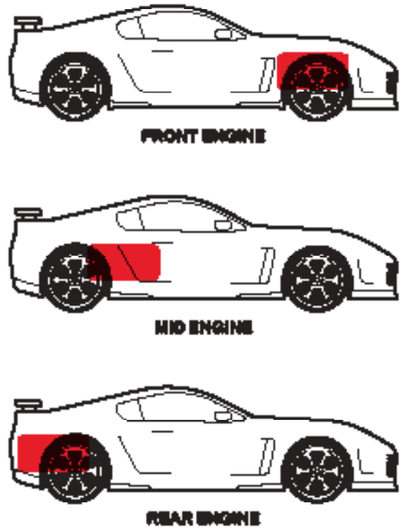
Now imagine sliding those 10-pound weights in towards the center of the dumbbell bar, until they're nearly touching your hand on either side. Again, twist your arm and rotate the bar in one direction, stop it, rotate it back in the other direction, then back the other.

With the weights located closer to the center, it's easier to change direction of the twisting, right?



The same concept applies to cars. If the weight of your car is located at the far ends, it's harder to get it to change direction, such as from a straight line into a corner, or from a corner in one direction to one in the opposite direction. But if the car's weight is concentrated more in the center of the car, it's easier to change direction. That is why race cars are built with as much of their weight concentrated in the center of the car.

UNDERSTANDING VEHICLE DYNAMICS WILL HELP YOU UNDERSTAND THE LIMIT.



HANDLING CHARACTERISTICS

You hear the terms "understeer" and "oversteer" all the time, right?

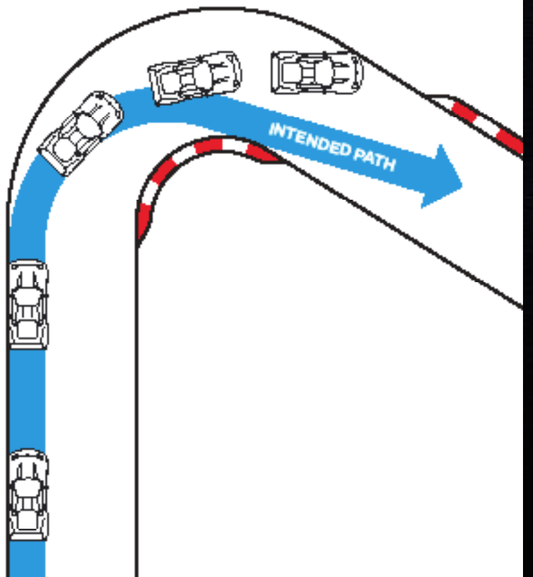
BUT WHAT DO THEY ACTUALLY MEAN?

UNDERSTEER

When the front tires have less traction than the rears do, the car tends to "push" or plow relatively straight ahead, rather than turning as much as you'd like. That's understeer. The car has not steered as much as you'd like, so it is understeering.

Understeer is a function of car's inherent dynamics, a lack of weight transfer to the front wheels, and/or too much entry speed.

Therefore, the front tires don't have enough traction to change the direction of the car as much as you'd like.



HIGH-PERFORMANCE TIPS

CONTROLLING UNDERSTEER

NO MATTER WHAT, LOOK WHERE YOU WANT TO GO

Transfer weight to the front tires by easing your foot off the throttle. If you're not accelerating, it would make sense to brake to transfer weight forward, wouldn't it? That can work sometimes, but if the front tires are already beyond their limit of traction, then asking them to do some braking may actually make things worse. If you do brake, it needs to be very gentle and light.

BE PATIENT

Sometimes you just need to wait for the weight transfer from easing off the throttle to take effect, and for the car to have slowed enough for the front tires to grip the road enough to turn the car the way you want.

STRAIGHTEN THE STEERING SLIGHTLY

Yes, right when you feel you're going to plow off the edge of the road, you need to actually straighten the wheel and steer that way — just a little. See, the front tires are at an angle where they can't grip the track — they're turned too much for the amount of traction they have. So, the best thing to do is to unwind the steering just a little, to bring the front tires back to an angle that allows them to grip the road. This takes discipline and practice, because it goes against your sense of self-preservation.

SUMMARY

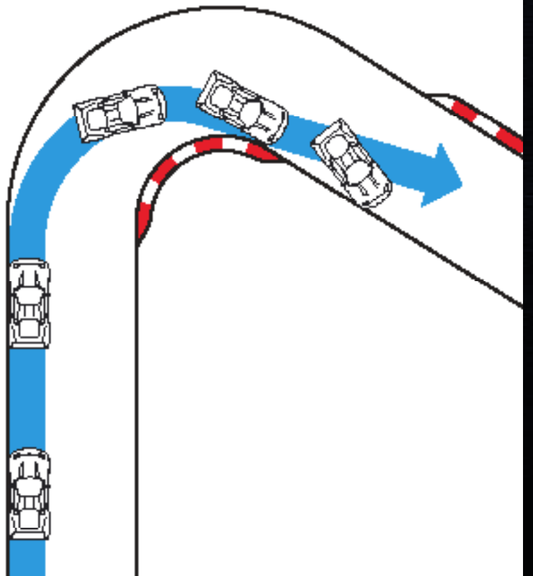
- Look where you want to go!
- Ease up on the throttle.
- Unwind the steering wheel very slightly.

OVERSTEER

When the rear tires have less traction than the front tires do, the rear of the car will slide more, causing the car to turn — or steer — more than you wanted. Therefore, it has oversteered.

Oversteer can be caused by too much weight transfer to the front, too much (or too sudden) application of throttle, or by the car's inherent dynamics.

If you don't manage the weight transfer properly, the car will oversteer. Or the combination of suspension setup, aerodynamic downforce balance, and tires can also lead to your car oversteering. It's important to learn how to identify each one, so you can "fix" the problem (and not something that you think is the problem).



HIGH-PERFORMANCE TIPS

CONTROLLING OVERSTEER

LOOK AND STEER WHERE YOU WANT TO GO.

This will cause you to "counter steer," or "steer into the skid." Essentially, you want to "open your hands" and unwind the wheel to allow the car to take a larger radius. Where you look is where you'll steer, so simply look where you want to go and you'll steer there.

SOMETIMES, YOU CAN TRANSFER WEIGHT TO THE REAR TIRES, GIVING THEM MORE TRACTION, BY GENTLY ACCELERATING.

You'll need to be very smooth with this, though, because too much speed for the traction level of the rear tires is what caused the oversteer in the first place. Accelerating too much, or too aggressively, will increase your speed and make things worse.

IF THE OVERSTEER IS CAUSED BY BEING TOO HARD ON THE THROTTLE, CAUSING "POWER OVERSTEER," GENTLY EASE OFF THE THROTTLE.

If you lift too quickly, you'll transfer more weight to the front, making the oversteer worse. Note that this can only be done in a rear-wheel drive car.

THERE ARE TIMES WHEN YOU WANT A SMALL AMOUNT OF OVERSTEER.

For example, in a tight corner (a hairpin turn), you need the car to change direction a lot — you need to get it to turn a lot, or "rotate." Using weight transfer to the front as you turn into a corner will help the car rotate, or oversteer a little (just enough).

SUMMARY

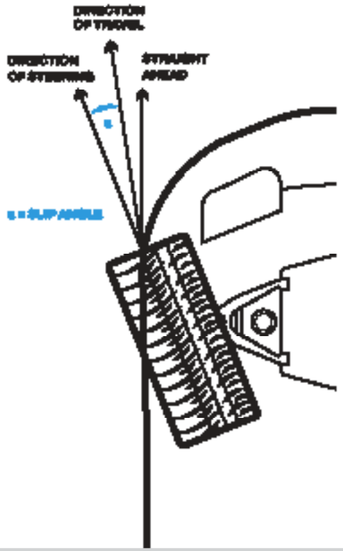
- Look and steer where you want to go — that's priority one.
- Gently and smoothly modulate the throttle (to either transfer weight to the rear, or reduce the amount of power to the rear wheels).

SLIP ANGLE

A tire's slip angle can be viewed as the difference between the direction the wheel is pointing and the direction the car is heading.

When driving at the limit, there is a certain amount of slip (actually, twist between the tire and the wheel).

Surprisingly, tires generate more traction when there is some amount of slip (see Slip Angle vs. Traction graph).



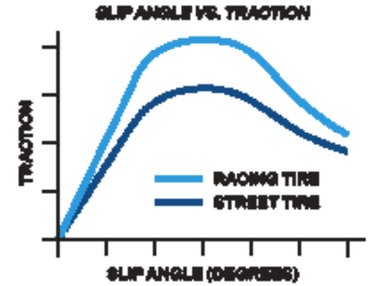
SPEED READ

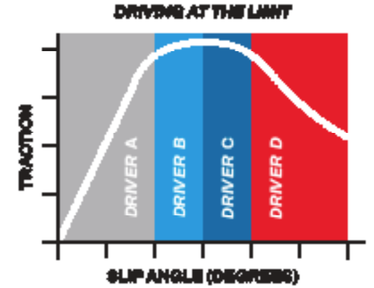
SLIP ANGLE IS THE DIFFERENCE BETWEEN WHEEL DIRECTION & DIRECTION THE CAR IS HEADING

The first graph compares traction/grip to a tire's slip angle. As the slip angle increases the tire actually gains traction until it plateaus and then falls off, resulting in sliding and potential loss of control.

The graph below shows 4 different drivers: Driver A spends most of the time driving at less than the limit. Driver D is over-driving the car, spending too much time with the tires beyond their limit (note that this doesn't necessarily mean spinning or crashing — it can just be too much sliding through corners).

Drivers B & C would have roughly the same speed around a track because they spend the same amount of time in the peak traction zone, but Driver B would be faster over time. Why? They're putting less wear and tear on the tires.





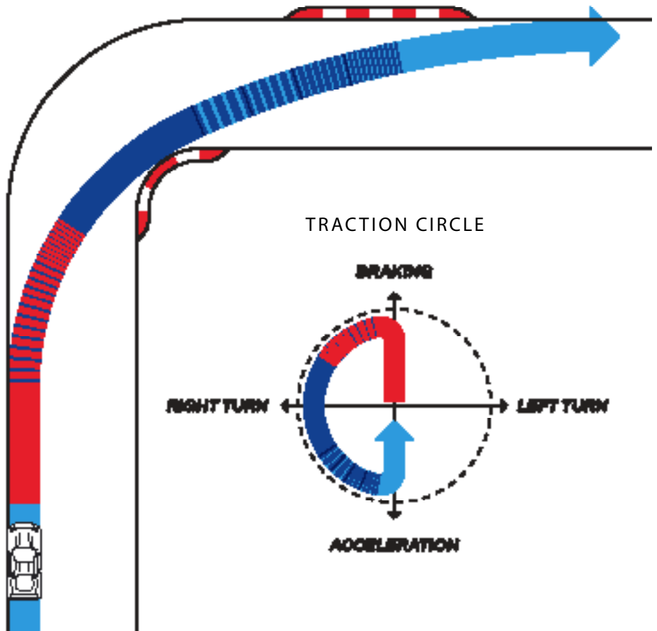
DRIVING AT THE LIMIT

There's a lot going on in these illustrations and all are related. So, take time to fully understand what's going on here.

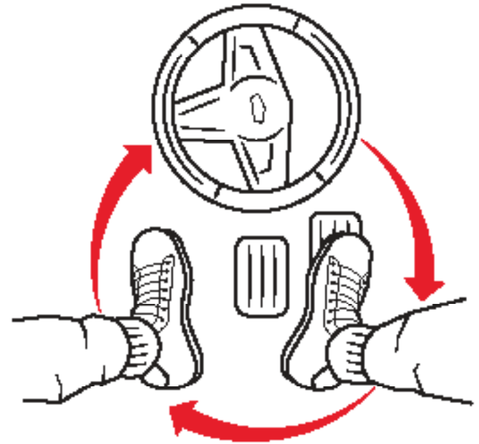
The track illustration shows a car going through a corner and what is happening with braking, cornering, and accelerating through the turn.

The accompanying Traction Circle shows the amount of traction the tires have and the direction of the force during the turn. Think about how your body is forced forward when you break hard, or how you are tilted to the left when you turn to the right. The same forces are at play on your tires.

Keeping your tires within the circle (maintaining traction) is what driving "the limit" is all about.



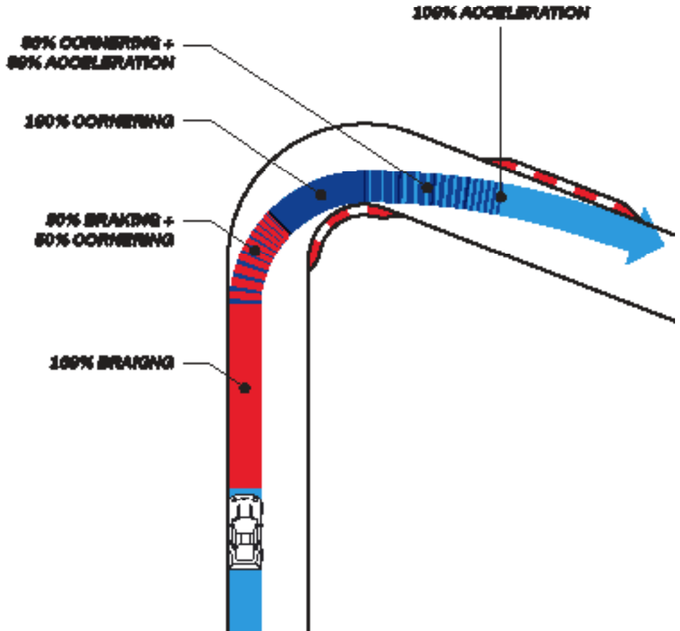
Note the relationship, or interplay, between the steering wheel and the throttle and brake pedals. You're constantly trading off braking for cornering, cornering for braking, acceleration for cornering, and cornering for acceleration.



100% RULE

You can only ever use 100% of your tires' traction, no more. If you want to use 5% for accelerating out of a corner, you can only use 95% still for cornering. In other words, you're going to have to unwind (straighten) the steering wheel by at least 5% to use that for accelerating.

HOW YOU MANAGE YOUR TIRES BY BLENDING BRAKING, CORNERING AND ACCELERATING IS AT THE CORE OF HIGH-PERFORMANCE DRIVING.



Approaching a corner, you can brake using 100% of the tires' traction for slowing the car. As you begin to turn the steering wheel, you'll need to release pressure off the brake pedal.

10% Cornering + 90% Braking
25% Cornering + 75% Braking
50% Cornering + 50% Braking
75% Cornering + 25% Braking
100% Cornering

After cornering at 100%, you'll want to begin accelerating, and that means reducing cornering: As you apply the throttle, you'll need to unwind the steering wheel — 75 for cornering, 25 for acceleration; 50 for each; 25 for cornering, 75 for acceleration; finally using 100% for acceleration on the straightaway.

You can only ever get 100% out of your tires, but that can be used for a combination of traction forces.

In reality you'll often get to full throttle acceleration before you have the steering wheel perfectly straight, because your car often doesn't have enough power to exceed or even get anywhere near to 100% under acceleration. But if you've ever induced "power oversteer" by tromping on the throttle while turning, especially on a slippery surface, you know what using more than 100% is!

This is such a common mistake, that there's a term for it. "Pinching" the car at the exit of a corner is not unwinding the steering wheel as much, or as soon as you should. It's not using all the track or lane available to you.

To avoid pinching the car, focus on unwinding the steering wheel as early and quickly as you can, as you feed in the throttle.

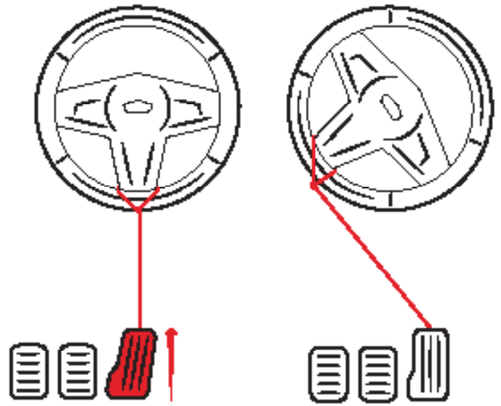
Of course, this interaction between the steering wheel and the throttle also applies to the brakes and steering. More on this when we discuss "trail braking."

STRING THEORY

Imagine having a string attached to the bottom of the steering wheel, and to the top of the gas pedal when it's fully depressed to the floor — it's tight. As you turn the steering wheel, the string will pull the top of the gas pedal upward, right?

Once it's pulled all the way up — zero throttle — the steering wheel is fully turned to use up all the tires' traction. Then, as you come out of a corner and squeeze on the gas pedal, it's going to straighten the steering wheel.

The interplay of the throttle and steering wheel are critical when exiting a corner. Step on the throttle too soon (when you still have too much steering angle in), and you're asking for more than 100% from the tires. Expect to experience a skid, slide, or spin.



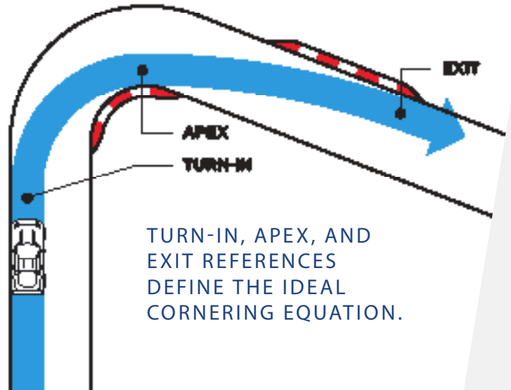
CORNERING

The race track is the perfect place to practice using your vision and the controls, and merging them together with driving the ideal line, or path, through corners.

The following section on cornering uses terminology and illustrations from the discipline of road racing, but the techniques and philosophy will help you in your everyday high-performance driving.

REFERENCE POINTS

Every corner can be described by three reference points: Turn-in, Apex, and Exit (or "Track-out"). The simplest instruction is to keep two goals in mind: Straighten the corner out as much as possible, and drive it in such a way that it allows you to begin accelerating early (the speed on the straight after the corner is usually more important than the speed through the turn).



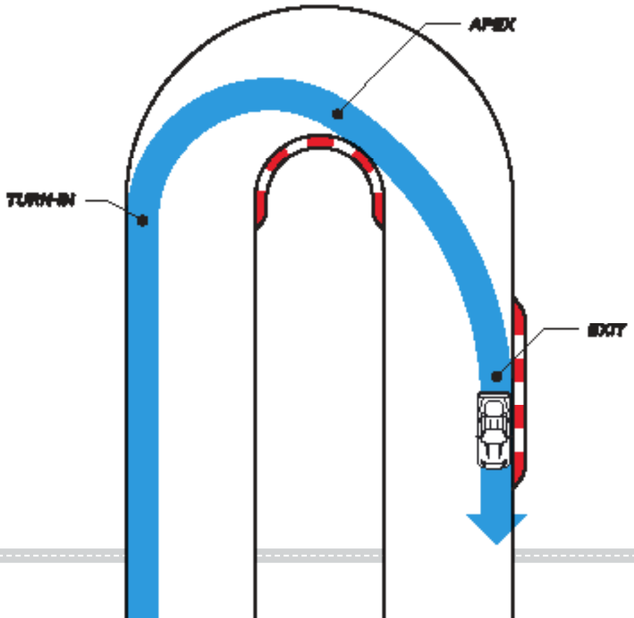
TURN-IN, APEX, AND EXIT REFERENCES DEFINE THE IDEAL CORNERING EQUATION.

Here's what the three reference points look like in a hairpin corner.

It also shows how you want to use all the track, entering from the outside edge of the track (at the Turn-in point), to the inside at the Apex, and then back to the outside edge at the Exit.

This also illustrates what is referred to as a "late apex line," as the apex is beyond the middle of the corner.

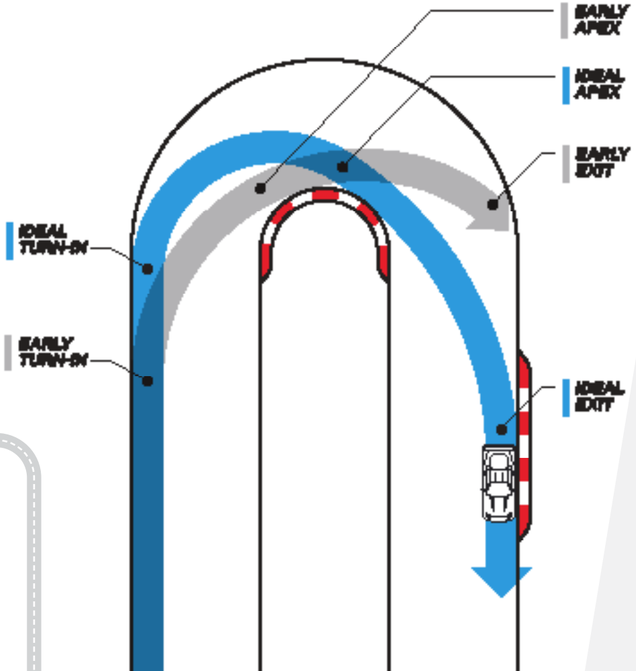
Using this line allows you to begin accelerating earlier, and therefore end up with a faster straightaway speed (possibly even for accelerating onto a freeway).



EARLY VS. LATE TURN-IN

As you can see from this illustration, if you turn in early, you'll clip an early apex, and ultimately "run out of track" at the exit.

Your Turn-in point is critical, so having a good reference point for it is key.



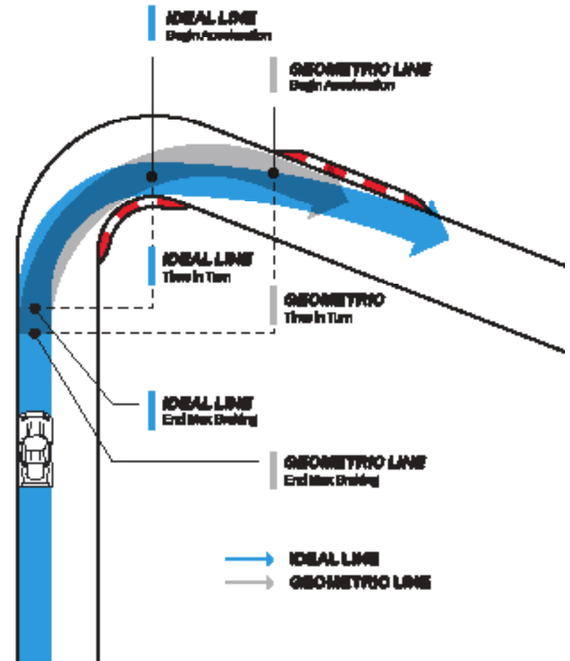
SPEED READ

ACCELERATE EARLY TO END UP WITH A FASTER STRAIGHTAWAY. AVOID EARLY TURN-IN SO YOU DON'T RUN OUT OF TRACK.

IDEAL LINE

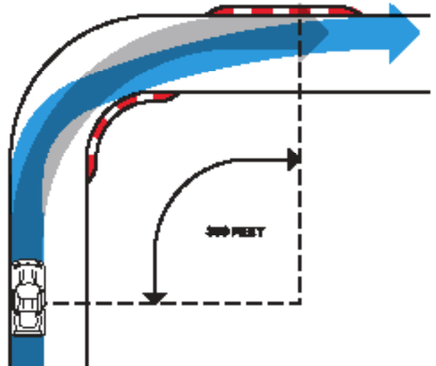
THE BENEFITS OF A LATE APEX (IDEAL LINE)

- It allows later braking, since you're going to turn in later;
- You spend less overall time in the corner, and that means more time spent accelerating;
- It means you can start accelerating earlier;
- What's not really indicated here, but is an important benefit, is that it allows you to see, or "peek" around the corner better.

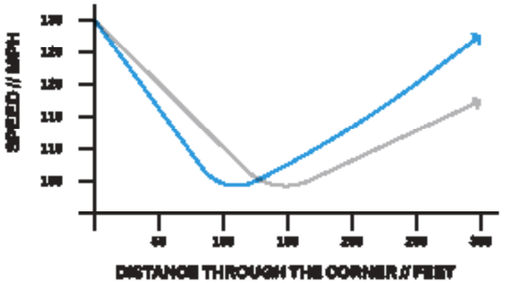


ANOTHER LOOK AT THE LATER APEX LINE

The gray line demonstrates the geometrically largest radius – the fastest way to drive through the corner in isolation – but as you can see, you spend practically all of the 300 feet cornering. Until you begin unwinding/straightening the steering wheel, you can't start to accelerate.



By turning in and apexing later, it allows you to accelerate earlier, meaning you'll be faster on the following straightaway. As the speed trace diagram shows, you will be a little slower at the beginning of the corner, but you'll more than make up for it later in the corner and down the straightaway. This is why the late apex line is referred to as the "Ideal line."



DIFFERENT CORNERS, DIFFERENT LINES

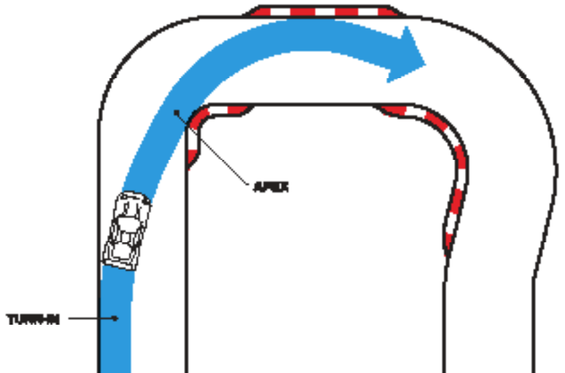
High-performance cornering is a series of compromises: You give up speed in one place to get more in another place.

THE BEST DRIVERS KNOW WHERE TO GO FAST, AND WHERE TO GIVE UP A LITTLE TO GAIN ELSEWHERE.

SPEED IN VS. SPEED OUT

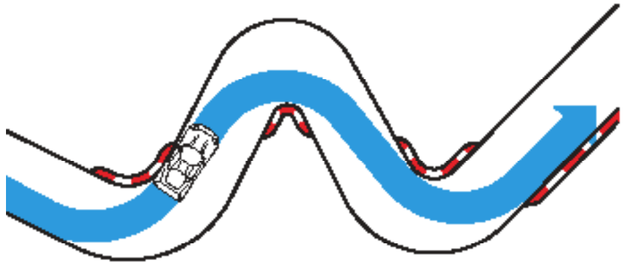
If you have a corner with very little straightaway after it, your focus should be on carrying as much speed into it, and not worry so much about exit speed.

Having said that, there are very few corners like this, so don't get carried away with this!



SNAKING AROUND

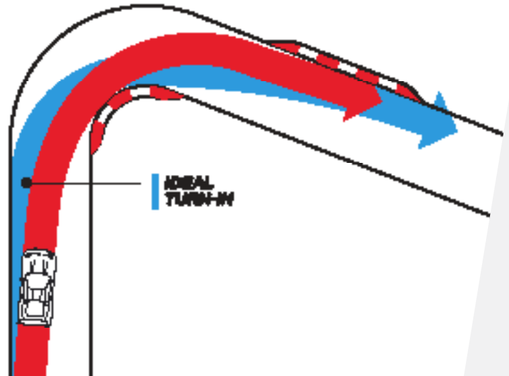
Here's how you would approach and drive a series of corners like Esses. The lesson here is that you'll have to compromise at least one corner to maximize your exit out of the final corner. In other words, your priority should be how quickly you get out of the last corner.



DON'T GET CRABBY

Here, we're illustrating how NOT to do it.

This driver is "crabbing" into the corner, pulling the car away from the edge of the track before the Turn-in point, reducing the radius of the corner – meaning the car will not be able to carry as much speed through the corner.



WHAT NOT TO DO

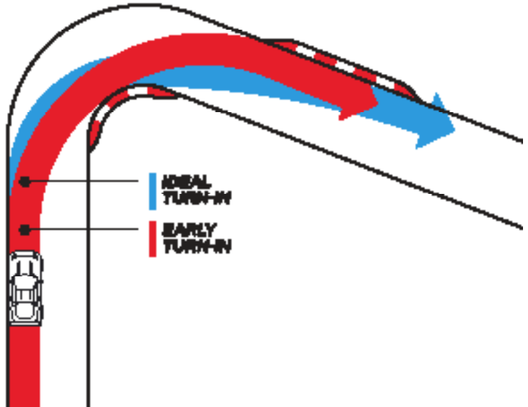
Here are three more errors illustrated to help you learn from them.

Even the best driver makes mistakes, but it's what you do with them that makes you a high-performance driver. First,the more references you have, the earlier you'll recognize you're making a mistake, and therefore be able to minimize the effect of it. And then, it's what you learn from it.

Think of mistakes as "learning takes."

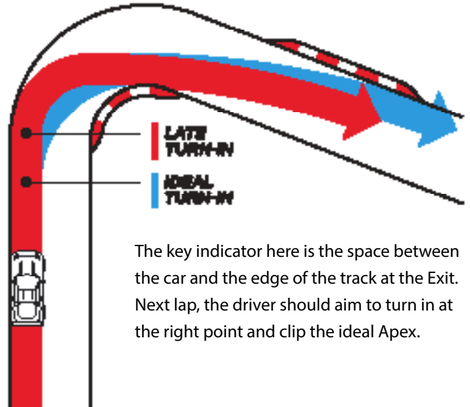
ERROR #1 TURN-IN TOO EARLY

In the first illustration, the driver has turned in too early (before the Ideal Turn-in point), resulting in an early Apex. The driver would have to delay beginning to accelerate to avoid driving off the track.



ERROR #2 TURN-IN TOO LATE

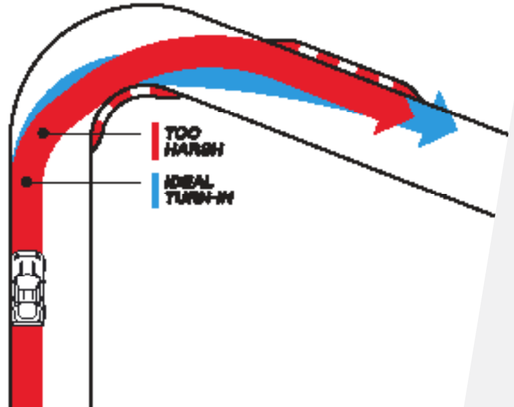
In the second illustration, the driver has turned in too late, resulting in a super-late Apex. While safer than the previous mistake, the amount the driver would have to slow down for the very tight radius early in the corner would be impossible to make up for – the driver would be slow down the straightaway.



The key indicator here is the space between the car and the edge of the track at the Exit. Next lap, the driver should aim to turn in at the right point and clip the ideal Apex.

ERROR #3 TURN-IN TOO ABRUPT & SHARP

In the third illustration, the driver turned in at the right place – at the Turn-in point – but they turned too abruptly, too sharp, resulting in an early Apex. Ultimately, it ends up very similar to the first illustration – delayed acceleration to avoid running out of track at the Exit.



FINDING THE LINE

Here's a comparison of two lines through a hairpin turn, one with a fairly Standard Late Turn-in and Apex on the left, and the one on the right with a more Exaggerated "Late Apex" Line.

WHICH IS BEST? THAT DEPENDS ON:

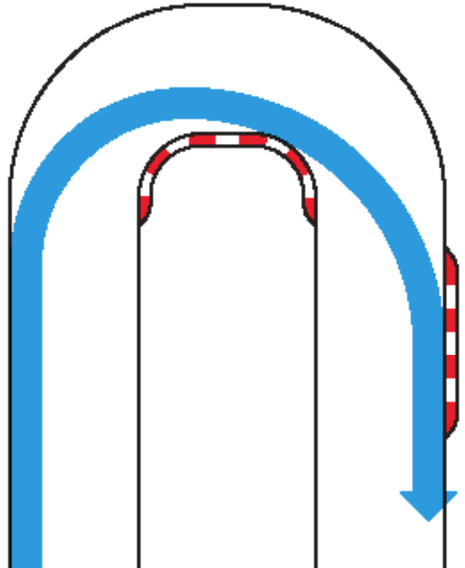
- Track conditions
- How the car handles
- Car's acceleration capabilities

If it were raining, the Exaggerated Late Apex might be better, providing a straighter line for acceleration. In contrast, if the car had little power, the momentum you could carry through the corner with the Standard line might be better.

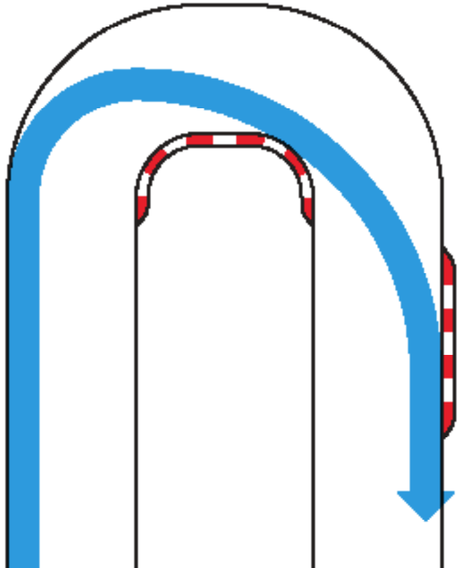
SPEED READ

EXPERIMENT WITH THE LINES THAT YOU DRIVE TO FIND THE IDEAL COMPROMISE.

STANDARD LATE TURN-IN AND APEX



EXAGGERATED "LATE APEX"

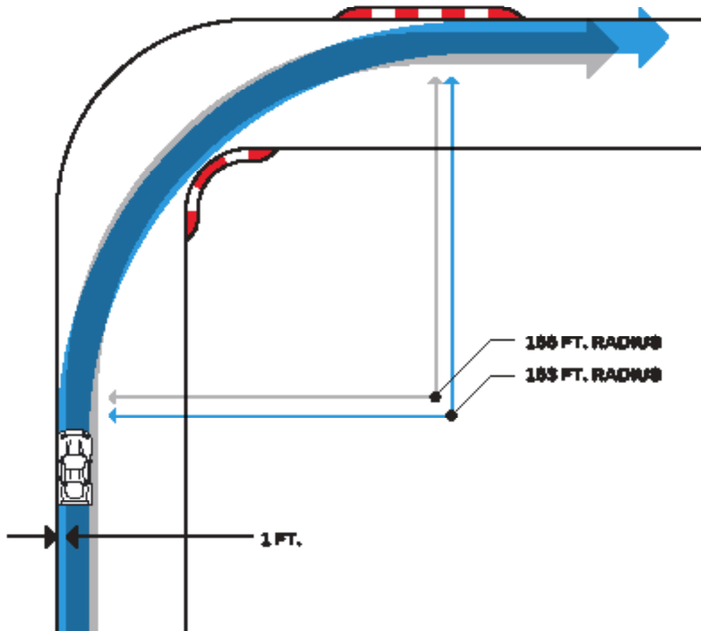


USE ALL THE TRACK

Not using all the track width is a big no-no. Even just being 1 foot away from the edge of the track as you enter a corner can have a big negative impact — reducing the turn radius more than you might imagine.

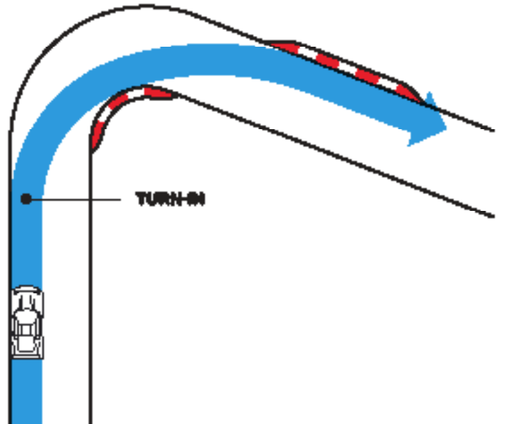
SPEED READ

YOU PAID TO USE THE TRACK — USE IT ALL!

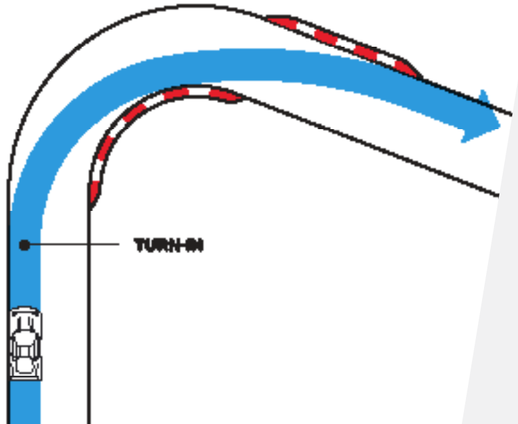


SUBTLE DIFFERENCES

The differences in the line you drive can be subtle, as this illustration demonstrates. The corner on the left is a slightly tighter radius than the one on the right, so it requires a later Turn-in and Apex line.



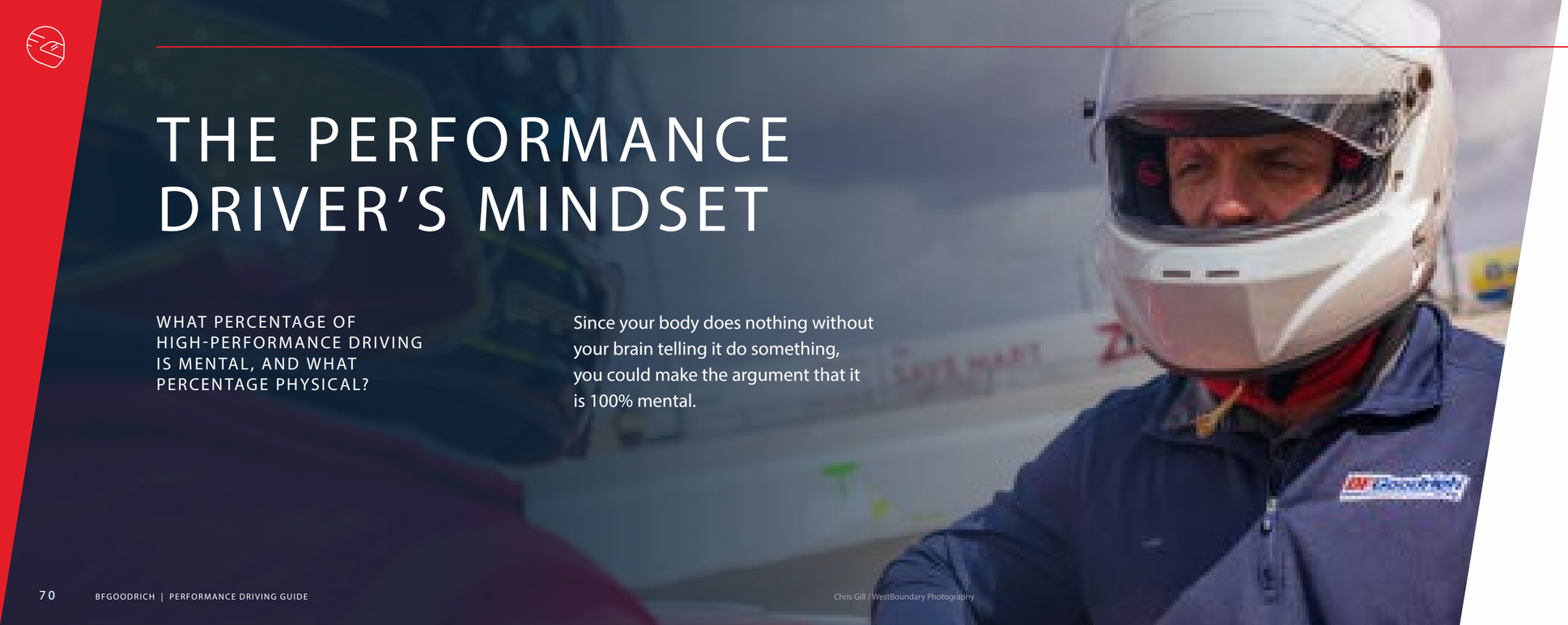
However, both of these illustrations are showing early Turn-ins – both would benefit from a later Turn-in and Apex to maximize straightaway speed.



THE PERFORMANCE DRIVER'S MINDSET

WHAT PERCENTAGE OF HIGH-PERFORMANCE DRIVING IS MENTAL, AND WHAT PERCENTAGE PHYSICAL?

Since your body does nothing without your brain telling it do something, you could make the argument that it is 100% mental.



Chris Gill / WestBoundary Photography

GO WITH THE FLOW

Focus, decision-making, mindset, learning — even your physical skills — are all part of "the mental game," and when you put it all together in the right way, you'll feel as though you're in the zone, or in flow.

Being "in flow," or "in the zone," is that state when you're absolutely absorbed in the activity, everything feels almost effortless, you're confident (without realizing you're confident), you're focused, time seems to slow down, and nothing else matters other than what you're doing.

The highest levels of high-performance driving are done in the zone.

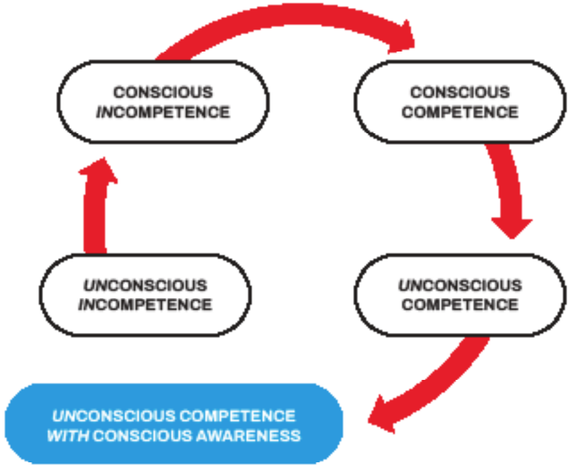
LEARNING TO IMPROVE

LEARNING THEORY TELLS US THERE ARE FOUR STAGES TO MASTERING AN ACTIVITY:

1. Unconscious Incompetence (you don't know what you don't know);
2. Conscious Incompetence (you know what you don't know);
3. Conscious Competence (you know what you're doing, but you're having to think about it);
4. Unconscious Competence (you no longer have to think about it – you just do it).

Consider an additional fifth stage that describes what "being in the zone" is:

5. Unconscious Competence with Conscious Awareness.



At this stage, you don't have to think about the mechanics of doing something, but your conscious mind is fully aware of everything going on, and is thinking about how to do things even better.

Driving in the zone is a balance between thinking and not thinking too much. To do that, you need as many of the skills and techniques as possible practiced to the point of no longer having to consciously think about doing them; now the basics of driving are on auto-pilot.

One thing separates the best drivers from the rest: a burning desire to learn and improve, and an open mind to new techniques and approaches.

If being a high-performance driver is all about performing at a high level, then being a high-performance learner is no different. Plus, continual learning is part of what makes you a high-performance driver.

FOCUS ON LEARNING AND CONTINUALLY IMPROVING.

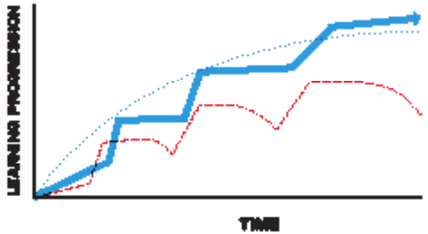
SPEED READ

PRACTICE UNTIL THESE SAFE DRIVING TECHNIQUES BECOME SECOND NATURE.

LEARNING STEPS

People talk about the "learning curve," as if we actually learn on this smooth path. But we don't.

Instead, we learn in steps: We make progress, plateau for a while, make another step of learning, plateau, and so on. That is, unless we get frustrated when on these plateaus, resulting in a digression in learning. The lesson here? Be patient if you're on a plateau, as there is a burst of learning after every one.



PROGRAMMING

Learning is programming; it's when you've programmed your mind to the point where you no longer have to consciously think about how to do something, you just do it. You can think of habits as mental programs, since you rarely think about something you do habitually.

Mental programming is a result of repetition, either physically or mentally. In fact, you do what you do because you're programmed to do so. The way you sit, walk, talk or turn a steering wheel is due to your mental programming. You sometimes don't do what you want because you either don't have the right mental programming yet, or — because you're human — you access the wrong program at the wrong time and make a mistake.

MENTAL IMAGERY

If you can't imagine doing something in your mind, it's unlikely you'll be able to do it physically. The flipside of that is also true: When you imagine doing something, you're much more likely to be able to do this outside of your head. That is why every high-performer, from athletes to musicians and leaders to hobbyists, use some amount of visualization to develop their mental programming.

As you read this guide, imagine every part of technique and skill — and yourself actually doing these things — in as much detail as you can. The more you imagine driving your car, using all of your senses and pre-playing your emotions and mindset, the more effective it'll be.

If you close your eyes and imagine doing something — using your visual, feel, and auditory senses — with as much realism as possible, your brain won't know the difference between a real or imagined event. Develop your high-performance driving skills in your mind as much as you do on the road or track.

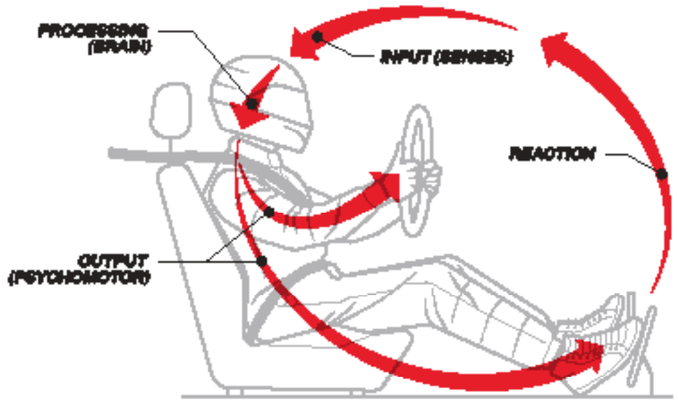
SPEED READ

EVERY HIGH-PERFORMER USES SOME AMOUNT OF VISUALIZATION TO HELP DEVELOP THEIR MENTAL PROGRAMMING

SENSORY INFORMATION

As you drive, information is taken in through your senses (the input), then processed by your brain, which tells your body what to do (the output — brake, turn the steering wheel, squeeze the throttle, turn your head to look through a corner, etc.); you then react to the results of those actions, and the cycle continues.

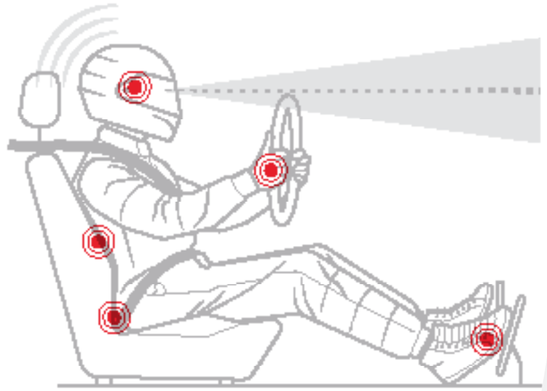
This loop/process happens over and over, thousands of times per second, and as you improve, it happens faster and more efficiently.



SENSORY INPUT PRACTICE

On track, you're constantly picking up information through your visual, kinesthetic (touch, balance, sensing g-forces pushing against your body), and auditory senses. The better the quality of this information, the better you'll drive. That is why it is so important to pay attention to what you are experiencing through all of your senses.

If you take time to focus solely on taking in more sensory input — visual, kinesthetic, and auditory — you'll be giving your brain better quality information to work with. Better quality information results in a better output, a better performance. When you specifically and deliberately spend time on the track to focus on these senses, one at a time, you're doing what are called "Sensory Input Sessions." The results are very powerful.



Here are two views of the same section of the track, and what two different drivers are visually picking up.

The driver in the top scene sees more; the driver in the lower scene misses some of what the driver at the top sees.

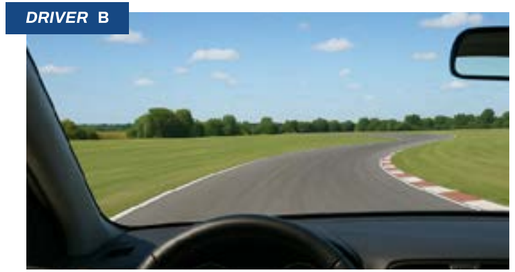
WHICH DRIVER DO YOU THINK IS FASTER?

WHICH DRIVER IS MOST CONSISTENT?

WHICH DRIVER DO YOU WANT TO BE?

DRIVER A

DRIVER B



GETTING INTO THE ZONE

There is a fine line between not thinking enough, and thinking too much. There comes a point when you need to relax and trust your subconscious, mental programming to drive the car — letting go of the minute, detailed, analytical thought — while using your conscious mind to observe and be aware.

The right balance, which is a little different for every driver, leads to the zone — that almost magical state of mind where things just happen. You're focused but not overly focused; you seem to have all the time in the world to do what's next; and you feel confident and practically all-knowing.

@drewskisillsmedia

RESPONSIBILITY

As we said earlier, high-performance driving can take place on the track or the street. With that comes responsibility. You need to know where it's appropriate to push the limits of your vehicle, and where it is not.

How many times have you spoken to a person who "brags" that they've been in a number of "accidents" — none of them their fault? It makes you think, doesn't it?

Perhaps it's about time these drivers began to take more responsibility for their driving actions, instead of feeling completely blameless when found "not at fault." Many crashes in which a driver is found "not at fault" could have been avoided altogether.

High-performance drivers take full responsibility for their actions, whether "at fault" or not.

As part of this sense of responsibility, you need to know where it's appropriate to drive fast, and where it is not.

SPEED READ

THE OBVIOUS PLACE TO DRIVE FAST IS ON A RACE TRACK, AND WE HIGHLY RECOMMEND DOING THAT!

RISK PERCEPTION VS. SKILL LEVEL

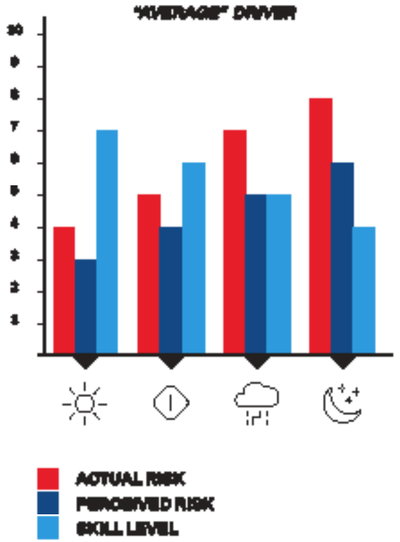
Most drivers consider themselves to be "good" drivers. Just ask them! After all, they've earned a license that says so, right? Well, perhaps they are. But why, then, are so many involved in so many crashes?

When most people first learn to drive, they're taught less than half of the necessary skills to become "adequate" drivers. Generally, they are left to acquire good driving skills through years of trial and error (often, the "error" part of this equation is tragic). This helps to explain why the more experience a driver gains, the more skill they acquire, the safer they become.

But that's not the whole story.

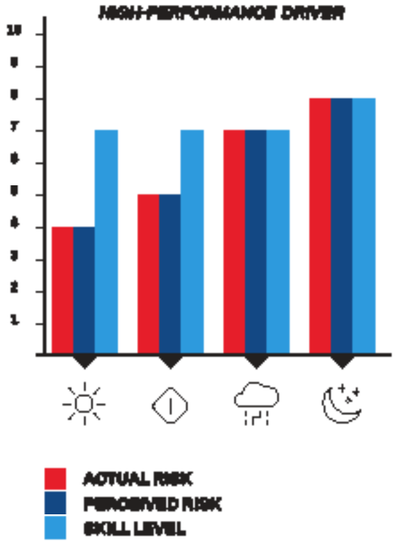
Every time you drive, there is a certain amount of risk involved. Call this the Risk Level. This will vary with changing traffic volume, road, vehicle, and weather conditions, and driver distraction/awareness levels. For example, driving through an intersection in rush hour in the rain has a higher Risk Level than driving on a wide-open country road on a sunny day. Or, driving while your mind is still thinking about work, or while eating, or talking on the phone all cause a higher Risk Level than when you're focused on driving.

How a driver assesses this Risk Level is the most important factor. For many, the Perceived Risk Level is lower than the Real Risk Level. In other words, the driver does not accurately assess how risky the driving conditions are.



Driving 70 MPH in a 60 zone in the pouring rain at night. Most people would think nothing of it. On a scale of 1 to 10, the driver perceives the Risk Level to be at 5, when in reality — accounting for the condition of the tires on the car, the amount of water on the road, the lack of visibility, the driver's awareness level, traffic volume, etc. — the Real Risk Level may be an 8 or higher.

Now, when you factor in the driver's Skill Level, you may have a formula for disaster. If, on that same scale of 1 to 10, the driver's Skill Level is a 4 in this situation (understand that a driver may be very skilled — an 8 — at driving in good conditions; but through lack of training and experience, is unskilled — a 4 — at dealing with the rain and darkness), the only thing that's going to stop them from crashing is good ol' luck. If the driver doesn't crash, would you say they were a "good" driver? Or just fortunate?



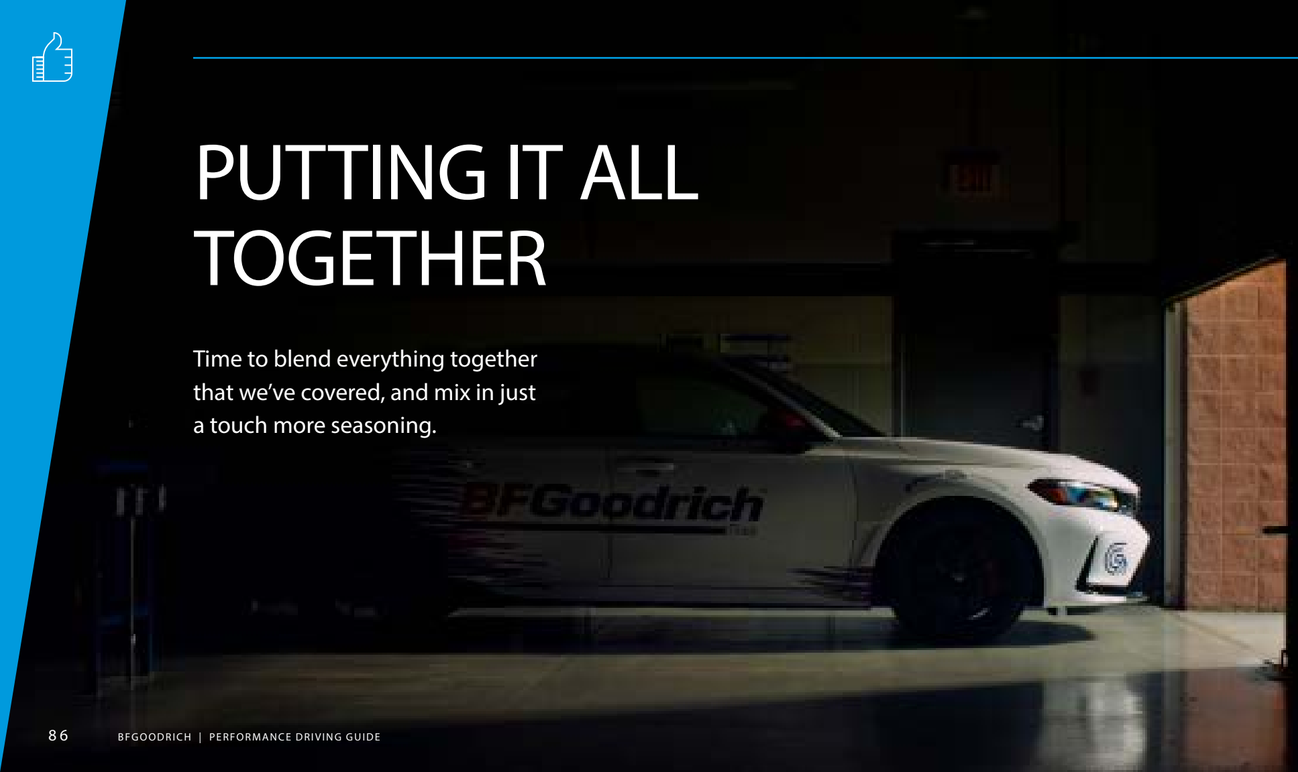
When a driver's Perceived Risk Level encourages them to go faster than what would be appropriate for the Actual Risk Level, and with less focus than is needed for their Skill Level, all too often the result is a crash! The odds of collision increase even more if they "meet" someone in the same situation.

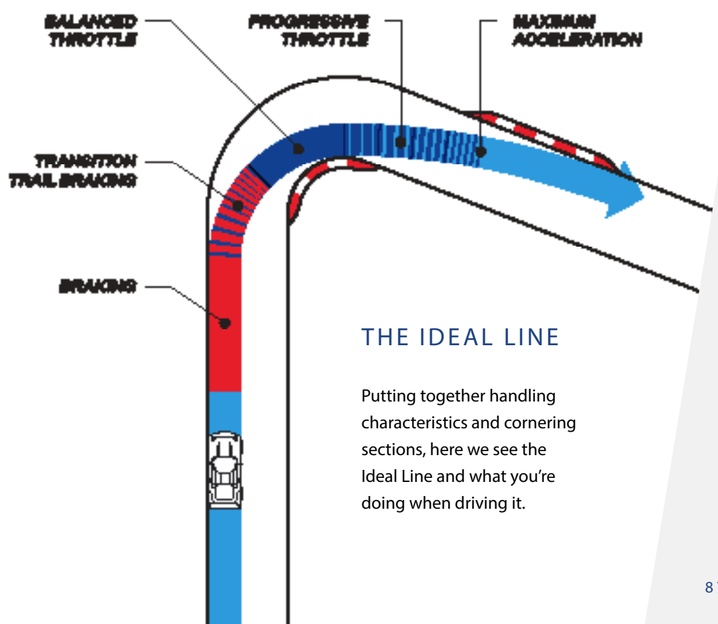
The ultimate goal of high-performance drivers, then, is to match their Perceived Risk with the Actual Risk, and to have a Skill Level that exceeds both. Such a driver will always have a margin for error, and therefore the chance of being involved in a collision will be extremely rare.

Being a good high-performance driver is not just a matter of increasing your Skill Level through experience. You also need to improve your ability to accurately assess Risk Levels.

PUTTING IT ALL TOGETHER

Time to blend everything together that we've covered, and mix in just a touch more seasoning.





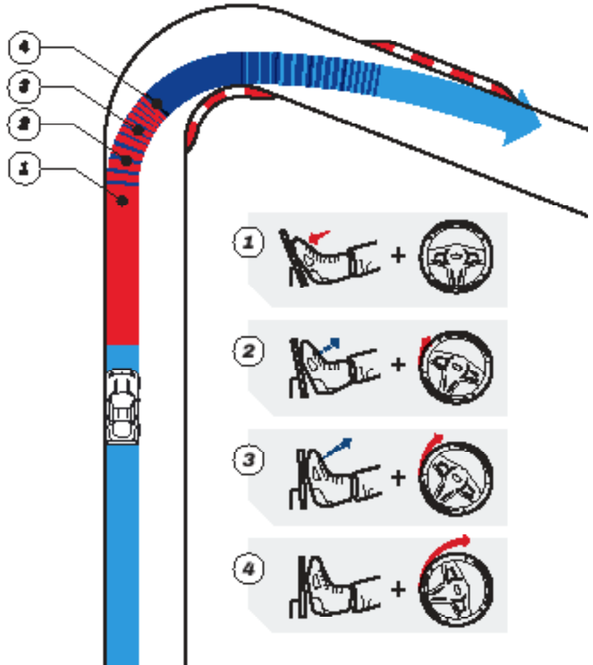
THE IDEAL LINE

Putting together handling characteristics and cornering sections, here we see the Ideal Line and what you're doing when driving it.

TRAIL BRAKING

You can think of trail braking as simply "trailing" (slowly releasing) your foot off the brake as you turn into a corner, trading braking force for cornering force. You can see how there's a trade-off of braking for steering angle. This keeps the tires at their maximum traction levels, and can help you change the direction of your car into the corner by keeping weight loaded on the front tires.

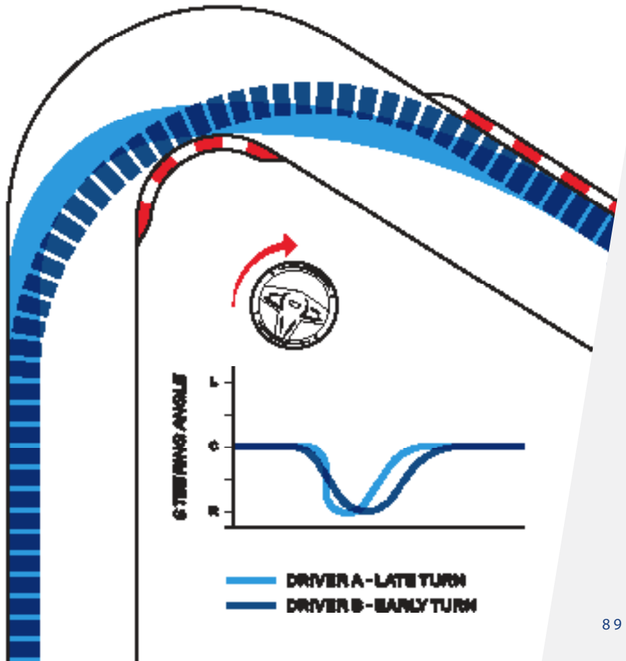
Recall the "string theory" from earlier in the guide, and apply it to blending brake release with steering into a corner.



STEERING

There's no absolute right or wrong way to turn into a corner, or even just one perfect line through it. It depends on many factors, from the type of car and how it handles, to track conditions; from driving style to the shape of the corner.

This illustration should get you thinking about how a later Turn-in requires a sharper turn of the steering; an earlier Turn-in makes for a more gentle turn of the wheel. Which is best? You have to experiment with both to learn and find out which is best.

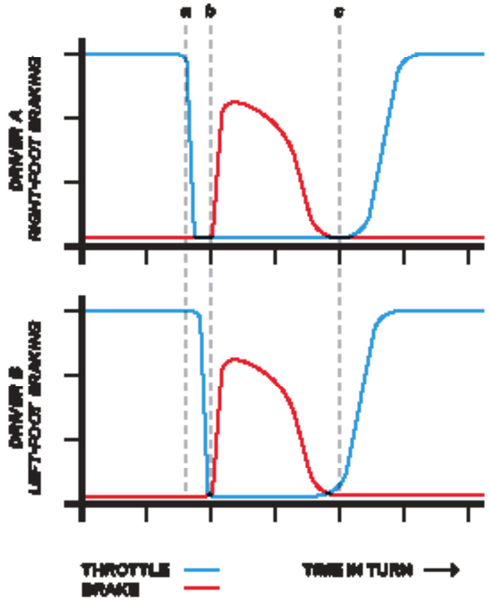


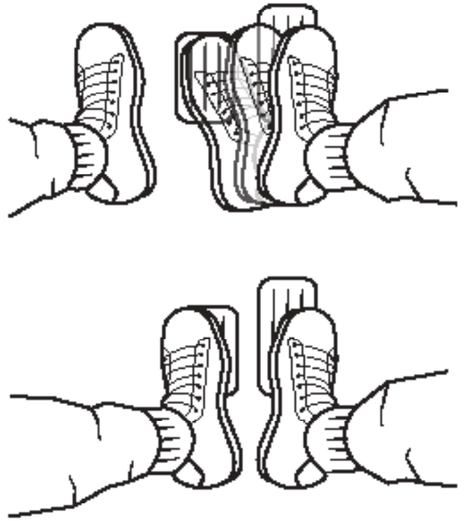
RIGHT-FOOT VS. LEFT-FOOT BRAKING

These illustrations show the benefits of left-foot braking compared to right-foot braking. In both graphs the red line is the brake pedal and the blue line is throttle, with the vertical axis representing pedal pressure and the horizontal axis representing time through a turn.

Because there is a finite amount of time that it takes to lift the right foot from the throttle and move it over to the brake pedal, Driver A (right-foot braking) must lift at Point "a," whereas Driver B (left-foot braking) is able to lift the right foot from the throttle at the exact same time that they begin braking with the left foot (Point "b").

Also note that Driver B is able to slightly overlap braking and acceleration (Point "c") — but, this can be overdone so be careful if attempting.



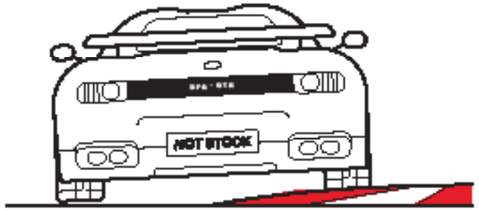


Not all cars can be left-foot braked, and we're not saying all drivers should try it even if they can, but it's something to consider.

A good right-foot braker will always be faster than a mediocre left-foot braker; learning to left-foot brake is not as easy as it sounds.

It takes a massive amount of time to develop the fine muscle control and finesse to work the brake pedal, and unless you have the ability to practice it a lot, it may not be worth it.

And, obviously, if you use your left foot for the clutch pedal, you're better off right-foot braking.



APEX CURBS

Driving over Apex curbs is something race circuit drivers do all the time (but, obviously there is no place for it on the road). It allows you to straighten the corner out, increasing its radius, meaning you can carry more speed through it.

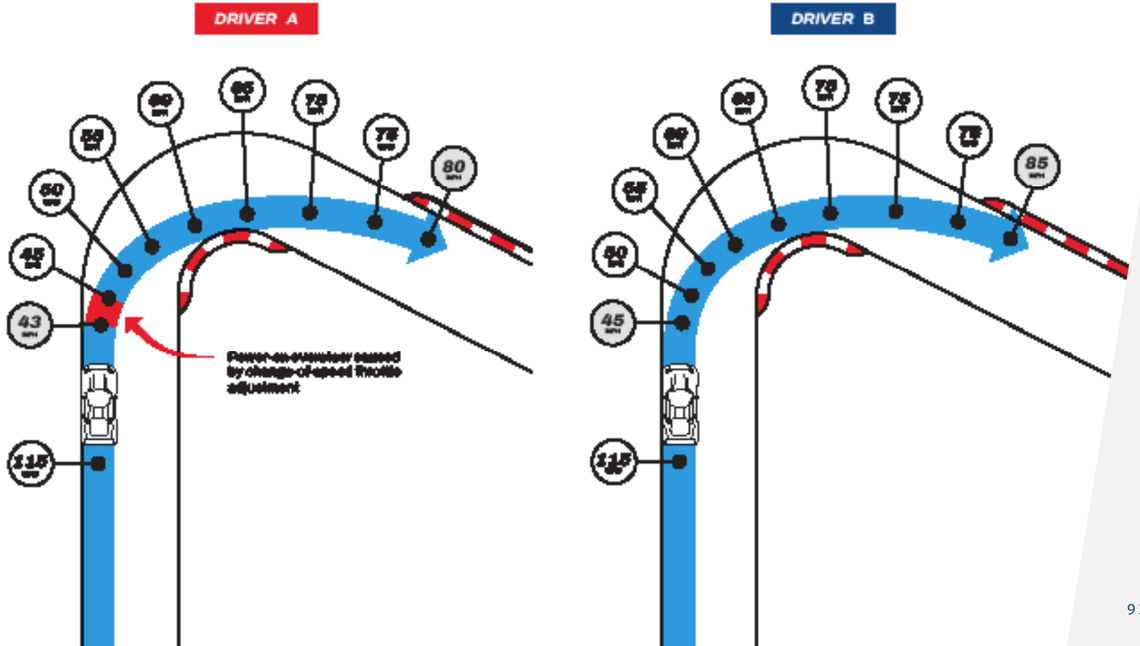
Of course, not all curbs and cars are created equal. Some curbs are meant to be driven over, and some not; some cars soak up curbs, and others don't. The only way to know whether to drive over a curb is to test it, experiment with it. As always, though, do so in small incremental steps.

CHANGING SPEED

The illustrations on the right demonstrate the "Change in Speed" problem.

Driver A slows the car to 43 MPH on the entry to the corner, while Driver B enters at 45 MPH. Let's assume 45 MPH is the limit. Even though 43 MPH is below the limit, it's close to it. As Driver A enters the corner, they sense that the tires are not quite at their limits, so they accelerate to get the car to its limit. This causes the car to either understeer due to the rearward weight transfer, or some power-on oversteer. Either way, the driver interprets this as reaching the limit, so they continue to enter at 43 MPH.

In the meantime, Driver B carries 45 MPH into the corner, smoothly transitions to acceleration at the right time, and begins accelerating from a higher speed.



BRAKING — IT'S MORE THAN WHERE YOU BEGIN

Most drivers focus on the Begin-of-Braking (BoB) point — the reference point on the straightaway approaching a corner that tells them where to start braking.

The best drivers, though, focus more on the End-of-Braking (EoB) point, where they finish braking and their foot has come completely off the pedal.

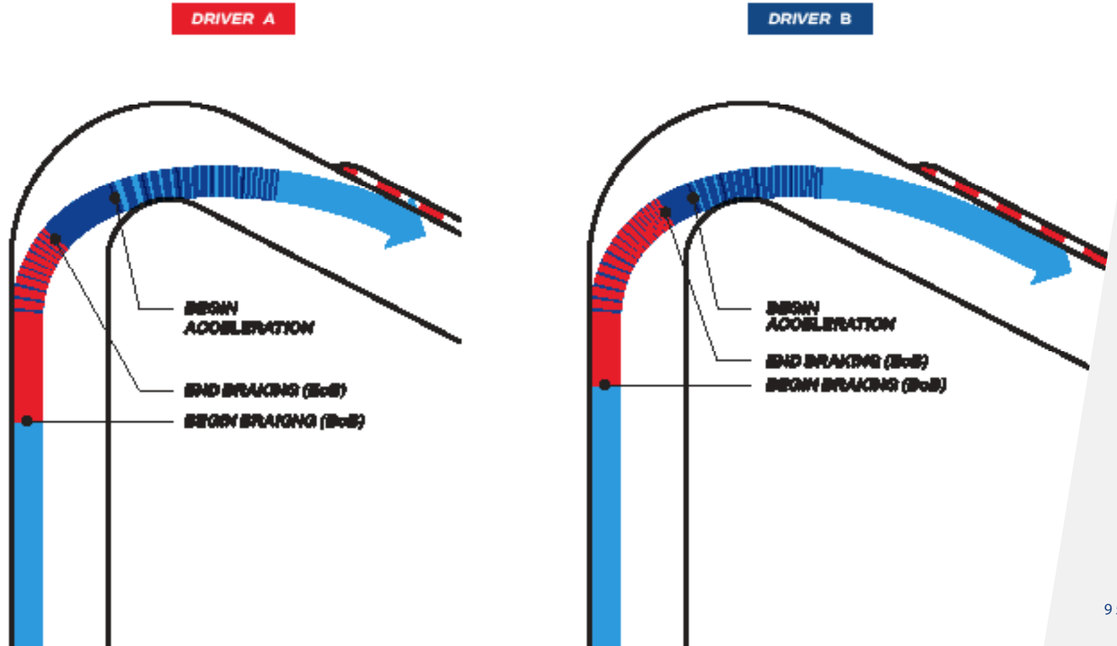
This does three things: First, it forces you to look into the corner, which is always a good thing. Second, it results in a smoother brake release, therefore balancing the car better, and meaning you're able to carry more speed through and out of the corner.

Ultimately, it results in less "nothing" time in between your brake release and start of applying the throttle. And finally, by looking into the corner, to the EoB point, you're likely to brake slightly later, but be more calm and relaxed when doing so, because you know where you're going. Begin (braking) with the end in mind.

THE END-OF-BRAKING POINT IS MORE IMPORTANT THAN WHERE YOU BEGIN BRAKING.

TIMING AND RATE OF RELEASE OF THE BRAKES IS EQUALLY IMPORTANT AS YOU ENTER CORNERS.

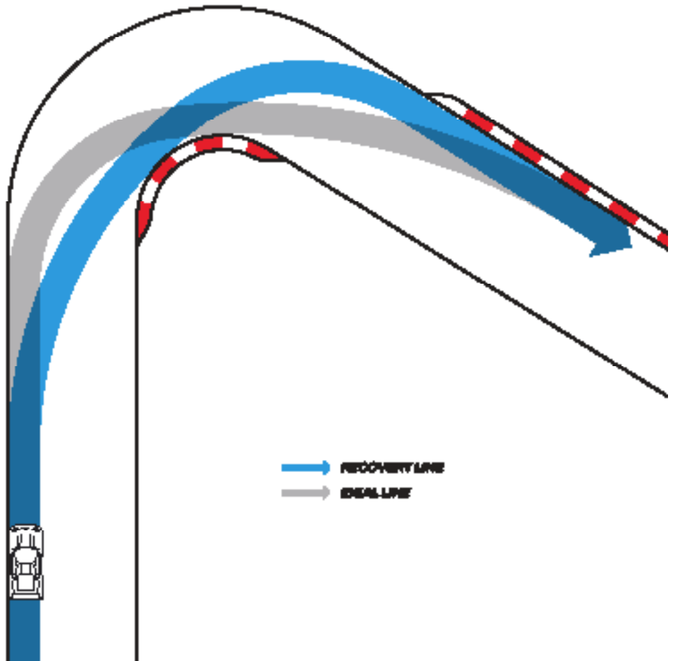
START BRAKING WITH THE END IN MIND.



RECOVERY LINE

OK, you've made a big mistake (or the brakes are failing in your car), and you're carrying way too much speed into a corner.

Rather than riding it out and likely spinning or crashing off the track, adjust your line to lengthen the amount of time you have to slow the car down by using the "Recovery line."

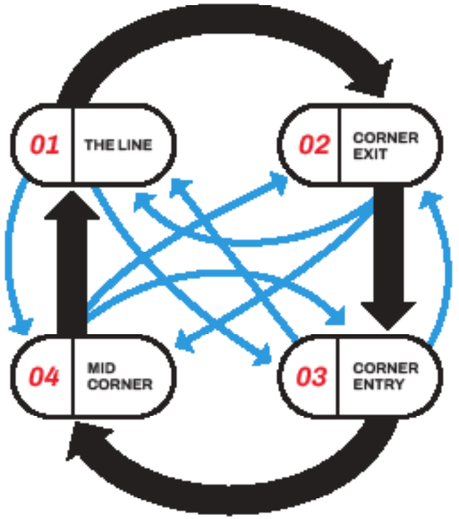


LEARNING PRIORITIES

When you first start learning to drive on the track, your first focus should be on following the right line.

As you begin working on going faster, you should target your corner exit speed, then your corner entry speed (governed by your braking). As you put those together, your mid-corner speed will naturally pick up. It's at this point that the one change you made to improve your exit speed, for example, will impact your line, and that will change your corner entry speed, and so on.

It's this constant learning and fine-tuning that makes high-performance driving so challenging and fun!



THE LIMIT

If you want to drive "at the limit," are you prepared to accept the risk that comes with driving at that level, and do it in an appropriate place (a race track)?

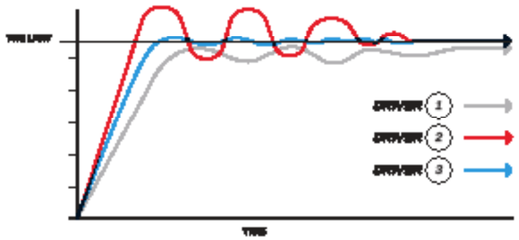
Whatever limit you set is OK. A ten-tenths driver is not a better person than someone who drives at eight-tenths.

It's all about driving at your best — performing at your highest level — at whatever limit you've set for yourself.

If you've decided that you want to drive at eight-tenths to limit the risk to you, your car, and others, and you drive at nine-tenths, then you're not performing at the highest level.

When we talk about driving at the limit, we're talking about the limit that you've set for yourself.

To consistently drive at your car's limit, you're going to need to go beyond it every now and then — safely, and in the right place. Your goal, though, is to go over it just a little, as illustrated by Driver #3's progress. Driver #2 is going over it (and under it) too much; Driver #1 never reaches it.



UNDERSTAND WHAT THE LIMIT YOU'VE SET FOR YOURSELF MEANS, AND DRIVE AS CLOSE TO IT AS YOU CAN — NOT ABOVE OR BELOW IT.

LET'S DRIVE

Chris Gill / WestBoundary Photography

WHERE THE RUBBER MEETS THE ROAD: TAKING YOUR DRIVING PASSION FURTHER

You've learned the fundamentals of high-performance driving — now it's time to put that knowledge into action. Whether you're chasing lap times, looking for a new weekend thrill, or dreaming of racing glory, there's a path for you.

And the best part?
It's more accessible than you may think.

Chris Gill / WestBoundary Photography

IT'S EASY TO FEEL OVERWHELMED BY THE OPTIONS — BUT DON'T!

The most important thing is to start where you feel comfortable. Whether it's autocross, a track day, or a racing school, you'll find a welcoming community of enthusiasts ready to help.

ALL YOU NEED IS:

- A safe, well-maintained car
- Basic safety gear (only a helmet to get started, and often you can get a loaner by paying a nominal fee to rent one)
- A willingness to learn
- And a little courage to take that first step

Once you're in, you'll discover a world of opportunity — and a tribe of like-minded drivers who will support you every step of the way. And of course, BFGoodrich Tires is here to support your journey, wherever it leads!

DREAM BIG, START SMALL. AUTOCROSS AND ENTRY-LEVEL EVENTS

The easiest and most affordable way to get into performance driving is autocross. These events, often hosted by the Sports Car Club of America (SCCA) or local car clubs, are held in large parking lots or airfields using cone-defined courses. You'll learn car control at low speeds in a safe, supportive environment. No special car prep needed — just a safe vehicle and a helmet.

AUTOCROSS IS A FANTASTIC WAY TO:

- Build confidence behind the wheel
- Learn the limits of your car
- Meet a community of passionate, helpful enthusiasts

READY FOR MORE SPEED? TRY HPDE AND TRACK DAYS

If you're craving more speed and track time, High-Performance Driver Education (HPDE) or "Track Day" events are your next step. These are non-competitive, educational events held on real racetracks.

TOP PROGRAMS INCLUDE:

- ***SCCA's Track Night in America*** – A relaxed, beginner-friendly way to experience track driving.
- ***National Auto Sport Association (NASA)'s HPDE Ladder System*** – A structured program that lets you advance through four levels, from beginner to solo driver, and eventually to instructor or racer. HPDE level 1 starts off with an in-car instructor and through level 3 you'll receive classroom sessions to help you progress.

Other organizations, such as non-profit marque-specific clubs, offer excellent HPDE programs — including BMW Car Club of America, Porsche Club of America, and Audi Club of America, to name a few.

There are many great options among numerous regional and local for-profit HPDE organizers as well (check online to find one near you). These events are about learning, not racing — and they're open to anyone with a safe car and a desire to improve.

WANT TO COMPETE WITHOUT CONTACT? ENTER TIME TRIALS

If you're ready to compete but not quite ready for wheel-to-wheel racing, Time Trials are your sweet spot. You'll race against the clock, not other cars, focusing on precision and consistency. SCCA Time Trials and NASA Time Trials (TT) offer structured, competitive formats with safety and learning at the forefront. You'll get tons of track time, data analysis opportunities, and a welcoming community of drivers.

ENDURANCE RACING: THE ULTIMATE TEAM SPORT

For those who love long stints, camaraderie, and a bit of chaos, grassroots endurance racing is pure joy. These events are all about seat time, strategy, and fun with friends.

POPULAR SERIES INCLUDE:

- 24 Hours of Lemons – Wacky themes, budget builds, and serious fun.
- ChampCar Endurance Series – Affordable, competitive, and welcoming.
- American Endurance Racing (AER) and World Racing League (WRL) – More serious, but still grassroots-friendly.

Endurance racing is a blast — and a great way to learn teamwork, car prep, and racecraft.

CLUB RACING: THE REAL DEAL

If you're ready to go wheel-to-wheel, club racing is your next frontier. Organizations like SCCA, NASA, PCA, and BMW CCA offer regional and national racing series for all skill levels and budgets.

Yes, it's competitive. Yes, it's serious. But it's also incredibly rewarding — and more accessible than you might think.

Many racers start in HPDE or Time Trials and work their way up.

COACHING: THE FASTEST WAY TO GET FASTER

No matter where you are on your journey, coaching is the key to unlocking your potential. Great drivers are made, not born — and the best invest in learning.

- Self-coaching: Books such as the "Speed Secrets" series by Ross Bentley (yes, the same guy writing THIS driving guide with BFGoodrich!) are goldmines of knowledge and provide a more comprehensive version of the principles included in this driving guide.
- Private coaching: Hiring a coach for a day or a weekend can accelerate your learning curve dramatically.
- Racing schools: For the ultimate experience, consider the Skip Barber Racing School.

WHY SKIP BARBER?

BFGoodrich Tires is proud to be the official tire partner of the Skip Barber Racing School, the most recognized name in driver training. With a legacy of producing champions across all disciplines of motorsport, Skip Barber offers:

- World-class instructors
- Programs for all levels, from beginner to aspiring pro
- The ability to qualify for your SCCA Novice or Full Competition License
- Hands-on experience with BFGoodrich performance tires

Whether you're looking to improve your skills or start a racing career, Skip Barber is one of the best investments you can make.

Chris Gill / WestBoundary Photography

THE G-FORCE™ FAMILY CONTROL MANUAL

G-FORCE RIVAL S / RIVAL+, G-FORCE PHENOM T/A, G-FORCE COMP-2 A/S PLUS

This section is intended to assist you in getting the most out of your tires during a given race or track session. This information is general in nature, and numerous variables such as track conditions, car setup, and driver preference will play an important role in determining the optimum race configuration for your car.

G-FORCE PHENOM

The technology behind BFGoodrich g-Force tires is the result of decades of motorsports experience and competitive research. We are confident that these tires will provide the exceptional cornering and grip that you have come to expect from BFGoodrich Tires.

This guide offers a solid foundation for tuning your suspension and tires so they work together at the highest level. However, this general information doesn't address every possible track condition, car setup, or unique driver preference.

As always, firsthand experience and data acquisition are invaluable to tuning your setup for optimum performance.

TIRE PRESSURES

Determining the ideal tire pressure involves finding the optimum balance between grip, vertical stiffness and lateral stiffness from the tire as it relates to your vehicle setup.

A logical tuning approach would be to target pressures toward the middle of the recommended range and adjust target hot pressures based on vehicle, track conditions and your driving style. Vehicle balance can be somewhat adjusted by varying hot tire pressures.

The recommended hot pressure range for all tires in the BFGoodrich g-Force family should be in the 32-44 psi range.

In general, set cold pressures 5-7 psi below target hot pressures (not to go below 28 psi). When in doubt, err on the high side of target hot pressures since lowering pressure is quicker and easier than raising it. Plus, overestimating pressure increase can lead to running on underinflated tires, which could be a safety concern. Keep in mind that vehicle balance can be impacted by varying hot pressures.

The cold pressure required to get the desired hot pressure is dependent on variables such as humidity level inside the tire (ex: compressed air versus nitrogen), vehicle setup, track layout, ambient and track temperatures, and your driving style. If you have track experience with your vehicle and a reliable air pressure gauge, you probably have a good idea how much pressure increase you'll see.

For track lapping sessions, it is within reason to expect 5-7psi increase in pressure throughout the session. For autocross sessions, it is reasonable to expect 1-4psi increase in pressure throughout the session.

These are very generalized expectations, as the pressure change can be greatly impacted by vehicle load, camber, driving style, track layout, surface, etc. — you get the point.

TRACK USE — GENERAL GUIDELINES

COLD TIRES

- Never use inflation pressure below 1.9 bar (28 psi) cold
- To optimize the track longevity of BFGoodrich tires, BFGoodrich strongly recommends a minimum inflation pressure between 2.0 bar (29 psi) and 2.4 bar (35 psi)

HOT TIRES

- The best operating pressure of BFGoodrich tires is between 2.2 bar (32 psi) and 3.0 bar (44 psi) hot, according to vehicle and track conditions.
- Monitor tire pressures during the day to ensure that pressures do not exceed the maximum pressure marked on the sidewall of the tire.

TIRE PRESSURE PERFORMANCE IMPACT

PERFORMANCE	PRESSURE INCREASE +	PRESSURE DECREASE -
INITIAL RESPONSE	Faster	Slower
FIRMNESS	Increased	Decreased
SPRING RATE	Increased	Decreased
CONTACT PATCH	Slightly Smaller	Slightly Larger
TIRE "ROLL OVER"	Less	More
TIME TO "COME IN"	Faster	Slower

BEYOND TIRE PRESSURES

Your new BFGoodrich g-Force tires offer a level of control that can mask certain suspension shortcomings. Be careful not to use tire pressure adjustments as a quick fix for more involved setup issues — particularly if your vehicle and/or its suspension has been heavily modified. To get the most out of your tires, you'll want to make vehicle adjustments first, then use tire pressures only to fine-tune for optimum overall balance.

In general, we recommend that front camber be in the -2° to -3.5° range, and that rear camber be in the -1° to -2.5° range. If a track has significantly more turns in one direction than the other, it might be necessary to have different camber settings on the left and right sides of the vehicle to optimize performance.

For "rovals" (road courses inside banked ovals where the road course also uses the banking) the front camber should be in the -1° to -2.5° range with rear camber in the -0.5° to -1.25° range. Keep in mind that higher hot pressures should be used when running on high banked tracks.

ALIGNMENT — CAMBER

» Adjusting camber will contribute to higher cornering speeds and increased grip through maximizing the tires footprint under lateral load while also preventing excessive wear/fatigue to the outer shoulder.

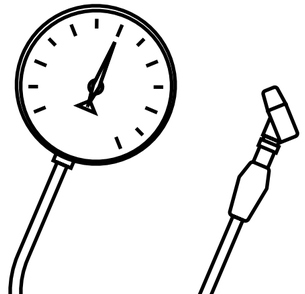
COLLECTING DATA

On most road courses, a minimum of six hot laps should be run before considering any changes based on temperature and pressure readings. This is because it takes a certain amount of "energy input" for tire pressures and tread temperatures to stabilize. Taking readings before the tires have reached stable operating conditions is not recommended and may lead you to miss the proper setup.

After a hot lap session, temperatures should be taken at three points across the tire with a contact probe pyrometer; start at the inside shoulder of the tire, move to the center, then finish at the outer shoulder. Readings on the outboard sections of the tire should be taken about 1.5" from the shoulder. Taking temperatures too close to the "corner" of the shoulder will give an inaccurate reading.

Due to heat dissipation, time plays a critical role in collecting the most accurate data. It is recommended that you begin with the outside tires and be sure to focus on the tread temperatures first.

We have provided a typical data acquisition sheet for your convenience with a blank form on the reverse side. Please feel free to make copies and use as needed.



DATA ACQUISITION EXAMPLE

BFGoodrich

TRACK	DATE	TIME	TEMPERATURE	WEATHER
Rolling Hills Raceway	8.6.25	13:15	81˚	Sunny, intermittent clouds, low humidity
SESSION#: 2				

LEFT FRONT

TIRE PRESSURE (PSI)		TREAD TEMPERATURES			TREAD TEMPERATURES			TIRE PRESSURE (PSI)	
COLD PRESSURE	HOT PRESSURE	OUTSIDE	CENTER	INSIDE	OUTSIDE	CENTER	INSIDE	HOT PRESSURE	COLD PRESSURE
30	39	200˚	180˚	170˚	173˚	182˚	185˚	38	30
		Avg. Temp	183˚		Avg. Temp	180˚			

RIGHT FRONT

LEFT REAR

TIRE PRESSURE (PSI)		TREAD TEMPERATURES			TREAD TEMPERATURES			TIRE PRESSURE (PSI)	
COLD PRESSURE	HOT PRESSURE	OUTSIDE	CENTER	INSIDE	OUTSIDE	CENTER	INSIDE	HOT PRESSURE	COLD PRESSURE
31	38	186˚	180˚	195˚	180˚	189˚	189˚	38	31
		Avg. Temp	187˚		Avg. Temp	186˚			

RIGHT REAR

TRACK	DATE	TIME	TEMPERATURE	WEATHER
SESSION#:				

TIRE PRESSURE (PSI)		TREAD TEMPERATURES			TREAD TEMPERATURES			TIRE PRESSURE (PSI)	
COLD PRESSURE	HOT PRESSURE	OUTSIDE	CENTER	INSIDE	OUTSIDE	CENTER	INSIDE	HOT PRESSURE	COLD PRESSURE
		Avg. Temp			Avg. Temp				

TIRE PRESSURE (PSI)		TREAD TEMPERATURES			TREAD TEMPERATURES			TIRE PRESSURE (PSI)	
COLD PRESSURE	HOT PRESSURE	OUTSIDE	CENTER	INSIDE	OUTSIDE	CENTER	INSIDE	HOT PRESSURE	COLD PRESSURE
		Avg. Temp			Avg. Temp				

SAFETY CONSIDERATIONS

Purchasing from the BFGoodrich g-Force family of tires proves that you're not inclined to make bad decisions.

Hopefully, this manual will provide ample information for making smart choices at the track. That being said, the quest for speed has been known to cloud even the best judgment.

PLEASE OBSERVE THESE IMPORTANT SAFETY WARNINGS:

- Never race on an underinflated tire.
- We strongly discourage "soaking" of tires. It can be hazardous to the person soaking the tires, the environment, and the tire itself. The additional complexity and components in radial tires put the product at risk when solvents are used in an attempt to "soften" the tread area of the tire.
- Always inspect each tire thoroughly prior to and immediately following each use.

FINAL THOUGHTS

The purpose of this guide is not to explain every detail of high-performance driving. The purpose is to make you think, to provide quick reminders and refreshers, and encourage you to continue to learn and improve your high-performance driving.

—Ross

THERE IS ALWAYS MORE TO LEARN.

» Use this guide, your driving skills, and your tires for good, and not evil!

» Know when/where it is appropriate to safely use your ever-improving skills and knowledge.

» Drive within the limits and the law — the limits of both your car and your skill, and the laws of both the road and physics.

ABOUT THE AUTHOR

Ross Bentley is a former professional race car driver turned internationally respected performance coach and author. With a career spanning everything from Formula Atlantic and Trans-Am to CART IndyCars and endurance racing — including a class win at the 24 Hours of Daytona — Ross brings decades of high-level driving experience to his work.

Now known for his bestselling ***Speed Secrets*** series, Ross has helped thousands of drivers — from weekend racers to professionals — sharpen their skills and unlock peak performance behind the wheel. His coaching blends practical technique with cutting-edge insights from sports psychology, neuroscience, and human performance.

Whether he's working one-on-one with a driver, speaking at industry events, or hosting his popular Speed Secrets Podcast, Ross' passion is clear: helping others discover the art and science of driving fast — by thinking faster.

BFGoodrich Tires