



NMSA
Drivers Journal

NMSA
Natl. Motorsports Safety Association
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www.motorsports-safety.com

Welcome to High Performance Motorsports!

We're so glad you've made the jump to High Performance Motorsports, it's an adrenaline rush and a great learning experience. You've taken great pride in your car, and now it's time to learn how to use it to its full potential.



It's my first time at an High Performance Motorsports Event, what should I bring to the Track?

You want to make sure that you have everything that you need to be comfortable, and safe all day long. For each person that is something different but to give you an idea here is a list of things for you to think about.

- **Helmet, appropriate track clothing, and weather gear**
(in March, we could have 75 degrees or we could have 15 degrees - it could rain, snow, and be beautiful in the same day). Come

prepared.

- **Appropriate documentation.** During the registration process you will be asked to provide your Club Member Number (SCCA, NASA, PCA, etc) or weekend membership, provide a driver's license or a permit, and if you are bringing any minors with you check with the club about their rules and any disclaimers that need to be signed; and your pre-event tech form.
- **Any supplies you might need for your vehicle.** Not all tracks have a "track store" this means that you won't have easy access to materials should you need to change fluids or have a miscellaneous need. So please thoroughly plan your needs.
- **Food or Cash.** There is always some sort of Food Stand/Truck at the Track and nearby restaurants. Not all take credit cards so you need to plan for this. You are always welcome to bring your own food items. – **medication**, should you need it. Tracks are usually a long way from a drug store.
- **Lawn chairs**...there are very few places to go and sit...so if you want to set up a little compound you are welcomed to.
- **A tarp to put your materials on.** Your car needs to be 100% empty...so all of your supplies and materials need to be outside of your car, a tarp will help you keep them clean and dry.
- **Tools**...you would be amazed what breaks at the track. Call upon your inner boy/girl scout and be prepared. And don't be afraid or embarrassed to ask others for help. Plenty of folks might have what you need around the paddock, just ask!
- **PEOPLE!!!** Bring your friends, folks that might also be interested in the sport. There is no cost for admission so why not spend a saturday or sunday at the Track?

Let's review some of the basics

Understand the FLAGS



The solid green flag is usually displayed by the starter to indicate the start of a session/race. During a session, it is displayed at the end of a caution period or a temporary delay to indicate that the race is restarting.



The solid yellow flag, or caution flag, universally requires drivers to slow down due to a hazard on the track, typically an accident, a stopped car, debris or light rain. However, the procedures for displaying the yellow flag vary for different racing styles and sanctioning bodies.

- A single waved flag denotes a hazard on the racing surface itself.
- A single stationary flag denotes a hazard near the racing surface.



- Two flags waved simultaneously denotes a hazard that wholly or partly blocks the racing surface. This informs the driver that there may be marshals on the track and to prepare to stop, if necessary.



- When the safety car is on the circuit, all flag points will display a White flag. When flag points are under radio control, this will happen immediately, otherwise, the White flag is displayed when the safety car comes round for the first time. This is accompanied by a waved yellow flag. Standard yellow flag conditions apply to the whole circuit; notably, overtaking is completely forbidden.



The red and yellow striped flag, or debris flag is displayed stationary at local flag stations to indicate that track conditions have changed due to substances on the track which could reduce grip or cause a car to lose control. Generally oil, coolant, small pieces of debris or sand

are the hazards. It can also be “rocked” back and forth (but not waved) to indicate a small animal on the racing surface. Many organizations will display this flag for only two laps, after which the changed surface is considered to merely be “part of the track”.



A mechanical black flag is a black flag with an orange disc (aka “the meatball”) in its center indicates that a vehicle is being summoned to the pits due to serious mechanical problems or loose bodywork that presents a risk to other competitors.



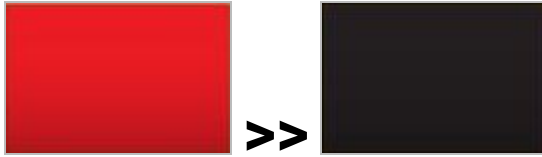
The solid (furred) pointed black flag is used to summon a driver to the pits. It is usually associated with a penalty imposed on the driver for disobeying the rules, but may also be used when a car is suffering a mechanical failure, leaking fluid, exhibiting damage such as loose bodywork, loose hood, dragging bumper, or any other damage that could potentially become a hazard to the driver or other competitors.



There are some instances where a Black Flag will be shown in conjunction with the White Flag, this is to indicate to all drivers coming back to the pits, that there is an emergency vehicle present in the area, but their actions remain guided by the black flag rules: return to the pits.



The solid red flag is displayed when conditions are too dangerous to continue the session. Depending on the series and the circumstances, the cars are typically directed to proceed immediately to pit road, or to stop at a specific spot on the track (the closest visible corner station). In some severe cases the cars might be required to stop immediately where they are.



Generally, when Red Flag conditions are lifted, they are immediately followed by a Black Flag requesting that all drivers return to the pits.



A solid blue flag, sometimes with a diagonal yellow, orange, or red stripe (seen below) –



informs a driver that a faster car is approaching and that the driver should move aside to allow one or more faster cars to pass. During a race, this would only be usually shown to a driver who is getting lapped but during practice or qualifying sessions, it could be shown to any driver. In most series, the blue flag is not mandatory—drivers obey

it only as a courtesy to their fellow racers. As such, it is often referred to as the “courtesy flag”.



The white flag indicates the presence of an official car or a competitor moving at below normal speed in the section of track covered by the flag station.



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- A white flag with coupled red cross, to indicate medical attention is required near the marshalling post. Can also mean an ambulance is on the course (generally a red cross is followed by the race being “red flagged”)



The checkered flag is displayed at the start/finish line to indicate that the race is officially finished. At some circuits, the first flag point will display a repeat checkered flag (usually on the opposite side of the circuit). Upon seeing the checkered flag and crossing the finish line, drivers are required to slow to a safe speed, and return to their garage or the paddock.

To learn more about flags or take our online FLAG TEST, visit www.motorsports-safety.com

Consider Chalking your Tires

Chalking tires is an AutoCross technique designed to give you base level information about the over/under and just right inflation of your tires without spending a lot of money on expensive tire monitors and pyrometers. The goal of chalking tires is to find the right tire pressure to maximize tire grip.

Over inflated tires lead to sliding and loss of traction while cornering. Under inflation leads to poor handling qualities. During a typical 25 to 30 minute HPDE session, tire temperatures increase much more than street driving. The increase in temperature leads to an increase in air pressure in the tires. Recommended tire pressures are posted on a placard visible when the driver's door is open. For a beginner, the placard recommended pressures are a good starting point. If you have inflated to the recommended pressure at the beginning of the session, the tires will heat and be in an overpressure situation during the session. Typical pressure increases can range between 2 to 12 psi depending on the type of tire, outside air temperature and other factors.

You can use sidewalk chalk purchased from the toy department of grocery stores or department stores or white shoe polish (preferable water soluble).

The mark should start from the sidewall and continue around the shoulder toward the center of the tire to where the tread flattens out (see Example below). The front tires will experience more heating than the rear tires, so chalk at least one front and one rear tire. For consistency, chalk each tire with three marks separated by 120 degrees (or at the 12, 4 and 8 o'clock positions on the clock face).

Example: Chalking the tire across the shoulder/sidewall of the tire



Determining the proper amount of rollover... try and use this technique to aid your driving and also rule out any possible handling "issues" due to poorly or improperly inflated tires.



Review your Hand Signals

- **Point-bys:** Prior to participating in your first track session, your instructor should meet with you at your car and have you demonstrate left and right point-bys so that the instructor can see that you are extending your hand well clear of the window and can be easily seen by other drivers. The instructor should be standing behind the car to get the proper perspective. If time allows, the instructor can switch roles with you so that you can see what a small target the hand and arm are compared to the size of the car.

Example: A preferred **LEFT-SIDE** pointby



Example: A preferred **RIGHT-SIDE** pointby



Example: Is this a left side or right side pointby? **NEITHER!**



- **Waving off a point-by**

- Acknowledging a faster car behind you in the curves that you will give a point-by when the wheels are straight/in an authorized passing zone (pointing to your inside/center mirror) for novice group. I have been taught by one instructor to wave to the car behind me like waving off a point-by, but a separate signal might be preferable/help with communication intentions

- **REMEMBER:** The difference between the wave forward/wave back is hand position..wave off a pass with your hand towards the windshield, wave to car behind you with your hand back by your helmet, it does make a difference. Mandatory safety of operation communication between cars is external and courtesy notifications are internal.

- **Pitting in:** Similar to the point-bys, the raised fist pitting in signal should be demonstrated to your instructor in the paddock before the first track session. Remember when you display the pit in signal, the car should be on the same side of the track as the exit and never come back out to the driving line. With most clubs and event sponsors, the pit in signal also means that continuing cars (if pitting in mid-session) may pass. Once you make intention to pit in, you must follow through and not change your mind. Flaggers have already radioed in that you're coming. One of the more important characteristics is being predictable to other drivers.

Example: A preferred "pit-in" signal



- **Acknowledging Corner Workers!** - There is always time to show goodwill to the flaggers/corner workers during the yellow flag sessions at the beginning of the day and after the checkered flag has been displayed. Give the corner workers a friendly wave from inside the car as you pass their stations as at almost all events these individuals are volunteers and not paid workers.

SEATING POSITION

NEEDS WRITE UP / PICTURES

HAND POSITIONS

Hand positions while driving are important in determining how much the driver will be able to operate the steering in any condition. We will review some of those hand positions here.

The Classic: "10 & 2"



When we first learned to drive we were all taught to drive with our hands at "10 & 2" – for general driving conditions this is probably the most appropriate hand position to use in 90% of all cases, however other habits are developed over time either for comfort or technique. It's rare to see someone "sticking with 10 & 2" all the time. At the track, "10 & 2" only affords you about 70% range of steering motion and will feel awkward when the wheel is turned close to 90-degrees. A slight adjustment to "9 & 3" will make driving much easier.

The "9 & 3"



As an alternative to "10 & 2" the "9 & 3" hand position is the most frequently taught hand position at HPDE events. The "9 & 3" is supposed to give you the most even range of motion (when not releasing the position) while navigating high speed corners.

"Low Grip" (aka: Kart Style)



A "low grip" (or "7 & 4") is often seen when drivers have a hobby in either airplanes or previous experience Kart racing. This low grip gives the operator the ability to make quick movements while keeping their arms close to their bodies. Some would argue that a low grip also gives you more "response" or "feel" from the road as the steering wheel twitches. In a loss of grip situation people can either reposition to "9 & 3" or Shuffle Steer.

Shuffle Steering - This is most commonly used when making very tight turns at slow speed such as parking a car. As the steering wheel turns, the driver releases their grip on the hand that was being pushed down and is repositioned at the top of the steering wheel (about 2 o'clock position) while the other hand is released and moved down (to about the 7 o'clock position) while the wheel is being turned. Shuffle steering has applications in Autocrossing, where speeds are lower and cornering is tighter than most tracks where HPDE events occur.

When using shuffle steering in any high performance driving, the arms should never cross - if the front wheels force the steering wheel to move suddenly, the driver can incur injuries. Some clubs do not promote shuffle steering because most tracks driven at speed the driver does not need to turn the steering wheel to the amounts necessary to shuffle steer - they can keep their hands in the 3 & 9 or 2 & 10 position while driving. Another reason for not using shuffle steering is that the driver may temporarily lose their reference to having the wheel straight during the turn if the car skids and the driver needs to take corrective action. The driver that keeps their hands in one position maintains the reference to the wheels straight position.

Take note of how you operate the steering wheel, where you grip it and what your "comfort zone" seems to be. We all have them. We don't recommend "correcting" but rather working with a natural feel -- unless you are driving one-handed like a boater, or worst "gangsta style" -- positions like this should be remedied immediately -- we recommend starting with "9 & 3".

Heel+Toe and other Foot Positions

As important as Hand Positions are the drivers Feet positions. Do you have a tendency to rest your foot on the clutch before/after shifting? Do you have to remind yourself to use the dead pedal? If you say "*I know how to heel+toe*" which way are your feet pointing when you heel+toe? While braking normally do you use the entire pedal, just part of it ... or are you more adept at left foot braking?

As a general rule: Heel+Toe should not be attempted by novice students. Instructors should advise students to practice heel+toe on the street or in parking lots at low speeds or practicing the mechanics of heel+toe while parked and not moving getting some muscle memory and foot placement. Proper heel+toe technique is essential for moving into more advanced run groups.

Example: "*Goofy Foot*" Heel+Toe (used on cars where pedal comes up from the floor: ie: Porsche, BMW, etc)



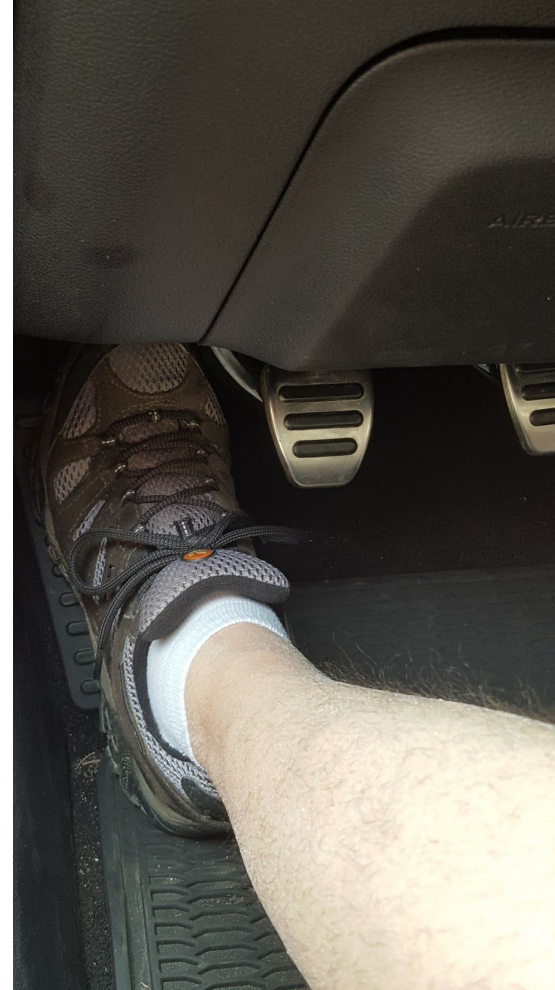
Example: "Rolled Ankle" Heel+Toe (used on cars where the pedal comes down from the firewall: ie: Volkswagen, Honda, etc)



Example: "In a spin, both feet in" -- Depress the Clutch and the Brakes fully during a spin.



Example: When you're not operating the clutch, make sure your foot is firmly planted on the "dead pedal"



Left Foot Braking

The track is not the place to begin practicing this technique as most people's left foot is accustomed to the on/off action of working the clutch and do not have the finesse that the right foot has developed using the accelerator and brake over the years. Similar to heel+toe, this is a technique that should be practiced on the street only after

clearing the back of the car using the mirrors since the first few applications will have the driver hanging in the shoulder strap until they build the finesse and smoothness needed.

Example: Left Foot Braking



If you use left foot braking, you should be resting your foot on the dead pedal only when accelerating on the straight, otherwise, your foot should be near the brake pedal ready to use. Someone new to left foot braking can momentarily freeze when they encounter a situation not anticipated and the muscle memory will make them want to use their right foot for braking, but their brain will tell them to use the left and the momentary lag may put the occupants in a bad situation. Beware of this transition period.

Shifting

Shifting is another dark art, it takes a rhythm and combination of steps to yield a truly *“great shift”* – there are so many styles of shifting depending on the discipline: Flat-foot, Speed, Granny, Double-Clutch, Short, etc. Not all of these are appropriate for DE. Clutch footwork should be limited to a traditional (aka *“smooth shift”*) there is no time savings in abusing the equipment or upsetting the balance of a car because you are shifting roughly.

More importantly than the shifting footwork is the hand placement while shifting. There are really two techniques here, what we like to call: Overhand vs Underhand shifting. Note: these styles only apply to classic H-pattern/gated shifters. Inline, Sequential and Pull Type shifters (ie: CAE) require a different hand movement to operate.

Let’s start with **“Overhand Shifting”** which many of us were taught when we first started driving. The idea of an *“overhand shift”* is that the motion from front-to-back is done with your hand leaning forward of *“gripping”* the shifter as your complete the motion. As demonstrated in the following pictures.

Overhand 1st Gear Grip



Overhand 3rd Gear Grip



1st to 2nd Gear (note that using this grip your hand will pull the shifter towards your hip).



Overhand 5th Gear Grip



*3rd to 4th Gear; Note: depending on your hand position during the 3rd to 4th motion this will result in pulling the shifter toward your hip. You might end up grabbing 2nd gear instead - **OUCH!***



A preferred alternative for a 3rd-to-4th Gear shift that eliminates the tendency to pull the shifter towards 2nd gear is to “palm” the shifter as seen in the pictures below; this also allows the shifter to come to center during the transition.



The same “palm” approach is recommended for cars with 6 speed transmissions.



Underhand Shifting - this takes the traditional Overhand approach and adds a few new twists to making track driving a little more focused.

Replace the Overhand upshift with a “ball of your hand” movement (seen in the picture below); this will allow the shifter to come to center before completing the upshift. This also helps avoid the dreaded “4th-to-1st” (aka “Money Shift”).



Rotate your hand position from 3rd-to-4th and 5th-to-6th. This will force the motion of your shift away from your hip, thus avoiding any “2nd-gear-snags” -- this is also useful during a downshift from 5th to 4th. It will seem a bit awkward at first -- much like “goofy foot” if you’ve ever been snowboarding.



Using a combination of the “*Palm*” and the “*Underhand*” techniques will ensure that your shifts are precise and direct. Again, shifting while on track isn’t like Drag Racing or AutoCross where the 0.3 sec that it takes to shift gears means all the difference. Take your time, enjoy the drive and save your equipment.

Let’s do this!

Looks like you’re all set... Remember

- **Safety First!**
- Go to Class
- Listen to your Instructor
- Paddock speed is as fast as you’d like to get hit by a car
- Warm up your tires, your brakes and your brain!
- ...and drink plenty of water.

Enjoy your High Performance Driving adventure!

The Crew, at NMSA.



Special thanks to GTM Members: Eric M, Brad N, Shane S, John R, Bruce S, Brett S for making this Journal a success. Without members like you, none of this would be possible.

Event Tracking

Date	
Circuit	
Club	
Event Type	
Instructor	

Key takeaways _____

Instructor Review

	1	2	3	4	5
Flags					
Braking					
Throttle					
Shifting					
Steering					
Passing					
Vision					

Feedback _____

Vehicle Tracking

Make/Model	
Surface	
Weather	

Vehicle Specs

	LF	RF	LR	RR
Caster				
Camber				
Toe				
Shocks				
Sways				
Pad Depth				

Tire Temps & Pressures

Left Front		psi	Right Front		psi
Left Rear		psi	Rear Rear		psi

Items to prep for the Next Event

Event Tracking

Date	
Circuit	
Club	
Event Type	
Instructor	

Key takeaways _____

Instructor Review

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Braking					
Throttle					
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Feedback _____

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Vehicle Tracking

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Pad Depth				

Tire Temps & Pressures

Left Front		psi	Right Front		psi
Left Rear		psi	Rear Rear		psi

Items to prep for the Next Event

Progress Report

Reflect over the last 4 events

	Yes	No
Have I mastered the line around the track(s) I've visited?		
Can I modify my driving based on the weather conditions?		
Have I driven in the Rain yet?		
Can I identify the turn-in/apex/track-out on each corner?		
Have I mastered Heel+Toe?		
Have I been soloed yet?		
Have I been promoted yet?		
Have I experienced an "off" yet?		
Have I experienced any mechanical issues?		

I've been promoted, from level _____ to _____ with the following organizations

I am still working on mastering....

What I would like to work on improving over the next 4 events?

What modifications have I made to the vehicle over the last 4 events?

What is still left to be done to the vehicle?

Motorsports terms you should know

Term	Synonyms	Explanation
Acceleration		The addition of speed, normally caused by an engine either pulling or pushing a car
Aerodynamics		The science dealing with a car passing through the air
Apex		The center point of a turn with respect to entering or exiting
Brake Modulation		Easing off of the brakes slightly when you feel the wheels locking then reapplying the brakes. ABS does this automatically.
Camber		The tilt of the wheel from the vertical, viewed head on. Positive Camber means the top of the wheel leans away from the vehicle centerline. Negative camber has the wheel leaning toward the centerline. Any wheel camber has two effects. A wheel tends to run in a circular path toward the direction in which it leans, and any time a wheel is not running at a right angle with the road surface, the flat of the tread is not fully in contact with the road. Since a vehicle tends to lean away from a turn due to centrifugal force and the wheels tend to lean with it, negative camber is sometimes used so that the tread is flat on the road surface when it is on the outside of a corner. This is when you most need the traction.

Caster		The more-or-less vertical axis about which a wheel rotates during steering. When the top of this axis leans toward the rear, like the front fork of a motorcycle, it is positive caster. The primary effect of positive caster is that the tire contact patch on the pavement trails behind the point at which this axis contacts the pavement. This causes the wheels to tend to follow the caster axis and run straight or return to straight ahead after a turn.
Center of Gravity		The center point at which the vehicle will balance
Centrifugal Force		The force towards the outside of the circle
Centripetal Force		The force towards the inside of the circle
Cornering		Driving in an arc predetermined by either limiting barrier such as a pylon, or be mental design on the part of the driver
Deceleration		The slowing of a vehicle, normally done by applying braking pressure
Dive		A word sometimes used to describe the pitch motion in a car under braking
Early Apex		Having the inside wheel come close to the inside of a corner before reaching the midpoint of the corner

Egress Corner		A corner that exits onto a straightaway
Entry Angle		The position of a car relative to an approaching corner
Esses		A series of "S" shaped bends.
Exit Angle		The position of a car relative to leaving a corner and approaching a straightaway
Friction Circle		
Heel and Toe	Heel+Toe, Heel/Toe	A driving method whereby the right foot is used to control both the accelerator and the brake
Ingres Corner		A corner at the end of a straightaway
Late Apex		Having the inside wheel come close to the inside of a corner past the midpoint of the corner
Left Foot Braking		Using the left foot to operate the brakes thereby maintaining throttle and chassis set
Lift Throttle Oversteer	LTO	Oversteer caused by lifting off the gas quickly just before or during a corner to increase weight transfer to the front of the car, causing the rear end to become light (and/or rotate). Front wheel drive cars are noted for doing this.
Neutral		The car feels balanced and responsive; the driver feels more comfortable and in control

Neutral Corner		A corner with less than 160 degrees of curvature.
Oversteer	Tail Happy	The car wants to over-respond to your steering inputs. The rear end of the car feels light, and the car acts as if it wants to spin.
Pylon	Cone	Usually a fluorescent orange traffic cone, rubber or plastic material.
Pyrometer		A technical instrument used to accurately gauge the temperature of the rubber compound of a tire
Sway Bar	Anti-Sway Bar, Roll Bar, Anti-Roll Bar	This device reduces body roll and is normally mounted laterally at the front and rear of the car.
Shock	Damper, Strut, Shock Absorber	A dampening device used in conjunction with springs to reduce bound (rebound), and stabilize the ride of a vehicle
Springs		Devices of various shapes (standard, progressive, coil-over) that support the weight of a vehicle in a resilient fashion.
The Line		The line is the route around a course and through its corners which will enable the car to go the fastest. Different cars require different approaches to stay on the line. The most important corners are those leading to the longest straights.
Threshold Braking		Maximum braking with the wheels on the verge of locking

Toe (In or Out)		The alignment of the wheels as viewed from above. "Toe-Out" means each wheel points away from the centerline. "Toe-In" means each wheel points in, toward the vehicle centerline. The primary purpose for the seeming mid-alignment of toe-in is to preload the steering and suspension linkage and take out all linkage slack or springiness. It does this because the centerline of the tire usually lies outboard of the caster axis, and forward motion tends to push the wheel and tire rearwards in an arc so that the wheels tend to toe-out. The amount of static-toe is such that the wheels are pointing at or near straight ahead after the car is in motion and all the slack is taken out of the system.
Torsion Bars		A supporting device much like a spring, only instead of moving up and down, they torque or twist.
Track-Out	Track-Out Point	The point on the course at which the car should be when you have completed the turn
Turn In	Track-In	The point on the course at which you should begin to turn the steering wheel in order to complete the corner.
Trailing Throttle	Trailing Accelerator	A condition whereby the driver maintains a lag in acceleration while beginning to apply the brakes.

Trailing Throttle Oversteer	TTO	Oversteer caused by lifting off the gas or breaking while in a corner. Rear engine cars are noted for doing this.
Trail Braking	Trailing Brake	A condition whereby the driver maintains a lag in braking while cornering, usually to the apex, then accelerating.
Understeer	Push, Plow	Often called "push" or "plow" the car feels like it is unresponsive to your steering inputs, will continue straight ahead, and feels like the wheels are not turned enough. The initial response - the wrong response - is to turn the wheels more.



*Enjoy on your
High Performance adventure!*

National Motorsports Safety Association

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