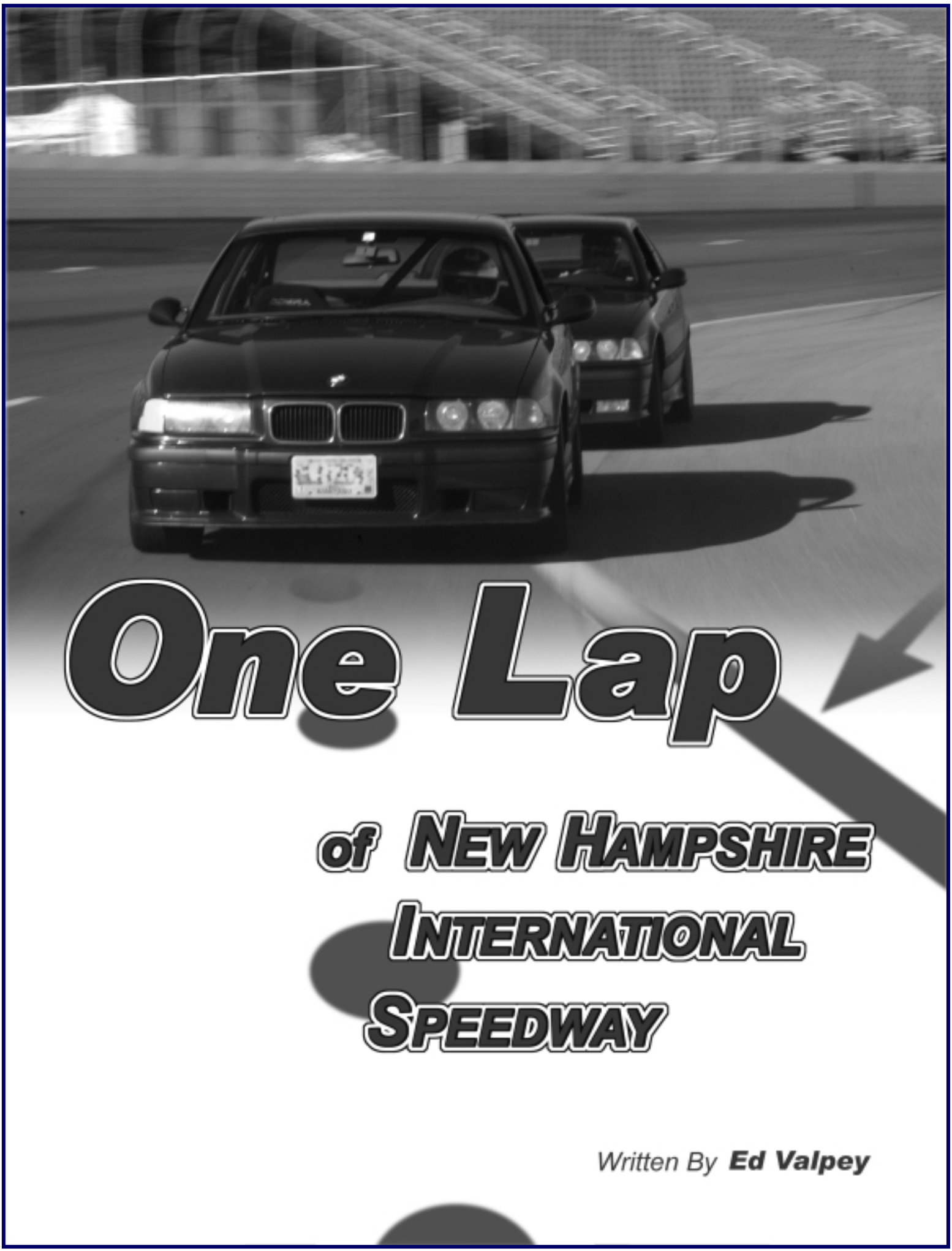

One Lap

of New Hampshire International Speedway

Written By **Ed Valpey**

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New Hampshire International Speedway

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Cover Photo By Martin Callahan
Instructors John Cloutier and Ed Valpey in the South Oval

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Contents

Foreword

by Martin Callahan,
past editor of *The Profile* newsletter

This publication is a compilation of a series articles by Ed Valpey which originally ran in his *Drivers Ed 101* column of *The Profile*, the newsletter of the White Mountain Chapter of the BMW CCA. Ed Valpey is the chapter's chief driving instructor and writes often for *The Profile*.

In the following chapters, Ed will take you step by step around a text book lap of New Hampshire International Speedway, a.k.a. NHIS, sharing with you with his personal insight that he has amassed from his many years as a high performance driving school instructor and competitive race car driver at NHIS and around the country.

For those who may not know, NHIS, located in Loudon, New Hampshire, is the White Mountain Chapter's "home track", and is the current location for all the chapter's Performance Driving Schools and Advanced Driving Skills Schools (ADSS). For more information about these schools visit the official chapter website at: www.wmc-bmwcca.org

The satellite imagery used in this publication is courtesy of the USGS in cooperation with TerraServer and Microsoft. To locate NHIS on the TerraServer website, visit this address: www.terraserver.microsoft.com and enter the coordinates: Longitude: -71.46197, Latitude: 43.36054. Although the satellite photos are dated, having been taken before major renovations to the driving surface at NHIS a few years ago, they suffice to show the different turns of the course.

Chapter 1

The South Oval

NASCAR Turns 1 & 2

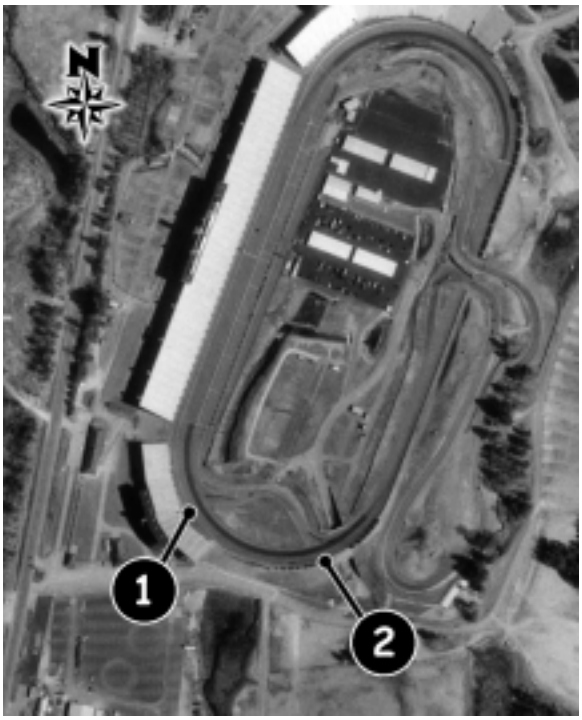

Fig. 1-1. NASCAR Turns 1and 2.

NASCAR turns 1 and 2 make up the "South Oval" at NHIS. Most experienced drivers prefer this configuration because it's more exhilarating. These drivers obviously haven't yet experienced the absolute hell visited on driving instructors by the unfortunate combination the South Oval, a fast car and a lousy student. Nevertheless, we run the oval from time to time so let's look at two basic lines that one might use. First, however, a disclaimer... I'm presenting two basic options for running the oval. An experienced oval track driver could probably look at this same corner and offer ten options.

The road racing and "NASCAR" lines depicted in fig. 1-2 have nothing to do with dialect, diet or deference to the confederate flag. Instead, they have to do with two distinctly different types of racing cars. To generalize, road racing cars are good at cornering, good at braking and a little lame at accelerating. Stock cars, on the other hand, accelerate like hell, stop fairly well and are just plain pitiful at cornering. When Indy cars used to run at NHIS they would go through the corners faster than Stock Cars go down the straights. Of course, to be fair, one should point out that Indy cars aren't making much progress at all around NHIS now, since nobody seemed to care to watch them race.

Nevertheless, consider the distinct characteristics of the two types of cars (with road racers represented by something more pedestrian than an Indy Car) and then apply the Golden Rule of racing, i.e., exit speed is crucial. If one's car doesn't accelerate very well, then one needs to drive a line that will give the car more time to spool up. Hence the road racing line. Road racers turn in later, taking advantage of their good handling, corner hard on a high line through *Sector A* and into *Sector B*, then set themselves up to go to power early with a late apex and a very long increasing radius line out of *Sector C*. The tightest radius traveled by a road racer takes place in the first third of the corner, while the stock car driver experiences his tightest radius through the middle, say, fifth of the corner. Road racers will generally brake moderately, if at all, through turn-in, and then gradually add power through the remaining two thirds of the corner. At track out, the road racer with 120hp is going just as fast as the 700hp stock car. If a road racer tried the "NASCAR" line he would do extremely well through *Sectors A and B*, but would get eaten alive through *Sector C*. Conversely, if a stock car driver attempted the road racing line he might very well hit the wall in Turn 1, or at least wash out and tiptoe through the marbles before regaining composure at 85mph somewhere in the middle of *Sector B*. The straighter the line a stock car travels, the better it is for everybody.

Hence, the "NASCAR" line. Stock cars drive in fast and deep on a straighter decreasing radius (*Sector A*), brake like hell and gather the thing together with lots of pucker factor through *Sector B*, and then paste 700hp to the pavement all the way to the wall on an increasing radius line through *Sector C*. While a driver on the NASCAR line drives a radius as small or smaller than that of the driver on the road racing line,

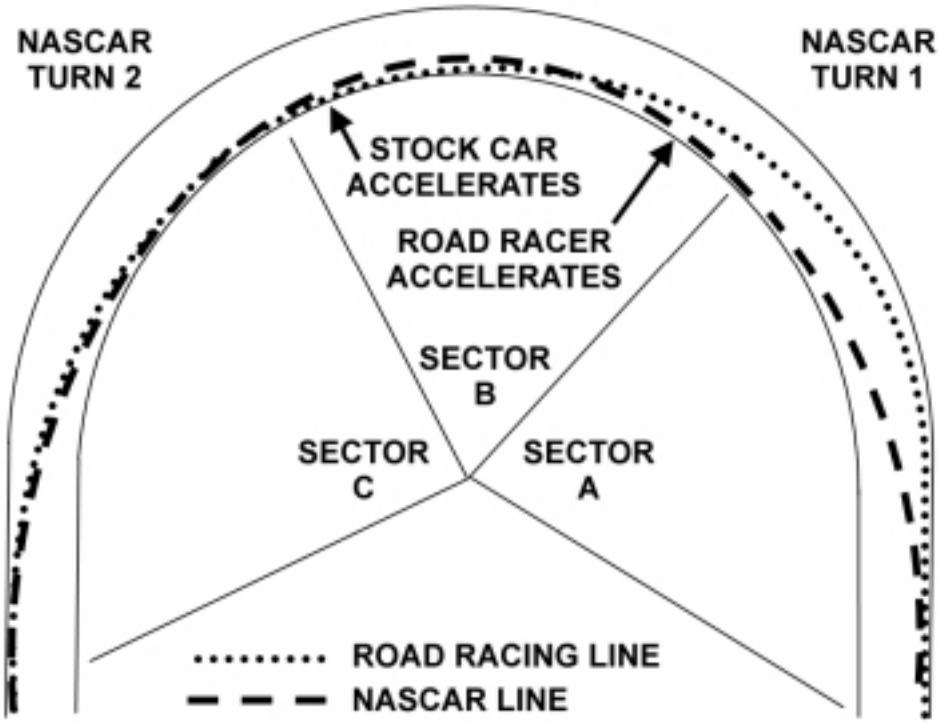

Fig. 1-2. The two common, but very different lines through the South Oval.

it's concentrated into a shorter amount of time. The end result is that the relative weakness of a stock car, handling, is minimized.

Consider the line in terms of time splits and tire potential. If one were to measure braking, cornering and accelerating, the driver of the NASCAR line would spend more time using his tires primarily for braking and accelerating, while the driver on the road racing line would spend more time using his tires primarily for cornering.

There is also the banking (track camber) to consider. The NASCAR line puts the car into the track camber at a more severe angle, hence making that camber more effective at helping to turn the car. They almost use the track camber like a berm through the middle of the turn. The road racing line more closely follows the contour of the track throughout turn-in, doing little to take advantage of track camber for cornering. Instead, however, the driver on the road racing line sets the car up to take advantage of track camber for acceleration. If you look at the point where the road racer begins accelerating, the car is actually traveling down hill toward the center of the corner. Gravity can equal lots of horsepower. Both lines take advantage of the track camber through *Sector C* to help turn the car through track-out.

In the end, driving the oval quickly is like loosing weight; it's very simple, but at the same time fairly hard to do. The biggest hurdle is knowing where you are in that large expanse of pavement. Getting used to finding a reference point two hundred yards ahead is crucial, yet in order to drive the oval quickly one must commit to a line, and a significant level of acceleration, well before the track-out reference point can provide all the feedback we need. With enough laps through the oval you'll begin to find subtle surface features to serve as reference points. As we pass the middle of the corner we should know where we are relative to the apron, certain painted lines or blemishes in the pavement. While keeping one eye on these closer reference points, we should have our other eye on our reference point on the wall. This latter reference point is a long way off and in a direction we're not yet traveling, making it more difficult to keep an eye on. As with driving anywhere, the key is to get the eyes up and looking far ahead while registering the nearer reference points in our peripheral vision.

Once the line is established, it comes down to the handling of the car and the willingness of the driver to use both 100% of the car's potential and 100% of the available track surface, which can mean a 100+mph four-wheel-drift to within inches of the wall at track-out. Hopefully not with me in the passenger seat.

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Chapter 2

Turns 1, 2A and 2B

The South Chicane

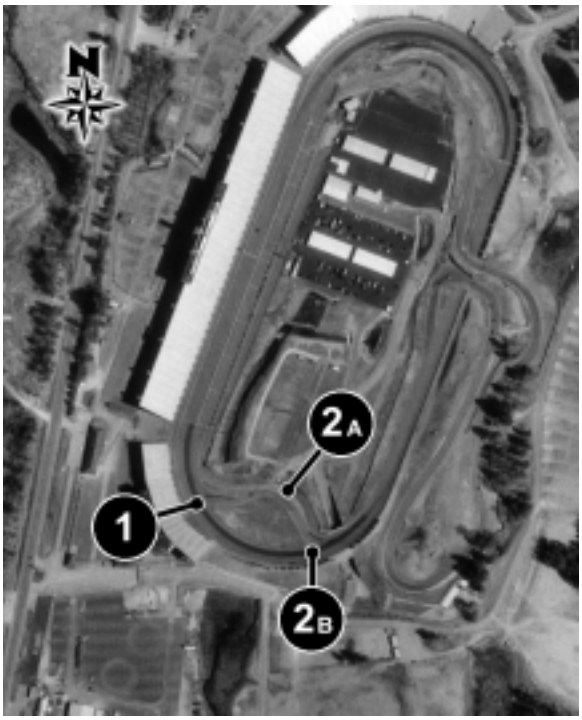

Fig. 2-1. Turns 1, 2A and 2B.

In the last chapter we looked at a couple of strategies for the South Oval; this time we'll look at the South Chicane. Before diving in, however, I'd like to make yet another disclaimer. As much as we'd all like to think we know the best line through every corner, sometimes variables such as handling characteristics and driving style mean that while our line may be best for us, it may not be best for everybody. Furthermore, don't take it as gospel from anybody who tells you a certain line is faster... your author included. People have been known on occasion to err, obfuscate and promote; stopwatches do none of these things. Until you do split times you won't know for sure which line or technique is faster. Your author's best lap in a Spec Racer Ford was three tenths slower than the track record. This is a decent time in one of the more competitive SCCA classes, but it also provides concrete proof that there are drivers out there who know how to do it faster. Talk to as many faster drivers as you can and try every trick they're willing to share. And be sure, when trying new things, to quantify your performance. Use a stopwatch if you can or, if you're doing this at a BMW CCA event, evaluate your progress by noting your tachometer readings at track-out. In most cases the latter technique will give you the information you need.

The Chicane

I've always found it curious that the oval is traditionally more popular than the south chicane, particularly among instructors. The south chicane has, after all, some distinct advantages. For one thing, students who manage to screw up the south chicane do so at much less risk to life and limb than those who screw up the oval. Further, the driver who learns to do the south chicane well will gain, between the turn-in of Turn 1 and the kink leading into Turn 3, at least two or three car lengths on those who haven't (assuming some parity in car performance). And if the allure of the oval is mainly exhilaration, well... how early can you apex 2B?

The aforementioned gains, which I realize on the vast majority of cars I chase through the south chicane, I attribute not to any particular talent but instead to a specific approach. The strategy I promote is based primarily on laps run in reasonably well prepared cars with handling characteristics closer to the race car side of the bell curve. Nevertheless, based on my experience with reasonably good handling production cars, I believe that if a car is able to run the "alternate" line the driver will find an advantage. There will be dissenters, especially with regard to the line suggested in Turn 1, but it doesn't hurt anybody to try a new line now and then. And if one gives it a fair effort and records split times, one can find the right answer for oneself.

Looking at the two lines shown in the fig.2-2, one could justifiably conclude that your author has no idea what he's talking about. After all, the "alternate" line through Turn 1 has a slightly tighter radius, which means it requires more braking and is slower. Also, the line through Turn 2B looks to have a decreasing radius, which should mean decreasing acceleration,

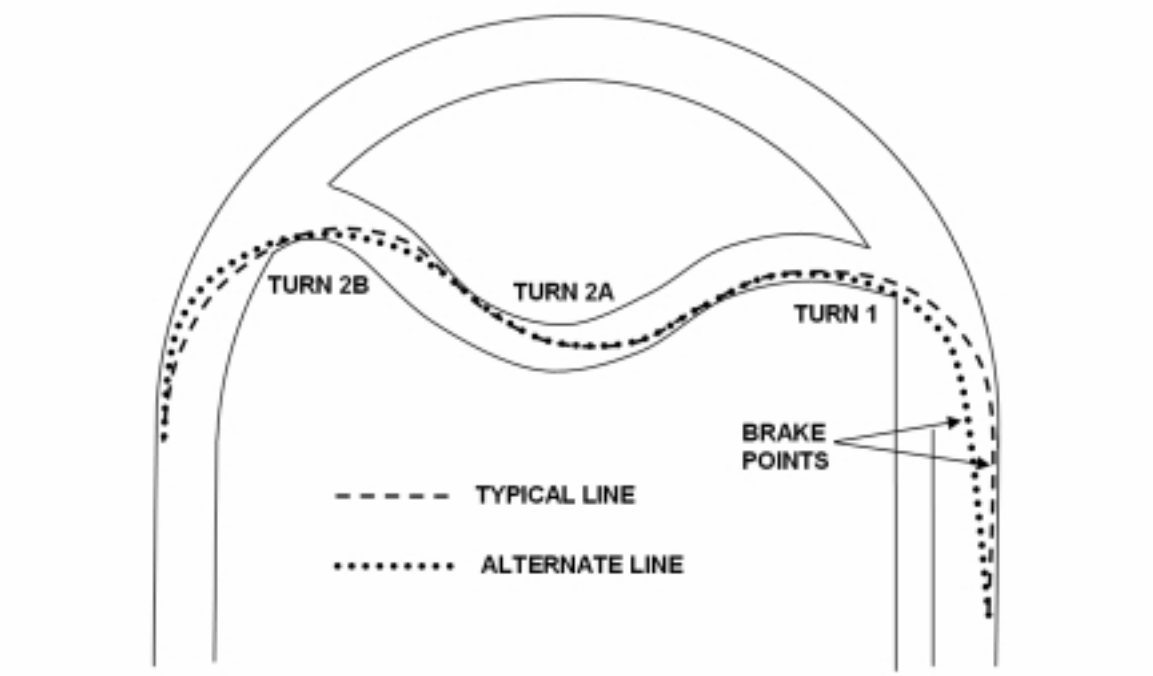

Fig. 2-2. The “typical” and “alternate” lines through the South Chicane.

while the “typical” line allows the driver to go fairly hard to power. Things are not always as they appear, however, especially when one factors in vehicle dynamics and track elevations.

We all know that the more a driver is able to transfer weight to the tires that need it, the better those tires will be at accelerating, turning or slowing the car. While it may not be obvious in the above illustration, the driver on the “typical” line is not using weight transfer to its full advantage. Not only does weight transfer help tires grip better, it also, due simply to the inertia of the car’s mass, helps the car turn better. If we can properly time the loading and unloading of the vehicle mass, we can require less of the tire’s potential for cornering and subsequently use more of it for acceleration. Rally drivers use a much exaggerated form of this technique, called the Pendulum Turn or the Scandinavian Flick. The less aggressive application of this technique used by road racers is called “rotation.” For more information on the topic of rotation please attend a couple of Advanced Driving Skills Schools. One more thing to remember while trying to decipher how the “alternate” line could possibly be quicker... vehicles generally corner better when under hard acceleration.

Turn 1

Not all drivers will realize an advantage from the “alternate” line, particularly those with heavier or very softly sprung cars. The rest may find that by turning away from the wall earlier and straightening the wheel into Turn 1, they are able to brake significantly later (some cars won’t brake until the flag stand at the end of the pit wall). One of our instructors, Peter Duffy, was kind enough to let me take his Porsche around the track with Shawn Lewis in the passenger seat. According to Shawn the speedometer was showing 117mph as we passed the flag station at the end of the pit wall... this kind of speed couldn’t be carried into Turn 1 without straight line braking. The typical line requires a longer, less aggressive use of brakes because the tires are also bring asked to turn the car. The driver on the “alternate” line arrives at the first apex (the alternate line uses a double apex) slightly ahead of the car on the “typical” line. Between the first and second apexes of Turn 1 the cars take on the same line and should be accelerating fairly aggressively. As the cars pass the second apex of Turn 1 the car on the “alternate” line has arrived both cornering and accelerating harder, has accumulated more weight transfer and, upon the lift for the turn-in to Turn 2A,

will experience better rotation. Again, for those who aren't quite sure what I'm talking about when I say that we experience better rotation, let me say simply that we're purposely putting the car in the beginning stages of a spin. For further information on the topic, please attend a couple of Advanced Driving Skills Schools.

Turns 2A and 2B

Better rotation into Turn 2A means the driver is able to accelerate harder to the apex of 2A, which is at the very end of the curbing and is, therefore, also the "track-out" point. As with Turn 1, greater acceleration and speed into the turn-in for 2B mean more accumulated weight transfer and better rotation, which brings us to the exhilarating part. In order to take advantage of the speed and weight transfer accumulated coming out of Turn 2A, the driver must turn earlier into Turn 2B. Those who use the "typical" line fight for grip through the first half of Turn 2B because a) they've turned-in too late to take full advantage of their accumulated weight transfer, thus minimizing rotation, and b) they must slow the car more because of the tighter radius required to make the late apex of 2B. As I said, these drivers fight to get the car turned in the first half of Turn 2B, and then accelerate away with very little cornering effort. They are, however, blessed with a feeling of security and contentment.

Those who first experience turning earlier, rotating the car and going fairly hard to power just after the turn-in of Turn 2B are blessed with misgiving, apprehension and an acute desire to maim their Chief Instructor. These drivers, the first time through, are convinced that they are going to join the NHIS "Wall Club." And they would, too, except that just after the apex of Turn 2B the south chicane meets the end of the banking for NASCAR Turn 2, which means track camber and elevation change that plants the car into the pavement and allows, once over the "bump" at the transition, for aggressive acceleration. In the illustration the line exiting Turn 2B looks like a decreasing radius, and it may well be, yet because of the banking we're able to accelerate hard without the proportional increase in radius that would be required if the track surface was flat. In fact, because of the banking we're able to accelerate on a slightly decreasing radius. Have faith, if you're doing it right the grip will come.

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Chapter 3

Turns 3 through 7

Over the Hill and Around the Bowl

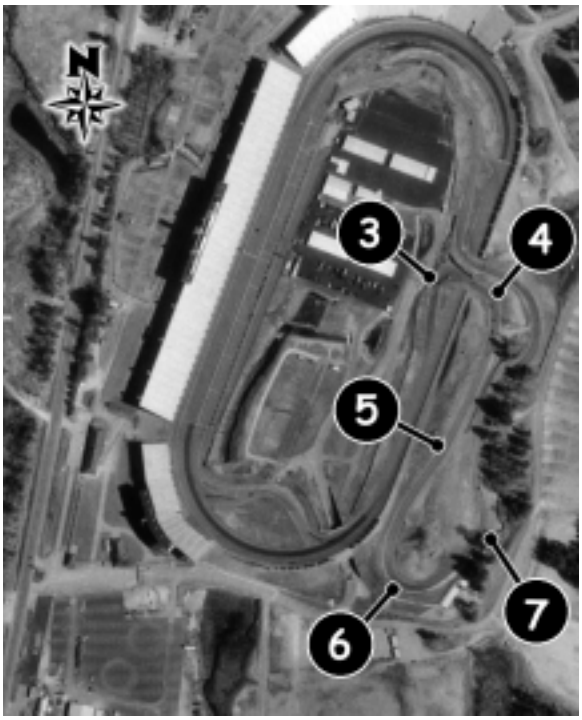

Fig. 3-1. Turns 3 through 7.

This section of the track brings you around the tightest part of the course, up over the hill and around "The Bowl".

Turn 3

This is one corner where I can promise most people, at some time or another, a gain of a solid half second per lap (though not by a method officially sanctioned by either the WMC or by NHIS). If you come into Turn 3 and see an array of cones up against the rumble strip, you're in luck. Hit the cones. Run right over the things. Next time through, after all the cars behind you have scattered the cones off the track, you can apex Turn 3 so that all four wheels go inside the rumble strips. This depends somewhat on where NHIS chooses to drop the jersey barriers, but generally there is room. If you can do this, it's good for a half second per lap. Otherwise, drive a line that allows you to go to power early and hard. For the record, don't worry about apexing the cone going up the hill (Turn 4). What matters most in this corner is a) maintaining whatever speed you carried out of Turn 3 and b) adding more speed by putting BHP to the pavement. If you're trying to apex the Turn 4 cone you may be "pinching" the car and costing yourself exit speed as you near the top of the hill... the more you're turning the steering wheel, the slower you're accelerating. I should point out that there are those who say one should not track out all the way to the wall/curb in Turn 3. Instead, they say, one should turn-in later and hold the car on a line that crosses the transition somewhere between the middle and a third of the track width away from the outside edge. I think there is possibly an advantage to this line, particularly for cars with relatively more power to weight, i.e., cars that have trouble getting the power down. There are enough quick drivers using this line that it's worth experimenting with.

Turn 5

Whenever I give novices my advice for Turn 5 they look at me like I'm a lunatic. As you slowly unwind your hands coming out of Turn 4, well before you begin to crest the hill, you will see in the distance some rolling hills. On the tallest of these rolling hills there is a tallest tree. If you slowly unwind your hands to aim at that tallest tree on the tallest hill, you will set yourself up perfectly for Turn 6. It works like a charm, but still people look at me like I'm a lunatic. Remember that they wanted to hang Galileo for saying that the world was round.

Turn 6

If you tried my advice for Turn 2B and it didn't work out like you'd hoped, skip this next one. On the other hand, if you found a few RPMs coming out of Turn 2B you'll likely find the same in Turn 6. Fig. 3-2 shows an alternate line that is distinct from the typical line in two ways. First, as drivers crest the hill (Turn 5) there is a natural tendency to want to follow the edge of the road all the way into Turn 6 (The Bowl). The problem with this is that all of the braking for Turn 6 – and Turn 6 requires a lot of braking – must be done while the car is also turning. The result, of course, is longer braking distances. The alternate line brings the

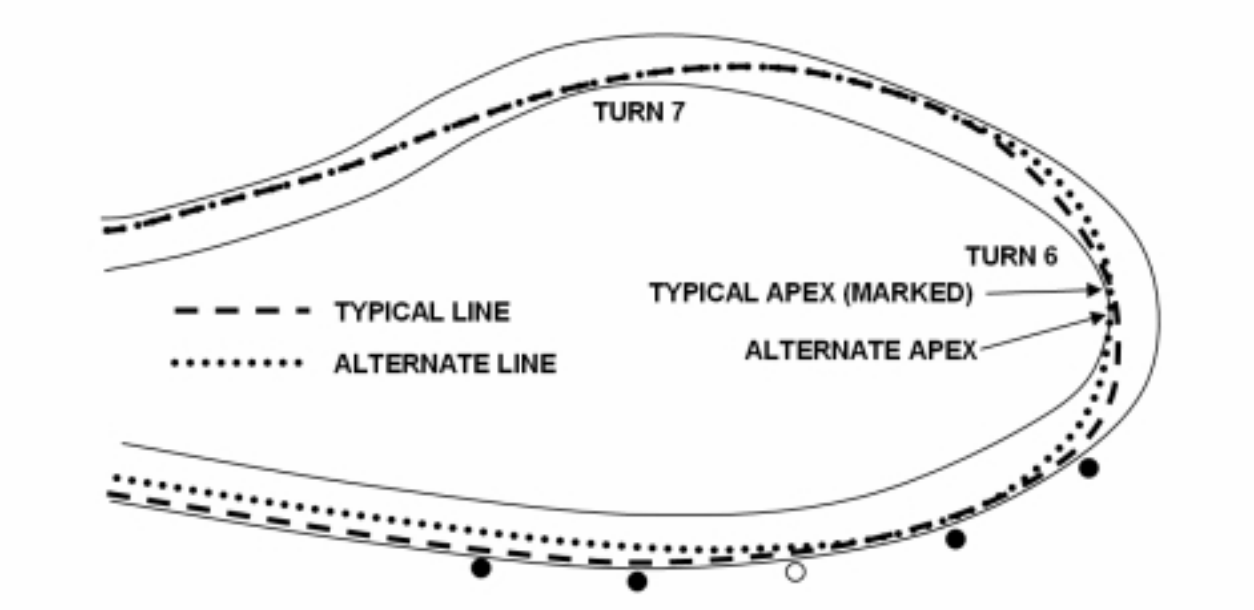

Fig. 3-2. Two approaches for navigating “The Bowl”.

driver in on a straight line aimed at the third cone from the end. This assumes the cones have been set up as they are normally (you must always double-check cone placement or, if there are no cones, find another reference point). This alternate line allows one to drive much deeper into Turn 6, and this alone will gain probably a car length or even two over those following the rim.

Furthermore, as one transitions to trail-braking the aggressive braking, and greater associated weight transfer, gives one the opportunity to rotate the car at turn-in, allowing the driver to go to power significantly earlier. The driver on the typical line brakes earlier and turns-in later on a tighter, slower radius. The apex for the alternate line is roughly 15 feet earlier than the one that is marked by a red square on the curbing (which is where we generally place our apex cone).

At the apex the driver on the alternate line is carrying more speed, and this speed would be carried right into the grandstands outside Turn 6 if not for the considerable camber and elevation change that kicks in immediately after the apex. When done properly, the driver will experience greater lateral g-forces just past the apex of Turn 6 than anywhere else on the track. When I had my Spec Racer Ford, I knew when I’d done the turn just right because the chassis would lightly scrub on the track surface just after the apex.

A final word on Turn 3... the early apex approach is faster, but it also sets the driver up to drop wheels at track out if things aren’t done just right. To use this line successfully a driver must have a very strong sense of the car’s handling and, through the “sight picture,” his position on the track. You must be prepared to give up the corner, and do so at or even before the apex, if you feel you’ve come in even a little early. If you try to force a bad line, you’ll find yourself in the gravel.

Turn 7

This one’s easy... an orbiting Space Shuttle could run Turn 7 flat out. Go for it!

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Chapter 4

Turns 8 through 10

No Room for Mistakes

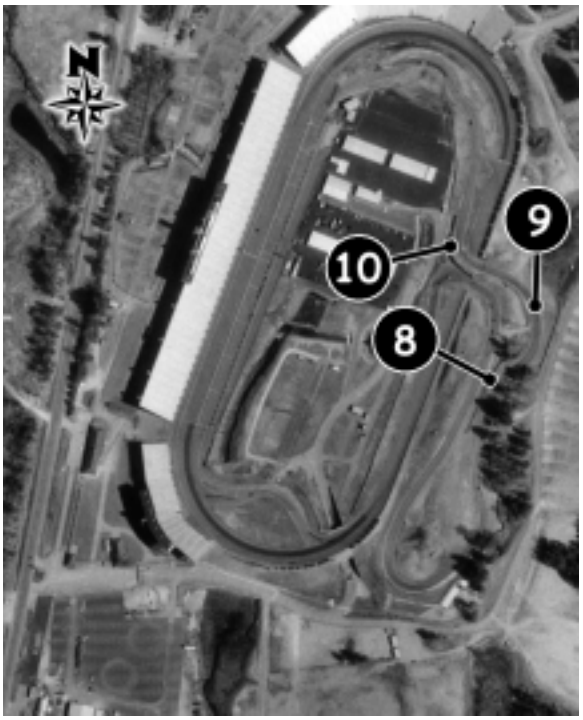

Fig. 4-1. Turns 8 through 10.

This is where we get into trouble. In Chapters 1 through 3 we looked at alternate lines that are likely faster, but are also essentially innocuous. There is a possibility that somebody, probably a solo driver overly confident in his abilities, will get in over his head and try to rotate his car into Turn 2A or 2B. This person will probably just spin off through the grass outside of the South Chicane and will have to come into the pits with his tail between his legs to get his paws slapped. In Turn 6 this person, if he keeps his wits about him and remembers what he learned in Advanced Skills, will merely take an exciting trip with 4 wheels in the gravel and re-enter the track in Turn 7. If he does both in the same day we'll send him home with an acute case of chagrin.

While there are walls to hit in both Turn 2 and in Turn 6, if this same person screws up the alternate line for Turn 9 he stands a significantly better chance of bending his sheet metal. Or, put another way, imagine the possibility that he will slam into the blunt end of either of two cement retaining walls and will be carted out of the track in an ambulance. And I'm not joking. Don't screw around in Turn 9 and don't get it wrong!

Fig. 4-2 shows the two approaches one may take through Turns 8, 9 and 10. Interestingly, until they put that extra 18 or so feet of pavement in the apex of Turn 8, I don't believe the "alternate line" was ever viable. Note the distinct difference in the minimum radii required by the two lines. R1 is associated with the "school" line, and R2 with the alternate line. Note also that the "alternate line" provides no straight line braking, either in Turn 9 or Turn 10. In both braking areas the car is still changing directions, making it unsettled and highly sensitive to secondary reaction weight transfer. This is precisely why the line is both potentially faster and, given the environment, potentially very dangerous.

The School Line

The aforementioned unsettled state is why we teach novices the "School Line." Coming out of Turn 7 the driver using the school line will set up about a car width away from the inside of the track coming over the crest of the hill into Turn 8. The apex for this turn is just past the flagging "tree house." Going by this apex the driver unwinds his hands so that as the car comes straight it will apex again on the curb to the driver's left. This is the first apex for Turn 9. Once the suspension has settled the driver can use hard straight line braking aimed back out toward the middle of Turn 9. As he approaches the middle of the track the driver will trail-brake and turn left, then gradually go to power and begin looking for the row of tires that comes in diagonally to the edge of the track from driver's left. These mark the second apex for Turn 9. As the driver passes this apex he will straighten the steering briefly, lift or brake, and almost immediately turn in to Turn 10. The tall curbing on the right, the apex for Turn 10, is very obvious. In fact, I believe if one hit it hard enough, and on the right line, one could flip a car.

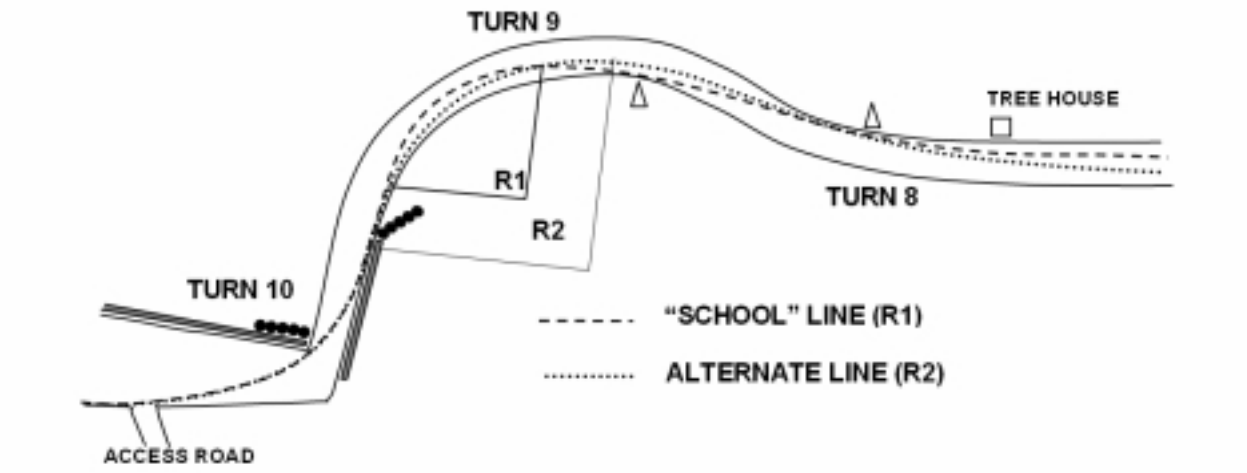

Fig. 4-2. Two approaches for Turns 8, 9 and 10.

The track-out for Turn 10 is on the far side of the access road that comes in from the paddock. Probably fewer than 75% of our drivers use all of the available track when exiting Turn 10. This may have something to do with the camber change that occurs midway through the NASCAR back straight. Just when you get the car settled after the transition bump, the camber drops slightly and the tail end wants to come around. I think a lot of drivers experience this and figure they've reached the limit. There is more grip after this, so once you get adjusted and take full advantage of the available grip you'll likely find that you can carry much more speed through and out of Turn 10.

The Alternate Line

The illustration provided above will hopefully make clear one fundamental advantage of the "alternate" line, i.e., a larger, faster radius. I suspect, however, that if the centerlines of two cars driving each line were recorded with a high-speed GPS or accelerometers, the variation in lines may not be quite as distinct as illustrated. Having said that, the experience provided by each line is very distinct. I've had a few people tell me, after their first ride on the alternate line, combined with using all of Turn 10, that they thought for sure we were going to crash. I'm fairly confident that it's not to my credit that I find this gratifying, but it does speak to the distinct experience provided by the alternate line, and how the alternate line effects how we can drive through Turn 10.

A few of you are probably now wringing your hands in anticipation of this new approach. It might be helpful to know going in that not all cars respond well to the alternate line in Turn 9. Cars that are very fast (most purpose built racers or production cars built to GT specs) may need to throw in a little straight line braking just get slowed enough to make the corner. Also, cars that understeer may be able to set up properly for Turn 9, but they'll wash out and won't be able to use enough power to gain full advantage from the alternate line. Be wary if your car fits the latter description, and many running with us will, because in your efforts to force the alternate line you may quickly reduce your right front tire to a gob of sizzling cords.

To run the alternate line properly you need to set up roughly three quarters of the way to the left coming out of Turn 7, then turn in for a slightly later apex in Turn 8. Soon after the apex the driver will lightly brush the brakes and gently turn left, which induces secondary reaction weight transfer. If done properly the car will start to come around, and if done in the right place the driver can catch the slide with power and keep adding power all of the way through Turn 9. The natural tendency on the this line, like many lines, is to turn in too early, but the proper line will also feel early, which means it takes a few runs through to find one's bearings. Further, because we're carrying a fair amount of speed we'll drift the latter part of the turn, almost hugging the curb in what would normally be indicative of an early turn in, and arrive at the apex (the same string of tires we use for the apex of the school line) with the right-side suspension fully loaded

and all four tires generating slip angles. We're now carrying significantly more speed and have accumulated significantly more weight transfer than we would using the school line. As with the turn-in for Turn 9, we lift slightly to plant the front wheels and then turn right into Turn 10. The car should rotate nicely and, unlike the turn in for Turn 9, we're generally able to go quickly to full throttle and hold it all the way to track out. In a high horsepower car the driver might need to back off a bit where the camber drops away. Also, as with Turn 6, the driver needs to know very early if he's not arriving at the track out on the right line. Realizing this at or after the camber change is too late, and will probably result in dropped wheels. If you're not sure you've gotten it just right it's best to ease off the power early and allow the front tires a little more grip through the exit.

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Turns 11 and 12

The North Chicane

Fig. 5-1. The North Chicane, Turns 11 and 12.

Some corners are deemed "easier" than others. However, just because a corner may fall into this category it doesn't mean there's nothing to be learned by it. In some cases such a corner may in fact be the very best place to learn more advanced driving techniques.

Every racing class has a track record, but some are more meaningful than others. In the SCCA IT, Production and GT classes the track records may have more to do with the car than with the driver. In the "spec" classes, such as Spec Racer Ford, Formula SCCA or Spec Miata, the track records are significantly more reflective of driving ability. This distinction aside, the track record for any given class provides the benchmark by which any driver can measure his or her ability. Many drivers will get fairly quickly to within a couple of seconds of a track record, but then they reach, and stagnate upon, a plateau.

So how do we get that last two seconds? In most cases, the difference is found in how we enter a corner. Those within two seconds of a track record and those within half of second of it are often driving basically the same line. The latter, however, are driving it in such a way that they are able to go to power sooner, and are therefore generating better exit speed. The final two seconds are found by gaining that extra two or three hundred RPM coming out of each corner.

At NHIS - if we disregard those corners where we merely change direction with our foot still in it - most of our drivers probably consider Turn 11 to be the easiest turn. If one were to spend time assembling satellite photos of cars running around the track, we would probably see significantly less variation in line in Turn 11 than in any other corner. It follows, then, that Turn 11, more than any other corner in my opinion, demonstrates that at times what matters most is not so much which line we drive, but how we drive the line. For proof I offer the majority of Instructor Candidates I've coached over the last three seasons. With very few exceptions we've been able to gain 200 to 400 rpm at trackout in Turn 11. This is a very meaningful jump in exit speed, and in a competitive series such as the SCCA's Spec Racer Ford class such gains in just a couple of corners could mean the difference between 1st and 10th place.

Turn 11

Let's consider Turn 11 for its merits as a classroom. First and foremost, it's relatively safe... there's a lot of run-off to the outside and a fair amount to the inside (athough the inside wall comes in quickly as we track out). Secondly, it's a flat corner, so we're not required to factor significant camber and elevation changes into the equation.

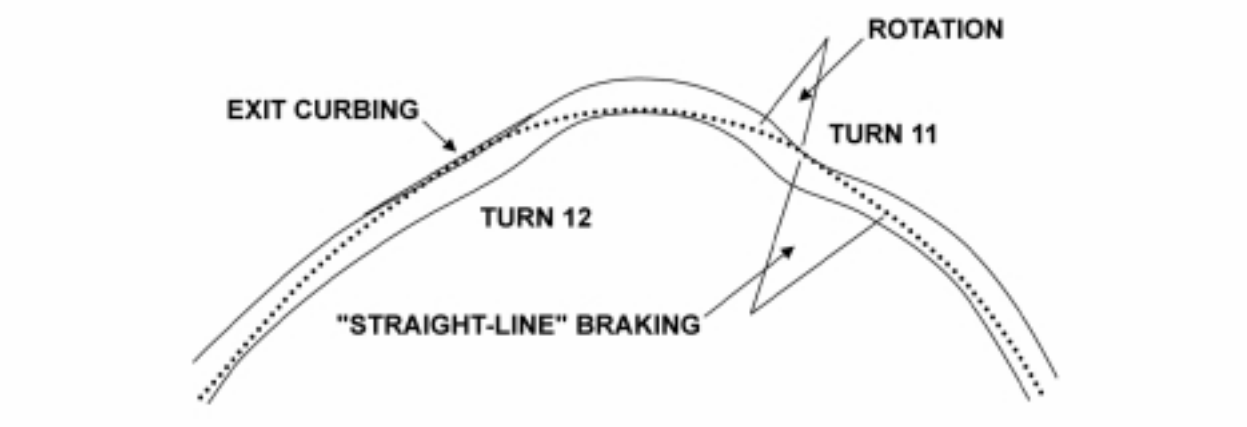

Fig. 5-2. The three basic components of Turns 11 and 12.

Note in fig. 5-2 I've shown the curbing at the exit of the turn. This is the only curb on the entire track that we're able to use without significantly upsetting the balance of the car (or bending or tearing off our suspension, which happens to purpose-built race cars in some of the other corners). Note also that there is a short bit of straight-line braking as we enter the corner. While the car may traveling in a straight line, the weight of the car may, and should if we want to go quickly, still be shifting.

I've put quotes around the portion labeled Straight Line Braking because some cars will not do what we want them to do if we're braking strictly in a straight line. In some cars, we may in fact want to turn right a little bit as we're braking, before we turn left into the corner... this facilitates secondary reaction weight transfer and, therefore, rotation. In other cars, we're able simply to trail-brake enough to induce rotation. In either case, what matters most is inducing rotation in the area so designated. As I've said before, for those who aren't quite sure what I'm talking about when I say that we must induce rotation, let me say simply that we're purposely putting the car in the beginning stages of a spin. For further information on the topic, attend a couple of Advanced Driving Skills Schools.

The entry for Turn 11 has notoriously lousy grip, and most drivers who are still two seconds off a track record are fighting understeer as they enter the corner. In order to combat this understeer, the driver must go to power less aggressively in order to maintain the traction of the front wheels. Or, even worse, some drivers go aggressively to power only to back out of it again before the apex in order to get the car to turn. Those who use rotation – those who get the car pointed through the corner just after turn-in – are able to go aggressively to power and are able to maintain that level of acceleration all the way through the corner.

The ability to usefully rotate a car into a corner is, in my opinion, the major difference between "quick" drivers and lesser drivers. Once proficient with the technique, a driver will use it three times in the South Chicane, and then again in varying degrees in Turns 6, 9, 10 and 11. I wouldn't speculate that drivers are able use the technique successfully in the oval (NASCAR Turn 1) simply because the speeds are so high, and the rotation would have to be carried for such a great distance, that any gains discovered would be brief and would soon be offset by the diminished cornering ability derived from cooked (over-heated and/or chunked) tires. Furthermore, such shenanigans in the oval would be within full view and earshot of Control, and I'm confident that Erik Wensberg would not tolerate it.

Let's do the math associated with an increase of, say, 300 RPM in exit speed. Since my math skills are questionable, and since our faithful Editor, Martin Callahan, is an engineer and will be required to check my numbers, we'll use a simple hypothetical corner and car combination. This corner leads on to a 10 second straight and the car is a 4-speed with a 3. 71 differential and tires with diameter of 25 inches. The first driver exits this corner at 4,000 RPM in 4th gear, and the second driver exits the corner at 4,300 RPM in 4th gear, generating exit speeds of 80. 13 MPH and 86. 13 MPH respectively... a difference of 6 MPH. We then apply the formula stating that a car will gain 1. 5 feet per second per every 1 MPH of increased exit speed over another car with the same acceleration.

Over the distance of a straight that takes 10 seconds to cover, the first driver will have gained 90 feet of distance over the slower car. If at the end of this hypothetical straight the slower car is traveling 135 MPH, the time gained by 300 RPM of exit speed for the faster car is approximately 0. 45 seconds. In a 30 lap race the increased exit speed in this one corner will result in a margin of victory of more than 13 seconds. If the driver of the faster car were to realize similar gains in, say, six corners around the track, his lap times would be 2. 7 seconds lower than the those of the slower driver, and the margin of victory on a 30 lap race would be 81 seconds. At Lime Rock, the faster driver would lap the slower driver. If you apply the same 300 RPM margin to the slower, 2nd and 3rd gear corners of NHIS, the difference in lap times will be less. Nevertheless, this exercise hopefully demonstrates the significance of a 300 RPM gain in exit speed. If you're driving in a race where the fastest 10 drivers qualified within a second of each other, then instead of 300 RPM of exit speed you'll be fighting for needle widths on the tachometer. Turn 11 is probably the best place at NHIS to learn how to shave off that last two seconds. Once you've gained those 300 RPM in Turn 11, start applying the same technique to some of the other corners.

Turn 12

There isn't a great deal to say about this corner, though you should be wary if you have lots of horsepower and/or the track is wet. The transition from the North Chicane to the oval's front straight can be harsh enough to bounce the car and cause the rear wheels to loose traction. A fair number of cars have visited the concrete walls on either side of the front straight because the driver wasn't quite wary enough.

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Chapter 6

In Conclusion

The Secret to Those Last Two Seconds

I'm hopeful that the information I've presented will be useful to novices and experts alike. I should point out, however, that the majority of the alternate lines and approaches I've presented require strong car control skills to be used effectively. I've broached the topic of car control in many of my articles published in *The Profile* Newsletter of the White Mountain Chapter, yet few of our club's "faster" drivers have shown much interest in putting those skills to the test at our Advanced Driving Skills School. There is, I believe, a common misconception that ADSS is for novices, and that the instructors who excel in the program are merely performing circus stunts with their cars. This couldn't be further from the truth.

The race track is no place to learn car control skills; the speeds are too high and the run-offs are too short to chance a mistake. With the White Mountain Chapter's ADSS program, however, we've created an environment wherein a driver may practice controlling a vehicle not only beyond the limit, but also, and more importantly for experienced drivers, at the limit.

Think of any professional driver you admire... whether Michael Schumacher, Bill Auberlen, Hans Stuck or Boris Said, each and every one is able to demonstrate mastery of the kinds of exercises we conduct in ADSS! This is not a coincidence. The skills that allow them to toss and slide cars with precision around a bunch of cones in a parking lot are the same skills that allow them to threshold brake, rotate and accelerate through the corners of a race track using every bit of a car's potential. They are simply more sensitive than the average driver to weight transfer, grip and yaw rates.

These advanced car control skills are the secret to those last two seconds, and ADSS is where we teach them. See you at school!

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