Westwood

MOUNTAIN HIGH RACING

Welcome to the

Sports Car Club of British Columbia's

Race Driver Training

at

Westwood Motorsport Park

Included in this package are instructions and information from the various officials and organizers you will be dealing with over the course of your racing. As well, there is a section on the techniques of high performance driving.

We would ask that you carefully read all of these instructions as you will be examined on their contents during the course. Please have this package with you throughout the school, and remember to bring a pencil and paper.

Enjoy yourself!

S.C.C.B.C. DRIVER TRAINING SCHOOL

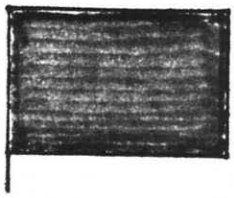
Listed here are a number of things that the race officials and/or organizers require you to do. Some are compulsory and some are suggestions, however, all are necessary to the smooth operation of the circuit and your enjoyment. Remember that your race officials must try to run a program that will satisfy the spectators as well as the race drivers. A very high degree of cooperation from drivers and crews makes this possible.

There are many things that go into the making of a good driver and going fast is just one of them. You must know the rules perfectly. You must always try to cooperate with the race officials even though their decisions at times will make you unhappy. You should learn and practice the procedures and courtesies common to racing everywhere. If you feel that you are being treated unfairly by any official, you should seek advice from a senior driver or the chief official for the department concerned. In most cases you will find that the decisions of the officials are for the good of all concerned. Don't at any time, be afraid to ask questions.

Finally, take it easy. It will take a few practice sessions and races to get yourself sorted out. Novices seldom win races, so concentrate on learning to do things properly at first. Your speed and efficiency will increase as you learn.

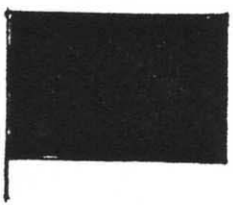
THE FLAGS:

Perhaps the single most important thing that you should learn is the flags. All flags are used to warn you of possible impending danger. All flags must be obeyed instantly without question and failure to do so will only result in your being severely reprimanded. When the starter or corner worker shows you a flag, you should acknowledge it with a wave of the hand or nod of the head at least the first time and on following laps at your own discretion.

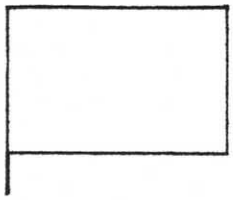


GREEN FLAG: Start of the race or practise session - course is clear.

YELLOW FLAG: **<u>Held stationary</u>: danger ahead, NO PASSING, be prepared for a waving yellow. If all stations are yellow be ready for a pace car, a serious problem exists.**
<u>Waving</u>: NO PASSING, extreme danger, prepare to stop! If all stations are waving & the lights are flashing at Turn Two and the Leap then there are DEER ON THE CIRCUIT.

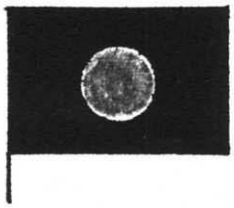


RED FLAG: Conditions on the track warrant stopping the session - stop immediately as safely as possible (check mirrors). This flag is displayed at Start/Finish only.

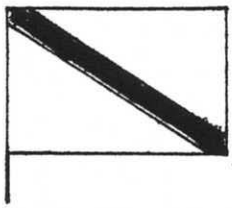


WHITE FLAG: Service vehicle or slow moving race car on track. Passing permitted with caution if no YELLOW flag. No passing pace car. Can be shown stationary or waving.

BLACK FLAG: A FURLED BLACK flag shown at Start/Finish is a warning you have committed an infraction! YOU ARE BEING WATCHED. An OPEN BLACK flag & your NUMBER shown at Start/Finish means you are to slow down, finish your lap & stop in the pits - you MAY be disqualified.
A WAVING BLACK at ALL stations & a RED flag at Start/Finish means slow down, cease racing and return to the pits. BE PREPARED TO STOP AT ANY TIME!



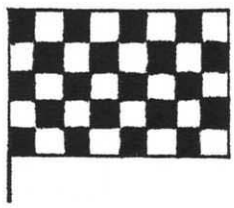
MEATBALL FLAG (Black with Orange Circle): Indicates you have a mechanical problem with your car; slow down and return to the racing pits. The Technical crew will assess the problem and advise if you may continue. Shown only at Start/Finish or the Hairpin.



BLUE FLAG (or Blue with Diagonal Yellow Stripe): When held stationary means you are being followed closely by a faster car - check your mirrors. When waved means faster car is about to pass, check mirrors and try to make room.

YELLOW/RED STRIPED FLAG: Slippery condition ahead (oil, water, gravel, etc.) or debris on track, use your own discretion.

LAST LAP SIGN: Indicates you are starting the last lap of the race. Shown at Start/Finish.



CHECKERED FLAG: The race or practise session is complete, slow down, no passing, return to the paddock.

All flags are shown at Start/Finish. All except the RED, CHECKERED and LAST LAP sign are shown at all corner stations around the track.

STARTERS INSTRUCTIONS:

When you come to the grid to start a race BE READY! Helmet on, gloves on, eye protection in place, seat belts on, etc. The wishes of the starters may vary

from track to track, and they will advise you of what they expect of you at a start, at the driver's meetings. If for any reason you have a problem with your car on the grid, raise your arm to let the starter know that you cannot start. If the problem can be rectified quickly he will wait for you, however, if the problem is of a time consuming nature then you will probably be pushed off the grid.

If you are proceeding onto the circuit from the racing pits during a race or practice session, be sure to check the starter for flags. The starter's tower is the first flag station that you will pass and there may be a condition on the circuit that you should know about.

TIMING AND SCORING INSTRUCTIONS:

The timing and lap scoring people at any track have basically only one rule for a driver. MAKE SURE THAT YOUR NUMBERS ARE LEGIBLE! The various rule books will give you the details of how your numbers should be placed on the car, however, variations within these rules sometimes produce a beautiful number that cannot be read from the timing tower as you pass by at 100 MPH. The only recourse to a timer or scorer is simply not to bother timing you or scoring you. At most tracks the scoring staff will at times advise you before a race that they are having trouble reading your numbers. If you do not take heed and fix the numbers then you will be ignored during the event. Your only recourse should you be ignored by the scorers is to fix the numbers for the next race.

COURSE MARSHALL'S INSTRUCTIONS:

The Course Marshall is the official who is responsible for the various corner personnel and everything that takes place on the course. These few simple rules are for your protection and are worthwhile following.

1. If you spin off the circuit, make sure that the track is clear before you re-enter. If you cannot see the oncoming traffic the corner marshall will assist.
2. If your car breaks down out on the course and the corner marshall asks you to move the car further off the track, you must comply with his wishes as it is for the safety of your car and the other competitors.
3. Be on the watch for any flags the corner crews display, and acknowledge it at least the first lap past it.
4. When you are pulling into the racing pits, raise your arm to signify to the drivers behind you that you are pulling in. Make sure that you are well over to the side of the circuit on which the pit entrance road is. At Westwood you should be on the extreme left hand side of the track as you exit the esses.
5. If you come up on an emergency vehicle you may pass with care keeping in mind that all emergency vehicles travel on the extreme left hand side of the circuit.
6. If you should experience a fire in your car, you should proceed to the next corner crew location and have them put the fire out. Even though you have a fire bottle on your car you may find that it is not sufficient to extinguish the fire and the corner crew may be too far away to get there in time to prevent serious damage to the car. Unless it is absolutely necessary it is advised that you do not stop in the racing pits for this purpose due to the extreme fire hazards in that area.
7. If you should come across the scene of an accident, DO NOT STOP! The

corner crews are trained to take care of such an occurrence and your stopping will only lead to confusion and perhaps create an unsafe condition for other drivers.
8. If you have the misfortune of having an accident and your car has to be picked up by the tow truck, please cooperate with the crews. The drivers we have in our tow trucks are experienced racing people and know more about towing and lifting cars than you may think.
9. One of the problems you will no doubt experience on the circuit is another driver blocking you. If you cannot get around this problem you may ask for the help of the corner crews by pointing to the offending driver and asking to have the blue flag displayed. This may sound a little foolish considering you are trying to drive a car at the same time, however, the corner crews are watching for this sort of thing and they will understand.

The corner crews are your best friends, whether you have trouble on the track or win the race. They are racing enthusiasts of the most loyal kind and deserve your complete cooperation. Remember that you would not be racing without these people, and when you are racing your life depends largely on them. On your cool-off lap at the end of each session, give them a wave and try to thank them whenever possible.

RACE ORGANIZER'S INSTRUCTIONS:

The races at Westwood are organized and promoted by the Sports Car Club of B.C. with the help of many people outside of the club. We are proud of our track and our organization. There are a few ways that you can assist us in our efforts.

1. Prior to a race weekend you may be called upon to provide your car for promotional purposes and we would appreciate your cooperation. Having your car on display may be just the thing to help with your personal sponsor proposal.
2. Quite often you will be requested to supply the club with driver information and perhaps pictures of yourself and your car. This information is used for pre-race promotion and for the event program. Don't wait to be asked for this material, but rather keep us informed of your plans so that we can keep the public informed.
3. Some of the conditions imposed on you at the track may be due to the public appeal of the event and we would be pleased to explain to you why you may not have the best pit, the best time of day to race, etc.
4. One of the most important things that we try to do for the spectator is to keep the show moving and we try to minimize delays as much as possible. For this reason we ask you to keep track of the schedule so that you will be on time for each event in which you are entered.
5. Finally, we have one important request, we want you to enjoy yourself and come back to Westwood again and in keeping with this theme we state, "if you didn't enjoy yourself, come and tell us why, and if you did enjoy yourself, go tell your friends about Westwood".

REGISTRAR'S INSTRUCTIONS:

Registering for a race is the most important step towards an enjoyable race weekend. The information you send to the registrar enables the organizer to plan the event properly and efficiently. The following are some of the rules you must adhere to:

1. When filling out the entry form, do it neatly and completely including your full name, your full address including the postal code, complete details on your car and the class you are entering, etc. If the entry form is either incomplete or illegible you can expect your first problem of the weekend at registration. A tremendous amount of work is required of the registrars and your cooperation in this matter is imperative.
2. If you intend entering in more than one race, you must make out a separate entry form for each race entered.
3. If you are under 19 years of age, your parent or guardian must attend registration with you and sign a release form.
4. If you are a novice and you are expecting to be upgraded to a senior driver on a given weekend, be sure to make out a separate entry form for the senior event as well as the novice race. There is no extra entry fee charged for the senior race under these circumstances.
5. When you arrive at registration you MUST present the registrar with your provincial or state drivers licence, club membership card, and competition licence.
6. The registrar will advise you of any errors in your entry form and if your documents are in order and your entry is correct you will receive your driver's package, containing the following:
    a) Driver's pass
    b) Pit car pass
    c) Technical inspection form
    d) Race schedule for weekend
    e) Supplementary regulations
    f) Pit assignment if applicable
    g) Special notices, etc.
7. Registration opens and closes at the times stated in the race announcement. All novice races are held on Saturday so be sure you do not miss registration.
8. It is expected that you will vacate your pit space for Sunday unless you are entered in a senior race. This will leave more room for the Sunday competitors.
9. Your crew must also register. If they arrive after registration has closed they will have to pay to enter the main gate and will not be allowed in the racing pits without a pit pass.
10. If you think you may not be able to get ready for an event, enter anyway. Your entry will be returned to you within two weeks if you do not show up.

OBTAINING A RACE LICENCE:

You must hold a valid race licence in order to practise or race on the track. There are two licences available to novices - C.A.S.C. (Canadian Automobile Sports Club) and I.C.S.C.C. (International Conference of Sports Car Clubs).

Driver Training is only the first step towards obtaining a licence, and your successful completion of the course will be accepted for 12 months only. (i.e. You must obtain and use a novice licence within 12 months or take Driver Training again).

To obtain a licence you must fill out the appropriate sanctioning body's application form and take a medical. Medicals are good for 2 years if you are under 40 years of age.

To obtain a upgraded novice licence (senior), you must complete a minimum of 3 novice races under observation. Please note the key word is complete, not win. To be considered a finisher you must complete 50% of the laps of the

first place car AND be running at the finish of the race. Many novices push too hard and break during these races only to get no credit for that race.

Corner observation is also a requirement to being upgraded to a senior licence. (See the Novice Director for details)

Any novice licence (C.A.S.C. or I.C.S.C.C.) may be used to enter any NOVICE race at Westwood or other local U.S. track (Seattle, Portland, etc.).

The weekend you wish to upgrade your licence to a senior level must be the weekend race sanctioned by the appropriate body for that licence. (eg. A C.A.S.C. license can only be upgraded on a C.A.S.C. race weekend and an I.C.S.C.C. license only on a I.C.S.C.C. race weekend)

Which licence should you obtain? This answer depends upon the type of racing you wish to do; both licences have pros and cons to them. If you plan to race here at Westwood you should obtain both. Here are some facts about both licences:

C.A.S.C.
- Cost: $75 for Novice; $100 for Senior National
- Can be used in Canada and the U.S. at any track
- Is required to be eligible to compete in the Canadian Championship
- Can be used to get a F.I.A. license
- Nationally and Internationally recognized

I.C.S.C.C.
- Cost: $40 (U.S.) for Novice; same for Senior
- Can be used at I.C.S.C.C. tracks in the Northwest (Westwood, Seattle, Olympia and Portland)

TECHNIQUES OF HIGH PERFORMANCE DRIVING

I THE BASICS

GETTING COMFORTABLE

A) Car Seat:

One of the most important basics is COMFORT. If you aren't comfortable you won't enjoy driving nor will you do well.

It is important to sit properly to maxamize your sensitivity, your feel for what the car is doing, and so you can operate all your controls easily.

The sensitivity you seek will be the sensitivity of controlling weight transfer in your car - the essence of high performance driving. Ideally, then, you are seeking a seating position that puts as much of your body as possible in contact with the seat. You should also be sitting as upright as possible to help you be more alert.

The seat should be adjusted so that you have a bent arm driving position, about 120 to 140 degrees, at a comfortable distance from the wheel. This permits the use of your forearms and biceps instead of your shoulders and wrists and is much less tiring.

B) Racing Harness

The importance of a tightly fitting 5 or 6 point racing harness (seatbelts) cannot be stressed too much. If it's loose, as you corner and brake you'll lose that important sensitivity to the car.

Tight belts also help prevent you from leaning your body into the turn. This, too, cuts down on your contact with the seat, increases your fatigue and most importantly it alters your **visual perspective.**

C) Steering Wheel

Grip it firmly but not too tightly - no "white knuckles". A tight grip is fatiguing.

Where do you hold the wheel?

Firstly, think of a clock face. Put your right hand at 3 o'clock and your left hand at 9 o'clock. This is the 3 and 9 position (some people prefer the "2 and 10" position).

With this grip you should now be able to make most turns without moving your hands all over the wheel. In fact, in most cars you may not have to move your hands form this position at all. If you do, simply slide them along the wheel's rim.

By always holding the wheel in the same position you'll always know how much steering you've put in and where straight ahead is.

It is very important to be extremely smooth with your steering movements! You should never jerk the steering wheel into a turn - a smooth progressive turn of the wheel is required, placing the car where you want it to go, not jerking

it into a corner. And no see-sawing away at the wheel - it may look fast, but it difinitely isn't. Economy of movement is the key in the racing cockpit.

D) Mirrors

What can you see?

You have to know what is going on around you so your mirrors should already be adjusted properly.

THE CONTROLS

A) Your Feet

Important Step #1: Make sure that they reach the pedals **comfortably** and that your legs are **bent.**

When any of your pedals are fully depressed your legs should still be bent. This is safer, will lessen fatigue and permits the use of the balls of your feet - the strongest and most sensitive part of your foot.

Before you start your car make sure that both the pedals and the bottoms of your shoes are **DRY and CLEAN.**

Imagine what would happen if your foot slipped as you were braking frantically for Turn 2 or Turn 4!?

B) Shifting - The Basics

Speed in shifting is not as important as a good clean shift. A real fast shift won't gain you too much and it may cost you a transmission. Always be smooth and gentle.

Proper downshifting is most critical for extracting the full potential of your car. Proper downshifting is not easy, but once mastered smoothness and improved lap times will result.

Many drivers think that an important reason for downshifting is to take advantage of the engines braking effect. This **false notion** is a holdover form the days of skinny tires and rapidly fading drum brakes. With modern brakes it is unnecessary and with modern engines it is a good way to break them.

The case for downshifting is to change to a lower gear while maintaining maximum braking, without upsetting the car's weight transfer and balance. To do this there has to be a **PERFECT MATCH** between the engine RPM and the rear wheel RPM.

The technique required is called **"heel and toeing".**

The best way to learn this technique is to practice it before you ever turn your car on, or roll it out of the garage. If you can't do it properly sitting still then you won't get it right with the car moving.

C) Shifting - Heel and Toeing

Each process on its own is simple and when combined with the others can be

desribed in 7 steps.

1) Start braking, squeezing with the ball of your right foot and increasing the pressure.

2) Have your left foot in position to depress the clutch - but not yet.

3) Continue braking, increasing the pressure if necessary.

4) Push in the clutch and move the shift lever from 4th to 3rd.

5) Pivot your heel and roll the side of your right foot over the gas pedal and "blip" the throttle (rev the engine).

6) Pivot your right heel back in line with the brake pedal, still maintaining your braking, and **ease the clutch out at the same time.**

7) Continue braking and turn into the corner gradually releasing the brake.

One of the most important aspects of this technique is reving the throttle. You must match the speed of the engine with the speed of the gear you are selecting. Failure to do this will likely cause the wheels to lock up causing a skid.

To use this technique your car must be set up properly. This means that at full compression of the brake pedal it is still slightly higher and directly adjacent to the throttle.

TRACTION LIMIT

This is the limit of acceleration, cornering, and braking. Maximum acceleration occurs when there is 15 to 20% wheelspin. There will be a faint squealing of tires, and a faint grey line on the road. Exceding these limits results in a loud screeching and black stripes on the road. A definite No-No. If this happens, back off until the traction is controllable again.

BRAKING

The brakes are the most powerful part of the modern car. But most people use only about 20 to 40% of the brake capacity, and often improperly.

As with acceleration, maximum braking occurs with 15 to 20% wheelspin. This means the wheels are turning slightly slower than they should be for a given car speed. Don't pump the brakes. DO NOT LOCK UP ANY WHEELS - loss of braking efficiency, traction, steering and CONTROL will result. If lock up occurs, release pressure and reapply. Thus, by modulating your brake pressure you can achieve maximum braking effort. Again, as in acceleration, only a faint squeal should be heard. Braking at the Traction Limit is called THRESHOLD BRAKING, and should be practiced whenever possible. Don't jab the brakes on hard or "jump" on them. Squeeze them on smoothly but firmly - listen and feel for reaction or feedback. Sudden hard braking transfers too much weight to the front putting almost all the effort on the front brakes and upsetting the BALANCE of the car. As well, you must EASE OFF the brakes. By leaping off the brake pedal, the front suspension will rise rapidly, transfering too much weight to the rear. Again, the car will then be out of BALANCE.

WEIGHT TRANSFER AND TRACTION

The key to successful high performance driving is MAXIMIZING TRACTION, the cohesive factor between the tires and the road surface. The closer a racer gets to the complete utilization of the theoretical limit of traction the faster he will go.

Maximum traction is acheived by CONTROLLING WEIGHT TRANSFER. This means getting the shifting and moving mass of the car over the desired wheels to push those tires into maximum contact with the road.

This area of contact is the TIRE PATCH, the size of which is directly related to the weight distribution of the car at any time.

The tire patch is defined as the area on the bottom of the tire that is in direct contact with the road at any given time. It will vary in size and shape with the tire type, size, kind of car, the attitude of the car on the road, the suspension and your position in a turn.

As the car accelerates the weight transfers to the rear. As the car brakes it shifts to the front. As you turn weight tranfer will also occur laterally.

Thus, smoothness is essential as erratic weight transfer will alter the size of the tire patch, likely REDUCING TRACTION.

You can control weight transfer to your advantage or disadvantage causing either UNDERSTEER or OVERSTEER.

Understeer is a phenomenon that occurs when the front tires lose traction (in relationship to the rear) and regardless of your steering corrections the car slides to the outside of a turn. This is also called "pushing" or "plowing".

Understeer effectively increases the radius of a turn and is rarely desirable.

Oversteer occurs when the rear tires lose traction (in relation to the front) and slide toward the front. Also called "being loose", "having the car come around on you" or "hanging the rear end out".

Its effect is to decrease the radius of the turn and if controlled, can sometimes speed your progress through a turn.

Entering a corner with the brakes applied causes the weight to transfer forward, making the rear lighter, thus reducing rear wheel traction. The result - oversteer. To control oversteer turn the steering wheel the other way, out of the turn (opposite lock), and thereby increase the radius of the turn, reducing slippage at the rear wheels. At the same time you should ease on more throttle to increase the weight transfer to the rear. Whatever you do, avoid any rapid deceleration! This will surely result in a spin.

Accelerating hard through a corner transfers weight to the rear causing understeer (unless you have applied so much power that the rear wheels have broken loose. This reduces the cornering traction at the rear wheels and creates a phenomenon called power oversteer). Accelerating TOO HARD or NOT SMOOTHLY enough can result in the car "plowing" or understeering out of the corner. When this happens you will have to ease off the throttle to transfer weight back to the front again before accelerating, thus losing straightaway speed.

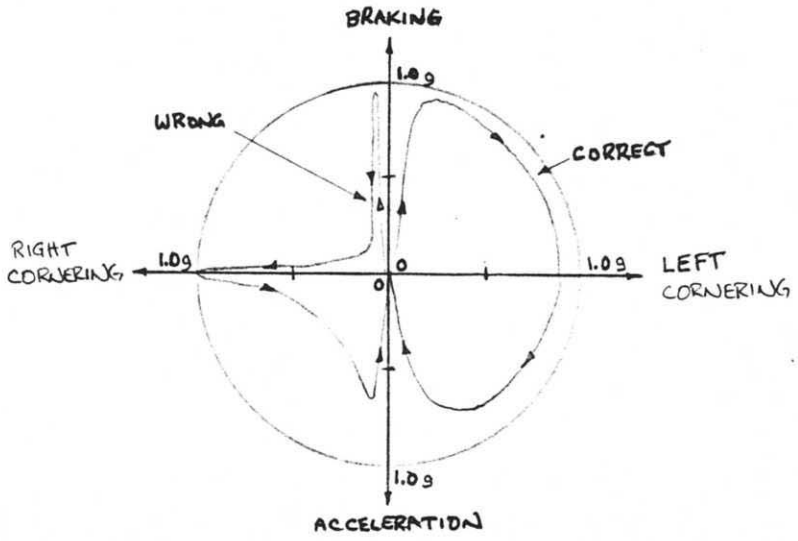
This balancing of oversteer and understeer by controlling the amount of weight transfer with the throttle, brakes and steering is THE VERY ESSENCE OF HIGH PERFORMANCE DRIVING! When all four tires are at their traction limit in a corner (15 to 20% slippage) alternating smoothly between understeer and oversteer (resulting in a four wheel drift) due to your weight transfer control - it's a beautiful feeling!

Remember that weight transfer not only increases the traction limit of certain wheels, it decreases traction of the wheels being unweighted! If weight transfer is not done smoothly, you'll be in for an unpleasant battle for control.

THE FRICTION CIRCLE

The Friction Circle concept is a simple graphic way of showing the performance of any driver in any car in any single maneuver. The easiest way to explain it is that a tire has relatively equal traction capabilities in any direction - acceleration, braking, or cornering, as shown in the diagram below. In any transient operation of a race car, say from braking to cornering, there are two ways to get from one limit of traction to the other. The driver may either suddenly get off the brakes and turn the steering wheel, or he may ease off the brakes while he gradually applies more and more steering angle. In the first option the car goes through a short period where no work is being done by the tires. This is wasted time, no matter how short, because the car cannot instantaneously change its motion from straight-line braking to a curved path. It has been mathematically and experimentally proven that the second option - trying to keep the tire and car on the outside edge of the friction circle at all times - is a measurably faster way around a race track. Not only that, but it reduces the stresses on the car and tires, which are created by sudden movements, and it is almost the definition of smoothness in driving technique.

So what you need to do - and what the Friction Circle is telling us to do - is to continue the braking into the corner entry phase so that, while the tires are in the process of building up cornering force they are still contributing braking force - we don't have to give up much cornering in order to develop meaningful amounts of braking force - and the result is a tire traction line that follows the boundary of the Friction Circle. We must also start to open up our exit line from the corner - or to "release the car" early so that we will have rear tire capacity available for early acceleration. Never forget that he who gets the power down first - and is able to keep it down - will arrive first at the other end.



The real key to the Friction Circle is the smooth progression from braking to cornering to acceleration. If we follow the prehistoric dictum, "Do all of the braking in a straight line, go through the corner at maximum cornering force, then accelerate in a straight line," we are going to waste a lot of the car's potential and a lot of lap time. We must "ride the rim of the Friction Circle" by balancing the brakes, cornering force and throttle so as to keep the tire's traction limit just inside the boundary of the circle.

THE ULTIMATE GOAL

To be a successful race driver, several elements come into play. They, however, can be reduced to a single formula:

CONCENTRATION + TECHNIQUE + CONSISTENCY = SMOOTHNESS

Smoothness takes a lot of self-discipline. But smooth is fast, and smooth is safe. Good race drivers are smooth, clean and unspectacular.

In racing, concentration is a must. There is no other way if you are to be successful and at the same time safe. A slight lapse in concentration for just a moment, EVEN A FRACTION OF A SECOND, can cause you to miss a shift, an apex, or worse yet - crash.

Technique is simply a matter of learning the basics and then practice, practice, practice!

Possibly the most difficult factor in the equation is consistency. Everything you do in a car is interrelated. If you are inconsistent or erratic in just one aspect of your driving it negatively effects everything else and smoothness is lost.

The car should be driven just as smoothly as possible at all times. Get into the habit of working on this in your everyday driving. Don't stab the gas pedal; squeeze it on and let it off smoothly. Don't slam on the brakes; apply them deliberately, increasing the pressure to get maximum braking without skidding, then ease back off the pedal when finished. Don't yank on the steering wheel; move it thoughtfully, feeling what is going on. The best drivers are the smoothest drivers. This has been proven time after time.

The primary reason for being smooth is to keep the car as well balanced as possible at all times. By "balance", we mean having the weight equally distributed on all four tires. Jerk the steering wheel and the car leans over on the suspension, lifting the weight on the springs and unloading the inside wheels. Then it has to come back down again, settling the weight on all four tires before the car is balanced again. During the time that the suspension is in its transient condition, the geometry isn't right and not operating at maximum efficiency. Your steering is less effective, the tires have less adhesion and your brakes can't work as well. No matter how smoothly you drive you can't avoid these transients altogether, but if you are driving smoothly, they will be much less abrupt and when you make a turn your car will balance up that much more quickly.

If you drive smoothly, concentrating on all these basic driving techniques, you will find that you become much more sensitive to everything the car is doing. You begin to develop a feel for balance in a car, your throttle foot develops a cunning all its own and when your car does something that surprises you either because you did something clumsy or because you let your concentration lapse, you'll be embarassed because of it. Or you should be.

But most important, you'll feel it because you've trained yourself to be aware.

Most of these basic driving techniques we've discussed are ones that you can practice and perfect in your everyday driving. Practise all the time. This does not necessarily mean exceeding the speed limit, but it does mean paying attention to your driving, concentrating on what you're doing, being critical of your driving and being alert to everything that is going on around. Concentrate on driving smoothly, keeping your car exactly where you want it at all times, picking out the exact spot where you want to have your wheels when you turn a corner, stopping smoothly with the front bumper exactly six inches from the crosswalk and modulating your braking effort as you stop so that you can't feel the exact moment when the car comes to a complete stop.

Nobody is ever so good that they don't need constant practice at driving. So practise all the time. You can't get too much.

II DRIVING THE TRACK

SEGMENTS OF A TURN

Any given corner can be broken up into 3 segments:

1) Entry
2) Apex area
3) Exit

1) The ENTRY is the most important part. It will dictate all that follows - where, how fast and how stably exit. Here, in general terms, is where you combine braking, heel and toe, and downshifting into one smooth movement. Remember to use your brakes, NOT YOUR ENGINE to slow the car.

2) The APEX of a corner is an AREA of the CORNER, not just a clipping point, where the inside front wheel runs closest to the inside of a given corner. The apex can also be thought of as that area of a turn where you are no longer driving INTO the corner but are now driving OUT of the corner.

An apex area in any given corner can either be early or late, and how well you match this area has a direct bearing on how well you do.

Where you apex is directly related to how you entered the turn and it will effect how you exit the turn.

The way to tell if you had the right apex or not is very simple. If you came out of the corner having to APPLY MORE STEERING to keep from running off the road, then you had TOO EARLY AN APEX. If you picked TOO LATE an apex then the car will be in TOO TIGHT and you won't be able to take full advantage of the road.

3) To properly EXIT a corner you want to come out long and wide. This will allow the car to safely dissipate all the unsettling forces which pick up momentum when your speed increases.

If you have hit the entry point, apex area and exit properly, through constant practice, you will be easing on the throttle earlier and earlier. This will allow you to enter the straightaway faster, reaching maximum speed sooner and beating your competition.

Remember, races are WON ON THE STRAIGHTS, NOT IN THE TURNS!!

TYPES OF TURNS

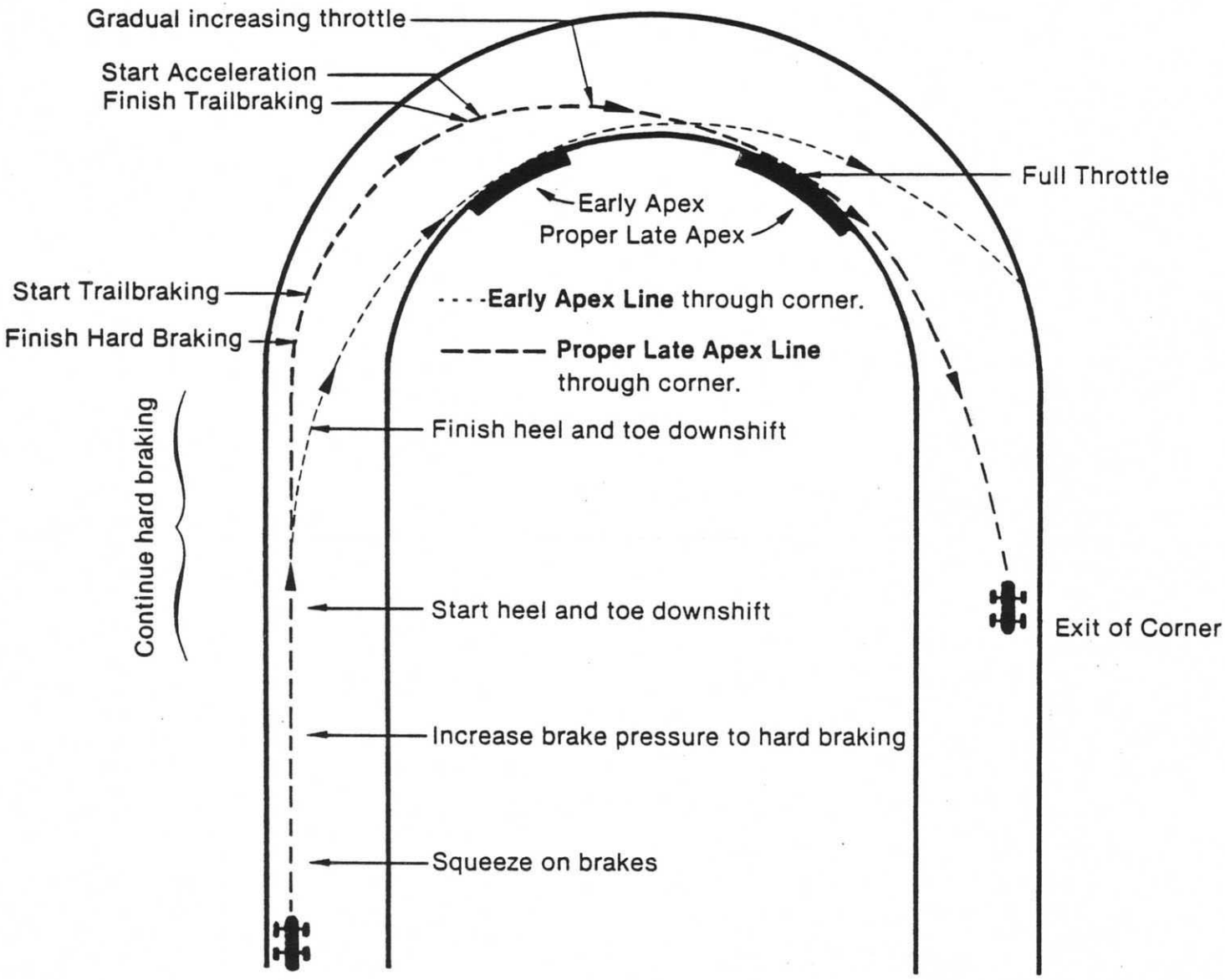
The race driver is not concerned with any one particular corner on a road, but rather with linking all encountered corners in a smooth fashion. Consider not only the corners themselves, but also the straights leading into the corners and the straights or corners following.

Keeping this in mind and the fact that a car's brakes are more powerful than the acceleration capability, best exit speed out of a corner matters a lot more than entrance speed.

A turn is a turn is a turn ... right? WRONG!!!

All turns ARE NOT of equal importance. The fastest lap time comes from knowing where to brake early and go slow and where to brake late and go fast.

HOW TO WORK A CORNER PROPERLY



The Early Apex is the usual line through a corner that most people take. It is the **shortest way** through a corner but **not the fastest** or **most stable.**

Proper Late Apex is the **fastest way out of a corner** and the **most stable.** The car will get most of its **cornering** done during the **first third** of the **corner** under trailing brake, and therefore, you will be able to give it **full throttle** much **earlier.** This will allow you **maximum exit speed.** In most cases you will be able to achieve **full throttle** around the **apex area** rather than waiting for the **exit area.**

When you analyse any track you'll find that there are three types of turns, and only three types. **Types I, II and III.**

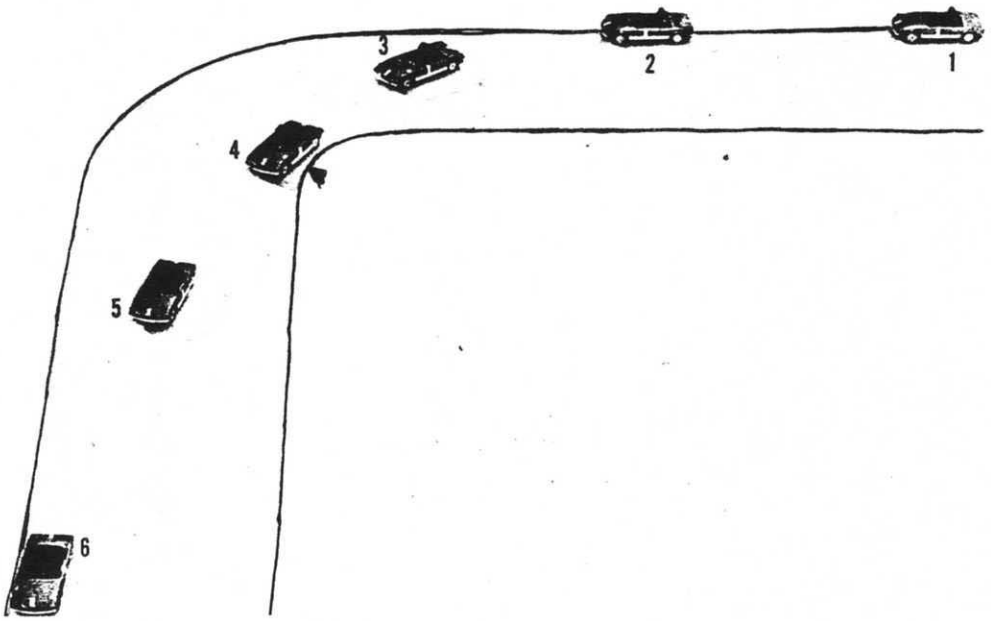
A Type I turn is the MOST IMPORTANT in terms of lap speed and it LEADS ONTO A STRAIGHTAWAY. A Type II turn is the next most imporatant and it COMES AT THE END OF A STRAIGHTAWAY. A Type III turn is the least important and it is a turn that comes between turns.

1) Type I Turns

A faster exit speed equals a higher final speed on the ensuing straight, where the race is won. This a LATE APEX (approximately two-thirds of the way through the turn) situation which is used if a straight follows a turn. It is much more effective to go into a corner slow and come out fast then vice versa.

Type I Turn. A Type I turn is one that leads onto a straightaway. In this type of turn you brake early, get on the throttle just as early as possible, make a late apex and accelerate onto the following straight at maximum rate of speed. In the illustration below, it is put together like this:

1. *Maximum braking.*
2. *Braking almost complete, downshifted to lowest gear that will be used in accelerating out of turn.*
3. *Balancing point. Transition from braking to accelerating. This is a critical point. If you accelerate too early, you will have to let off to keep from running out of road on exit from turn. If you wait too long to begin acceleration, you will not be able to make entrance onto straight at maximum speed.*
4. *Late apex. Should be at or very nearly at full throttle.*
5. *Full throttle, accelerating at maximum rate.*
6. *Full throttle, clear of turn, using all of the road to make a smooth arc on to straightaway.*



Balance and setting the suspension are important in this type of a turn to maximize your traction with a good tire patch.

How many of these are there at Westwood? FOUR.

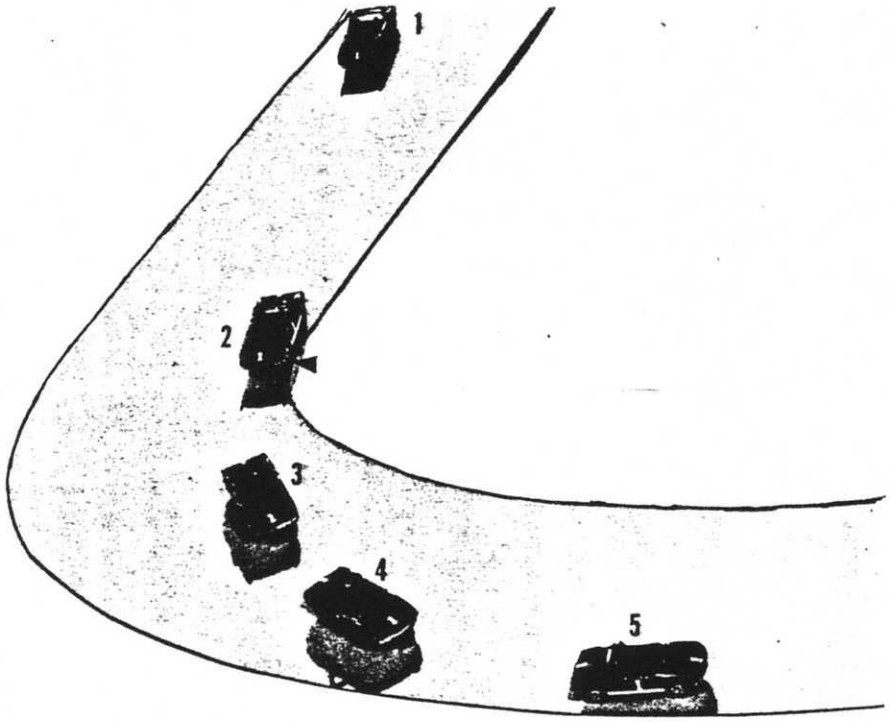
Where are they? In order of importance:

#1 out of 3B and onto the backstraight.
#2 coming out of Turn 4.
#3 out of the Esses and onto the pit straight.
#4 coming out of Turn 1

2) Type II Turns

The second most important turn comes at the end of the straight that you just passed your competitor on. So now you want to take advantage of your speed as long as possible.

When a straight leads into a turn that is not followed by another useable straight (one of substantial enough length to accelerate back up to a high speed), an EARLY APEX (approximately one-third of the way through) is used. This allows the entrance to be straightened out for much later braking, which in turn allows one to carry the speed from the entrance straight for a longer time.



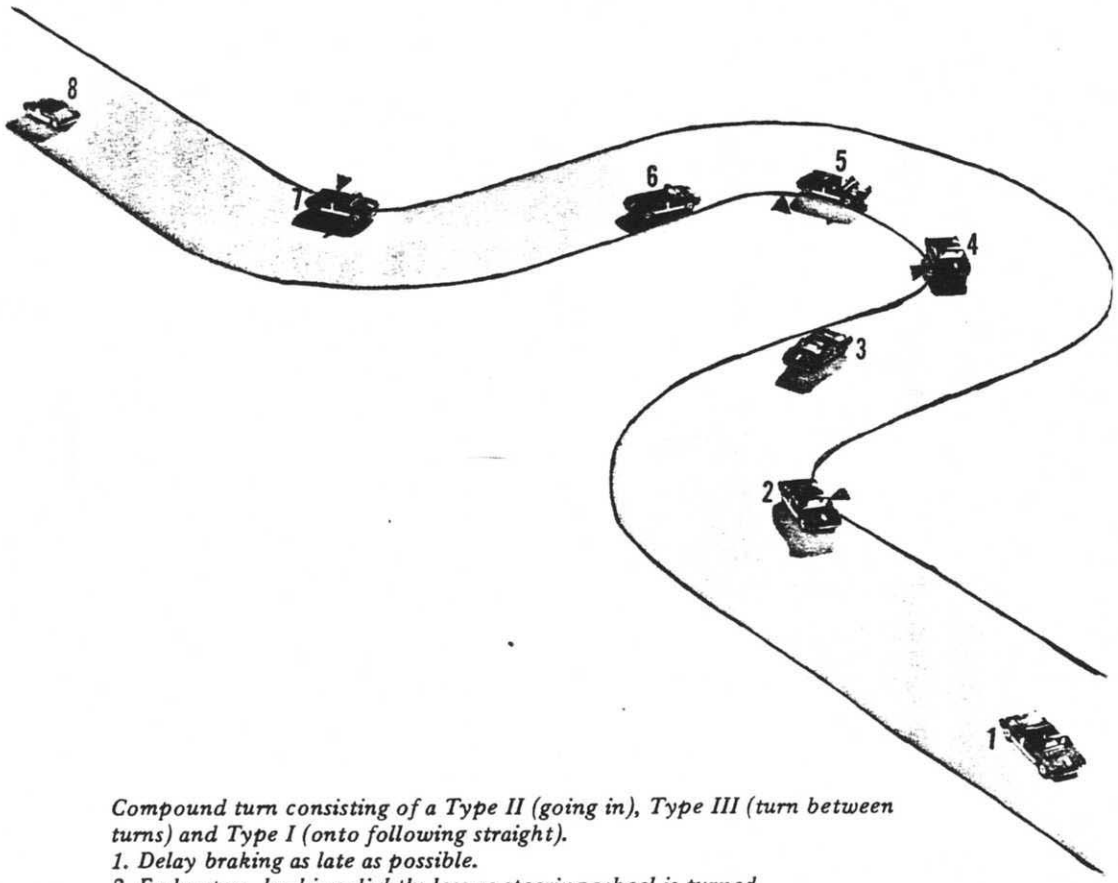
Type II Turn. A Type II turn is one that comes at the end of a straightaway. In order to get maximum benefit from straightaway speed, brake as late as possible, take an early apex, continue braking into turn and position the car for whatever comes next on the course.

1. *Delay braking just as late as possible, using fixed reference point to begin braking.*
2. *Early apex, braking slightly less in this area as you begin to steer the car into the turn.*
3. *Lighter braking (and possibly sliding) as you widen the radius of the turn.*
4. *Balancing point. Transition to very light throttle to "set" car on suspension.*
5. *Sufficient throttle to properly line up for next portion of the course.*

3) Type III Turns

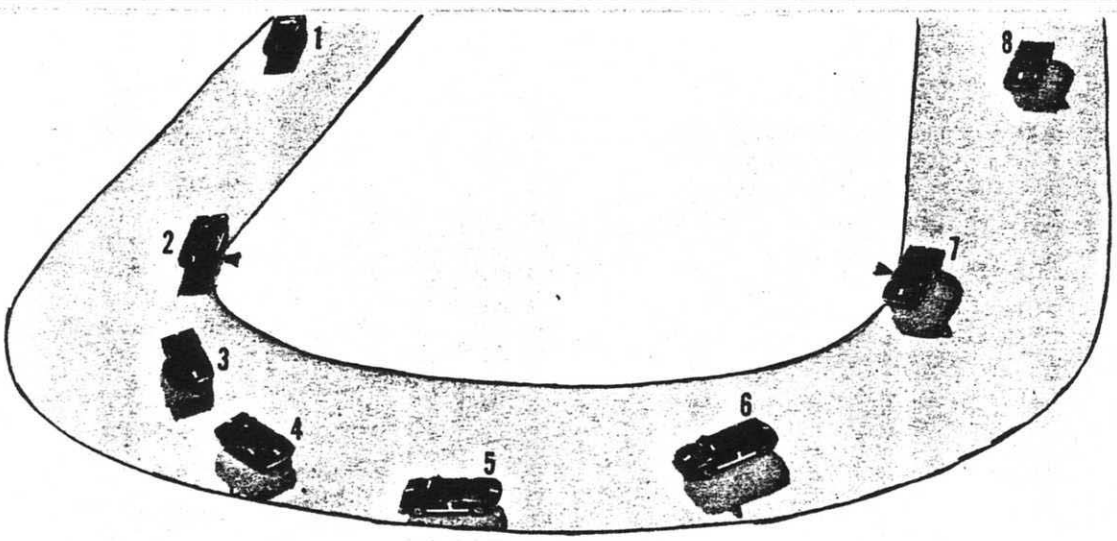
These turns connect two or more turns and the rule here is: DON'T TRY TO GO TOO FAST.

What is important here is getting set up for the right line for the Type I turn that inevitably has to follow. The Type III turn is the least important in terms of overall lap times.



Compound turn consisting of a Type II (going in), Type III (turn between turns) and Type I (onto following straight).

1. *Delay braking as late as possible.*
2. *Early apex, braking slightly less as steering wheel is turned.*
3. *Braking finished, very light throttle, car balanced.*
4. *Maintain very light throttle, staying to inside of course.*
5. *Still very light throttle, following inside line. Too much throttle here and position 4 would force car to outside, making it impossible to be in perfect position for the Type I turn that follows.*
6. *Begin acceleration as turn opens up.*
7. *Late apex, full throttle.*
8. *On to straight at maximum acceleration, using all of road.*

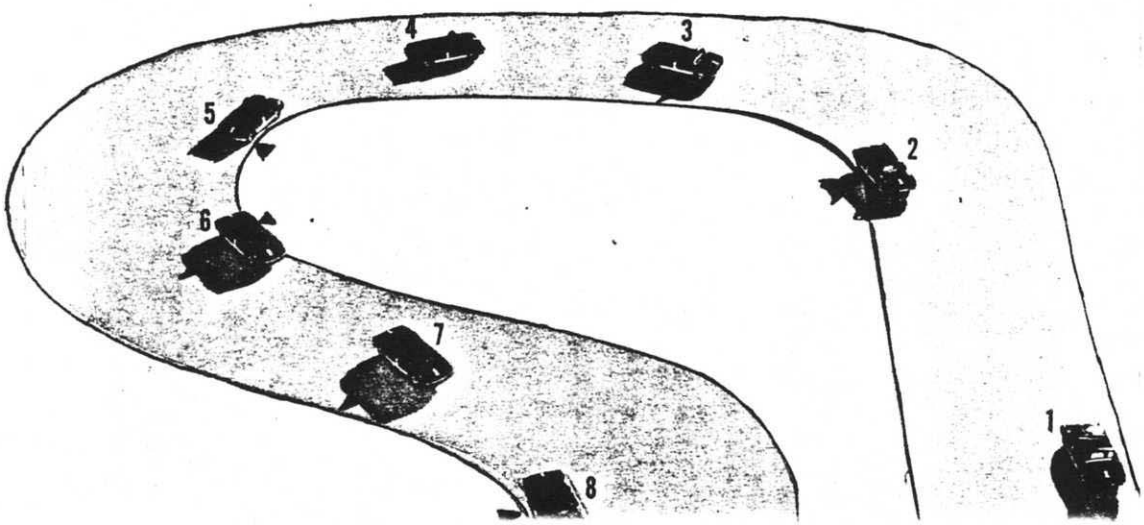


Compound turn that is a typical example of a Type II turn that leads to a Type I turn. Here you brake late coming into the Type II turn, then balance car and get set early for maximum-speed acceleration on to straight that follows.

1. *Delay braking just as late as possible.*
2. *Early apex.*
3. *Lighter braking as car begins to turn.*
4. *Balancing point. Transition to light throttle to "set" car.*
5. *Apply enough throttle to set up for exit.*
6. *Acceleration.*
7. *Late apex. Now under full throttle.*
8. *Exit turn, using all of road onto straightaway at maximum rate of acceleration.*

Compound turn with examples of Type II (coming off straight), Type III (turn between turns) and Type I (leading onto straight) turns.

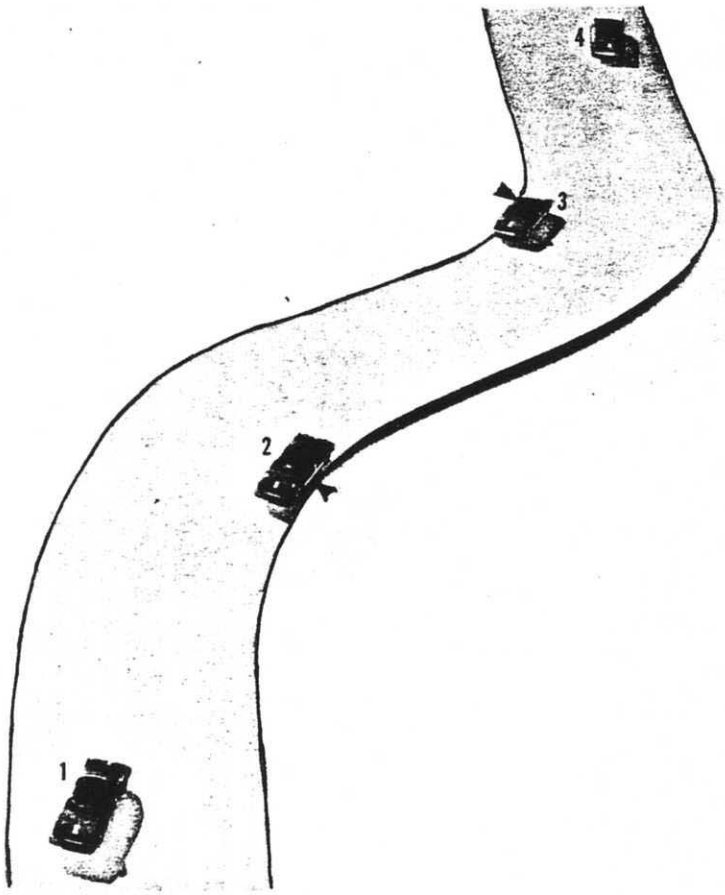
1. *Delay braking just as late as possible.*
2. *Early apex, slightly less braking as car begins to turn.*
3. *Balancing point, using very slight amount of throttle to "set" car.*
4. *Hold light throttle, follow smooth radius, not trying to go too fast.*
5. *Still light throttle, being especially careful to stay to inside of course and not increase acceleration too soon as this will carry you to outside of course and spoil exit.*
6. *Balancing point. Car should be lined up for exit and beginning to accelerate.*
7. *Hard acceleration, very nearly full throttle.*
8. *Late apex, full throttle, enter straight at maximum acceleration and use all of road getting onto straight at fastest possible speed.*



4) Esses

Because they lead to a straight they, too, should be driven as a Type I turn.

At Westwood, you enter the Esses deep on the left, line up the two turns and use all the road to make both apices, trying to straighten out the road as much as possible.



Typical "ess" bend. Although this may look like it can be driven in a straight line, there are two critical points to keep in mind. First, as this bend leads onto another straight, it should be regarded as a Type I turn. Therefore you have to plan ahead in order to get onto the following straight at maximum speed.

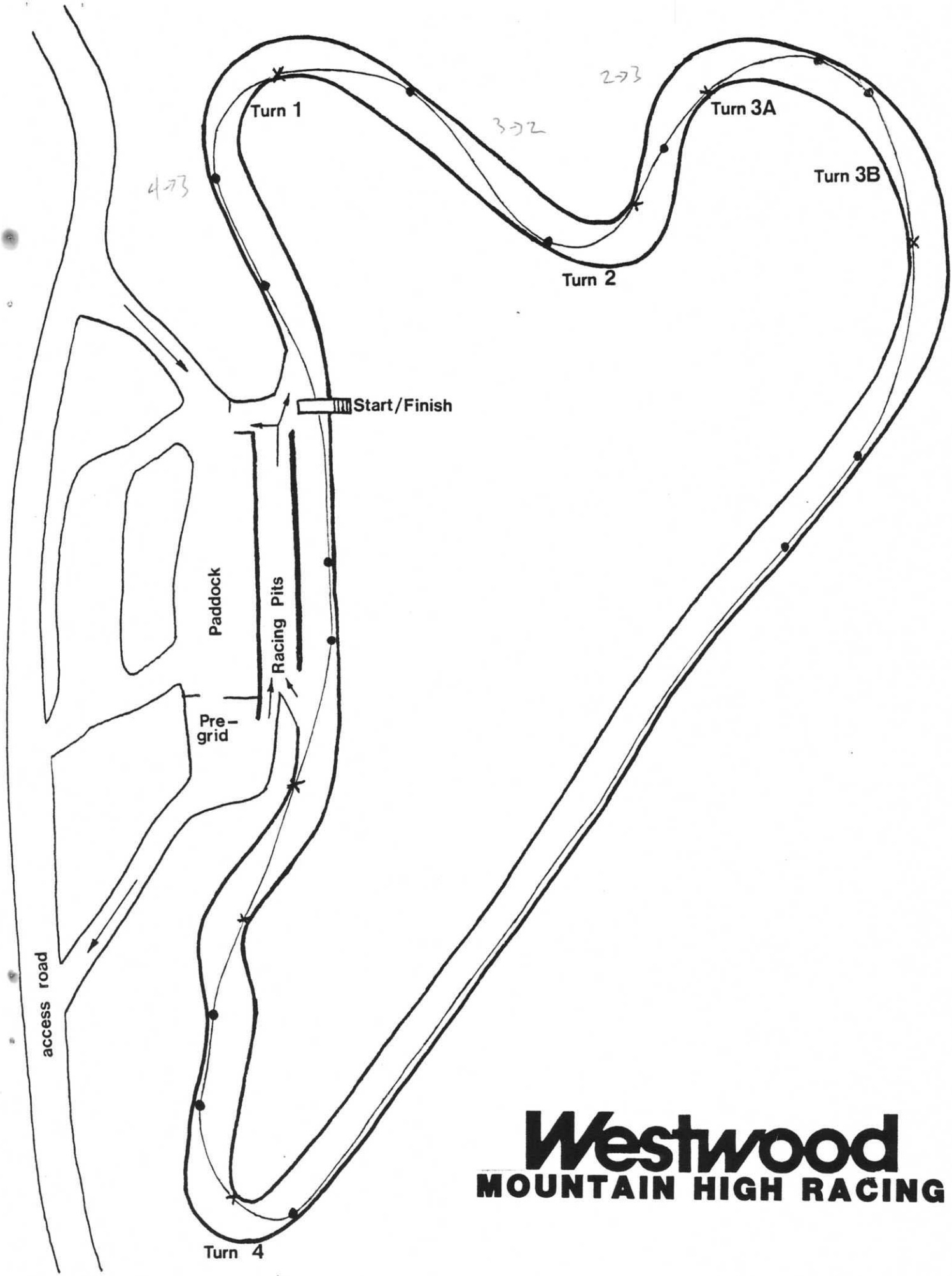
1. *Speed here should be such that the ess bend can be taken at full throttle, or very near full throttle. This may require lifting off throttle or even braking lightly before this point.*
2. *Line up the two turns and use all of course making this apex.*
3. *Apex on other side of course. Full acceleration.*
4. *Exit on to following straightaway, full acceleration, using all of road.*

PRIORITIES

Many Type II turns are also Type I turns - they lead onto a straight. When this is the case, drive them like a Type I turn taking a late apex. A Type I turn is always more important.

EVALUATION

It is of utmost importance to thoroughly learn which way the track goes before it can be driven with any sort of speed. Learn to identify the types of corners. When learning a new track, concentrate on perfecting the Type I turns first, then the Type II turns, and then the Type III last.



Westwood
MOUNTAIN HIGH RACING

PASSING AND DRIVING IN TRAFFIC

Probably the most important aspect in passing a car going into a corner is to "present" yourself. Make sure you get into a position where your competitor can see you. When you go into a corner on the inside of him, it is not necessary to pass him completely. Often, when someone tries to go too deep into a corner trying to get completely by another car, they over-do it and spin. All you have to do is get beside your competitor and the line is all yours. There is nothing he can do at that point.

In passing maneuvers, the general racing rule is the overtaking car is responsible for making a clean, safe pass. If the overtaking car is at least half-way past the slower car when entering a turn, it is his line.

If you are obviously slower than the car behind, you should try to let him by. When? Not in a corner, but on the straight. If you have already entered the corner, you are committed to the line - it is your corner. If you change your line in a corner after you are committed to it, you are going to confuse the faster car behind and possibly put yourself in a dangerous position. Wait until you are out of the corner and on the straight; then point to where you want him to pass, and let him by. Pointing is important, but make it one or two quick points, then get your hand back on the steering wheel and concentrate on your own driving.

Remember though, there are no real hard fast rules regarding passing on the race track. And no insurance on a race car. So remember, it takes some respect and courtesy for your fellow competitors for all of us to "play" safe.

Something to watch for in traffic is when you are following a group of cars into a corner, you most likely will not be able to brake as late as you normally do. As each car in front starts to brake, they begin to "stack" up in front of you. If you tried to go as deep as usual, you will run into the rear of someone.

III GETTING TO KNOW YOURSELF

VISION, BALANCE, AWARENESS & ATTITUDE

Never drive with any sort of vision impairment! If you require eyeglasses or contacts, wear them.

Do not drink and drive! One cannot say it enough - especially in racing. Not only is there a good chance of injuring yourself, and others, it will take away from the enjoyment and thrill of racing. If you ever get caught impaired at the race track, you can forget about racing for a long time! Remember, also, that the effects of alcohol last up to 24 hours.

While driving, don't concentrate on any one object in front of you, such as a car you may be following. Drive your own line - the car in front may be doing it all wrong. Look ahead down the track, and be prepared to act upon anything entering your overall vision. Sight should always be on the horizon level, not looking to the road or skyward. This establishes a reference point for BALANCE. Avoid head lean in cornering.

Although you hands and arms steer the car, your eyes tell you what to do. Your eyes actually lead your physical movement. Therefore, focus your eyes where you want to go, not where you are or where you don't want to go! Look ahead; don't drive off the nose of your car. At first, you will be surprised at how fast everything is happening on the track. If you aren't looking well ahead, you won't be able to react fast enough.

Be AWARE of everything and everyone around you, especially when racing in a pack of cars. Don't forget to check your mirrors on each straightaway. Pay strict attention to the flags. Also, check your gauges frequently.

Your mental ATTITUDE is extremely important when you begin racing. You will probably have the feeling that you're already a pretty competent driver. But it's important to keep an open mind about driving. Say to yourself, "There may be something I can learn." And it would be very unusual indeed if there wasn't something you can learn. The better drivers are almost always those who are ready to learn something new every time they get behind the wheel. Watch how other drivers take a particular problem corner. They may have found the secret you haven't. But be careful - he may be worse than you! Check his times and talk to some of the more experienced drivers.

Getting advice from the more experienced drivers - and even the corner workers - is a good practice. Most drivers will be flattered that you chose them to talk to, and respect you for making the effort to improve.

DRIVER'S SAFETY EQUIPMENT

The number one rule when purchasing driving suits, helmets and accessories is: BUY THE VERY BEST YOU CAN AFFORD! A bargain-priced driving suit doesn't look like such a good deal when you're laying in a hospital badly burnt. The same thing with helmets. Buying a cheap helmet really is false economy.

After you buy the best equipment you can, TAKE CARE OF IT. Don't drop or let your helmet sit upside down on the ground. Keep your driving suit CLEAN - it won't be fire resistent if its covered in grease and dirt.

Not only will this help save your life, but it is also a reflection of your attitude. First, if you look professional and act professional, you may just have a better chance of having someone actually pay for your racing - paid to play! Second, if you don't care enough about yourself to take every precaution available, no one else will either. And third, you owe it to your family. Racing is dangerous enough as is. At least show them you care!

PHYSICAL CONDITIONING

On the racing circuit, if you are to take maximum advantage of your car's potential and be any good at all you must be in good shape. Driving a racing car is both mentally and physically demanding. Coping with g-forces in cornering, working the steering or the brakes and functioning in extreme heat take strength and endurance.

In addition, all the physical exertion is nothing compared to the mental exertion. The real drain on your strength is the very intense and never-ending concentration you must maintain.

A slight lapse in concentration can bring disaster (How many times have you heard the expression "brain fade" used as an excuse?).

To improve your general coordination and fitness we highly recommend sports like running, tennis, racquetball, squash, weight training, etc. Most of these will also help your reaction time as well.

So, if you want to race, you owe it to yourself to be as physically fit as possible.

IV TROUBLE AND HOW TO GET OUT OF IT

Most out of control situations are a result of LACK OF CONCENTRATION, TRYING TO GO TOO FAST TOO SOON, OR SIMPLE CARELESSNESS.

CONTROLLING SKIDS

In general terms, quickly turning your steering wheel in the direction of your skid works. How well it works depends on you, if you are too slow you may spin anyway.

A) Oversteer

This is the most common type of skid and it occurs when your rear end slides out on you.

How to handle oversteer?

1. STAY OFF THE BRAKES or you may lose your steering.
2. QUICKLY STEER IN THE DIRECTION the rear of your car is sliding.
3. If you still have full throttle, EASE OFF ENOUGH TO BRING YOUR WHEELS BACK TO TRACTION.

In wet weather EASE all the way off the throttle to lessen the slide.

If you caught the first slide, be ready for one in the opposite direction that has been caused by your over-correction.

B) Understeer

Here the front is skidding and you're heading off the road.

How to handle understeer?

EASE OFF THE THROTTLE or CONTINUE BRAKING to transfer weight back to the front tires to gain steering control.

As your steering comes back and the rear lightens be ready for some oversteer.

AVOIDING TROUBLE

1. Don't use your brakes!! Come off the throttle which causes a forward weight transfer to enhance your steering.

2. STEER TO AVOID THE OBJECT and immediately correct to your forward direction and feed in some throttle.

Where do you go?

If its a spinning car, usually where IT HAS BEEN!!!

HOW TO PANIC STOP

If you can't avoid the object in your path and you have to stop, FIRSTLY MAKE SURE YOUR WHEELS ARE TURNED STRAIGHT AHEAD.

If you ease on the brakes or panic and lock them up YOU WON'T MAKE IT. In the latter case you lose steering and traction and with a loss of both steering AND traction you will simply slide right into what you wanted to miss.

So, how do you "panic stop"?

There are two theories on this topic and each is supported by at least one highly respected driving school.

The first theory states that the most efficient way to stop your car in a hurry is to apply the brakes to a near "lock up" condition. Thus, by modulating your brake pressure you can achieve maximum braking effort and avoid the loss of traction (and control) that comes with a complete locking up of the wheels.

The second theory states that pumping your brakes very rapidly, coming completely off them each time, is the only thing that MIGHT stop you.

In either case there in NO GUARANTEE, it depends on how fast you are going and how much room you have.

RAIN

Adverse weather conditions present even greater hazards and the need for even greater smoothness and concentration.

In the rain a typical turn can become a real problem if overdone. Your line should start a little sooner and slower and your APEX AREA MIGHT BE TWICE AS LONG.

If you aren't smooth you'll be off the road. You must be MORE ALERT AND EVERYTHING YOU DO MUST BE SMOOTH AND PRECISE.

You will be going much slower in the rain.

TWO AND FOUR WHEELS OFF

1. Keep your wheels straight.
2. Ease off the throttle slightly and hold your line.
3. STAY OFF THE BRAKES.
4. Maintain your traction and ease smoothly back onto the road WHEN YOU CAN SAFELY DO SO.

V GETTING TO KNOW YOUR CAR

A proper seating and steering wheel position are essential so you can "feel" what your car is doing. To trust these "feelings" you must have faith that your car is giving you the proper input. To ensure that your car must be properly maintained and prepared. When it is properly maintained and prepared, you will experience:

- fewer problems
- more enjoyable driving
- financial savings when problems are detected early

WHY IS PROPER PREPARATION VITAL?

1. You won't win if you don't finish
2. Doing it yourself will: a) make you more knowledgable,and
   b) save you money
3. So the car can be depended upon to react in the same fashion each time you want it to.

WHAT DO YOU NEED FOR PROPER PREPARATION?

1. A Complete Set of Tools

You should have all the standard tools (sockets, ratches, bars, screwdrivers, wrenches, timing light, etc.) as well as any special tools your car may require.

Your tools should also be of good quality and of the right type (i.e. metric for a metric car).

2. A Place to Work

How to get discouraged as a racer?

Make sure where you work is cramped, cold, dirty, and poorly lit.

Your work/storage area should be the opposite of all those. When you are warm and can see, the whole job is more pleasant.

Your garage should also be secure. You've a big investment sitting there, make sure it stays yours.

3. What is Preparation?

a) TIME

b) CHECK LISTS:

If everything is listed and ticked off then you know the job got done.

i) A list of work to do on the car.
   - routine checks and maintenance
   - repairs to be done
   - potential trouble spots to check

ii) A list of each step in the preparation process and a good manual.

iii) A list of each item that you're taking to practice or the races (tires, tools, gear, gas, water, towels, etc.).

c) Priorites:

Most of us work full time, do our own prep work and our time is therfore short and valuable. Thus we must priorize our work:

FIRST: anything that effects the car's SAFETY (tires, suspension,etc.)

SECOND: those items affecting the car's RELIABILITY

THIRD: the modifications for PERFORMANCE

d) Cleanliness:

Keep the car clean inside, outside and underneath. If dirt builds up, you get dirty working on that part. Further, you probably won't see that loose nut or bolt or that oil leak and that could mean trouble.

Yes, all of this takes time but, done properly, it means a great deal of peace of mind when you're out there rubbing door handles.