

BOB

BONDURANT

ON

HIGH PERFORMANCE DRIVING



**FOURTH
EDITION**



Bob Bondurant with John Blakemore

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Rick Scuteri

On the back cover: Bondurant Formula Fords. *Rick Scuteri*

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Performance Driving on February 14, 1968.

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who in 1997 won the Formula One World Championship. Good luck to Damon in the future.

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Ken (Chopper) Tyrrell, for giving me that real driver's test at Goodwood in 1965 in your Cooper Formula Three car. I was pleased that I was almost as fast as Jackie Stewart and you let me drive the Monaco Formula Three race. Thanks for teaching me how to really qualify by staying out the very last lap and running as fast as I could. It paid off as we set a new lap record, gained pole position for the Monaco Formula Three race, a full second faster than Roy Pike in second place. I also really enjoyed driving your Formula Two Cooper teamed with Jackie.

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Bobby, my son, for helping in the pits on several of my NASCAR rides and the IMSA races. We both like to give each other support in our racing. Congratulations on all your wins at the Daytona 610 in both the showroom stock and the orange Camaro. It makes my heart grow warm to help and watch you grow.

Willment Racing, outside of London, for letting me drive that Lotus Can-Am car to second place at Silverstone, behind Denny Hulme, and for giving me the car to win the Formula Three race at Monza in 1966.

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I especially want to thank all of the special sponsors that my school has had over the last few decades: Datsun/Nissan and Mr. Katayama for getting my school started and for many years of belief and support; Porsche for its help during the Ontario

years; Valvoline for over 15 years of trouble-free lubrication; Champion spark plugs for the many years of great service; and Bell helmets and safety equipment, Centerline wheels, H&M, and John and Mike at the Downey tire center for building all those Bandag Racing Retreads.

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Many thanks to my loyal and enthusiastic staff who make up our wonderful school. They really have ensured that the Bondurant School is of the highest quality and have definitely made us the number-one high-performance driving school in the world throughout the last 30 years.

I want to thank the racetrack owners and managers who have helped me around the world: Les Richter (who now manages Roger Penske's California Speedway in Fontana, California) of the former Riverside Raceway; Skip Berg and the entire staff of Sears Point International Raceway; the late Lee Mosel of Laguna Seca; Lee Hall of Elkhart Lake; and the late Bill France Sr., Bill France Jr., and the entire staff of Daytona International Raceway. Additionally my thanks goes out to Sebring Raceway and its former owner, Charlie Mendez; and the Ontario Motor Speedway and John Cooper and Ray Smartus. In Europe, I would like to thank the organizers of the famous Targa

Florio and the late Masten Gregory, the American who taught me this circuit and helped learn all the race circuits in Europe. Also, the organizers of Goodwood, Brands Hatch, and Silverstone in England; Le Mans, Reims, Rouen, Alby, and Pau in France; Nürburgring and Freiburg Hill Climb in Germany; Monza in Italy; Spa in Belgium; Sier-ra Montand in Switzerland; and Monaco and all the organizers for their help.

Most of all I would like to thank my current sponsors for helping me and the Bob Bondurant School of High Performance Driving reach, maintain and continue our goal of excellence: Ford Motor Company, SVT, and Lincoln-Mercury for their excellent high-performance cars and trucks; Motorcraft/Qualitycar and Visteon for great service and reliability; Goodyear for its great tires with fantastic traction, smooth ride, and predictable car control; Bell Sports for making motor racing safer each day; OMP for the best driving suits, gloves, and shoes in racing; Recaro for the very best in seating; Texaco for the very best in high-performance fuel and lubrication; American Racing Wheels for super-strong and beautiful lightweight wheels; Eibach springs and Monroe shocks for the best in quality, handling, and ride; and Performance Friction, the makers of the best racing brakes in the world. They stop you better and last longer.

A special thanks to all of our wonderful graduates from all around the world, who have helped make our school what it is today. Without them we couldn't have done it. Thank you one and all.

A special note of thanks to Charlie Allen and the entire staff at our new home at Firebird International Raceway, Phoenix, Arizona. It has been really great to be here.

*Bob Bondurant
Phoenix, Arizona*

I would like to thank the following people for their assistance in making this book possible: First and foremost, Bob Bondurant, with whom it has been my pleasure to again collaborate in this work, a good and loyal friend who stood with me through some really difficult times; Linda Muncey and Kristen Zagarella, of the Bondurant School, patient angels; Wolfgang Scholvien; Connie, John, and Rebecca Klampfe; Nikon Cameras; Eastman Kodak Company; Carolyn Sweeney and Going Places Travel; Pamela Lauesen and George Goad of the Formula One Spectators Asso-

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*John Blakemore
Oakland, California*

Elite Graduates of the Bob Bondurant School of High Performance Driving

CART

Rick Mears, Al Unser, Jr., Pancho Carter, Chip Ganassi, Lyn St. James, John Andretti, Robby Gordon, Dominic Dobson, Scott Pruett, P. J. Jones, Scott Brayton, Parker Johnstone

IRL

Johnny O'Connell, Scott Sharp, Jeff Ward

NASCAR

Mark Martin, Jeff Gordon, the late Davey Allison, the late Alan Kulwicki, Bill Elliott, Terry LaBonte, Brett Bodine, Geoff Bodine, Ricky Rudd, Dale Earnhardt, Dale Earnhardt Jr., Darrell Waltrip, Michael Waltrip, Kyle Petty, Hut Stricklen, Kenny Wallace, Bobby Hamilton, Dick Trickle, Kenny Irwin Jr., Steve Park, Buckshot Jones, Loy Allen, Rick Mast, Dale Jarret, Jason Jarret, Gary Bradberry

NASCAR Truck Series

Tammy Joe Kirk, Mike Bliss, Chuck Brown, Joe Ruttman, Randy Tolsma, Eric Norris, Greg Biffle

Formula One

Dan Gurney, Stirling Moss

NHRA Drag Racing

Kenny Bernstein, Don Prudhomme, Joe Amato, Ed McCulloch, Lori Johns, Cruz & Tony Pedregon, Darrell Alderman, Cory McClenathan, Shelly Anderson, Freddie Neally, Whit Bazemore, Tony Pedregon, Ron Capps, Christin Powell, Gary Densham, Bruce Sarver, Mike Dunn, Gary Scelzi

Indy Lights

Nick Firestone, Clint Mears, C. J. Mears, Tim Moser

Atlantic Series

Buddy Rice, Paul Jasper

Road Racing

Tom Kendall, Price Cobb, Whitney Ganz, Butch Leitzinger, Chris Kneifel, Brian Simo, Ron Fellows, Bill Saunders, Bill Cooper, Chris Neville, Ross Thompson, Terry Borcheller, Darren Law

Off Road

Walker Evans, Manny Esquerra, Ivan Stewart, Chuck Johnson, Paul Simon, Dave Ashley, Ed Herbst

World of Outlaws

Sammy Swindell, Jac Haudenschild

Boat Racing

Mark Tate, Chip Hanauer

Actors

Paul Newman, Clint Eastwood, Candice Bergen, Jason Priestley, Crystal Bernard, Tim Allen, James Brolin, James Garner, Gene Hackman, David Hasselhoff, Lorenzo Lamas, Lee Majors, Marsha Mason, William Shatner, Elke Sommer, Parker Stevenson, Robert Wagner, Alfonso Ribeiro, Richard Grieco, Jeff Fahey, Richard Dean Anderson, Perry King, Hugh Downes, John Schneider, Jim Belushi, James Coburn, Tom Cruise, Robert Hayes, Tommy Davidson, Dolf Lundgren, Eric Braeden, Michael Damien, Keith Carradine

Musicians/Singers

Christopher Cross, Sammy Hagar, John Oates, Paul Williams, Fee Waybill (The Tubes), George Lynch (Dokken), Nigel Olsson (Elton John), C. C. Deville/Rickie Rockett/Brett Michaels (Poison), Denny Carmassi/

Howard Leese (Heart), Steve Miller (Steve Miller Band)

Athletes

Dwight Clark, Bruce Jenner, Robin Yount, Bart Conner, Dan Pastorini, Gabrielle Reece, Sean Elliot, Phil and Steve Mahre, Christy Carlson, Walter Payton

ASA

Dave Sensiba, Mike Miller, Jay Sauter, Scott Hansen

Land Speed Racing

Gary Gabelich

TV and Radio Personalities

Hugh Downs, ABC News; Paul Harvey, National Radio Personality; Dallas Raines, KABC-TV, Los Angeles (ABC Affiliate); Jan Beekhus, Race announcer; Pat Patterson, Race announcer; Paul W. Smith, WJR Radio, Detroit; Bob Lawrence, KGTV, San Diego (ABC Affiliate)

Karts

Adam Andretti, Patrick Long

1 Getting Acquainted

The Bob Bondurant School of High Performance Driving, one of the most successful high performance driving schools in the world, is owned and operated by Bob Bondurant. Bob's school, which first opened its gates to students on February 14, 1968, is world famous for being the most advanced and intense school for high-performance driving, racing, law enforcement, and corporate antiterrorist training. Bob's school not only teaches the amateur enthusiast and the aspiring racer but also the advanced professional how to perfect and improve his driving form.

Under the close supervision of Bondurant and his hand-picked staff, many novice would-be racers, famous personalities, and some very formidable names in professional racing have passed through the gates of the Bondurant School. Some students take the school as a starter course, while for others it is a refresher, and for some it is just a "tune-up" in their driving styles. Just some of the names that Bob has given his personal instruction to are: the late Davy Allison, Candice Bergen, Crystal Bernard, Tom Cruise, Clint Eastwood, Bill Elliot, Dale Earnhardt, Dale Earnhardt Jr., James Garner, Jeff Gordon, Gene Hackman, Paul Harvey, Lori Johns, Perry King, Mark Martin, Rick Mears, Stirling Moss, Paul Newman, Elke Sommer, and Al Unser, Jr. Not long ago, Bob had the pleasure of giving a refresher course to Dan Gurney, his old Cobra racing teammate.

As well as earning the respect of the racing fraternity, Bob and his school are Number One in the world of street driving. The Bondurant School also offers the world's best courses in two highly specialized areas. For the last 30 years, Bob has had a special academy for instructing law enforcement officers in the proper techniques of handling their police cars in nearly all situations, including pursuit. Bob's other special



Bondurant's state-of-the-art purpose-built facility, featuring 150 race-prepared Ford vehicles. It is located at Firebird International Raceway just outside Phoenix, Arizona. Rick Scuteri



The Bondurant Skid Car in action, teaching students the principles of oversteer and understeer. Rick Scuteri

course is what he refers to as his "Executive Protection" course. This one deals with executives, VIPs, and their chauffeurs, teaching them how to get away from would-be terrorists and kidnappers by the use of "take-outs" and ramming. All of Bob's courses deal with reality, the how and the why, and then many hours behind the wheel practicing to ensure that it is all understood and done correctly. Bob is always creating new courses to meet the needs of today's drivers, such as a Women's Self-Protection Driving course and a Sport Utility Vehicle course. Over 5,500 students per



The Bondurant SVT Cobra. Rick Scuteri

year attend the Bondurant School's various driving courses.

Bob's credentials are enough, in themselves, to fill a book. It is only right that we take a few quick laps through the pages that brought Bob Bondurant into the world of high-performance driving instruction.

Bob's first interest in racing was sparked when he was eight years old, watching midget dirt-track oval racers with his father at the former Gilmore oval track stadium in Southern California. (This property is now a CBS television station.) It wasn't long until, at the age of 14, he was riding a Whizzer

motorbike, and then motorcycle racing an Indian 101 Scout on the dirt-track ovals in Southern California. Next it was hot-rodding and informal drag racing, then finally his first race car. Bob shares some of his reflections of his early days of competition, and, along with those thoughts, one can see how he molded and formed his concepts of how to teach others to drive both quicker and safer.

The days of motorcycle racing, motor cross and the ovals like the mile at Del Mar, half-mile at Bakersfield, the Carroll Speedway



Our rebodied Bondurant Formula Ford featuring a new "F-1-Style" design with functional front and rear wings.
Rick Scuteri



Instructing the next generation. Here I am, giving a few pointers to Jason Jarret, son of Ford Factory driver Dale Jarret. Rick Scuteri

and others brought these thoughts to mind: Motorcycle training is very good if you want to do car racing, because you learn to race handlebar to handlebar, and you get used to having someone very close to you!

Today most of your top international competitors have come up from the ranks of go-kart racing. Kart racing teaches you wheel-to-wheel racing and passing. Today it's very competitive.

Most people who have not raced bikes or go-karts find that in their first few years of car racing, they get very nervous having someone racing side by side with them.

Bob's change from two wheels to four came after his late cousin, J. C. Lewis, took him to the 1955 Santa Barbara road races. An entire new world opened up for him. The next year, he was to drive his first race at the same circuit.

I watched for about a year before I decided that this was what I was going to do. I bought a Morgan Plus-4 and ran my first race in the Saturday preliminary. I finished third. After the Saturday session, I thought, boy, was it great! There was nothing to it, just go out and play like I did on the street. The great thing was there was no highway patrol to watch out for. Sunday, however, was a different tune. I only placed fourth. I

was beaten by a fellow whom I had beaten the day before. I stopped and thought to myself that there was really a lot more to it than just playing around and driving fast. From that point on, I got serious.

I read everything I could find about racing and driving. One of the best books was, and still is, *The Technique of Motor Racing* by Piero Taruffi. It is literally a mathematically calculated book, complete with diagrams and equations that will get nearly any driver through any turn in the world successfully, if the equations are calculated and followed correctly. Although the book was written in the 1950s, the concepts remain the same, even with aerodynamic wings and the current extreme down-force; only the speeds in the corners have increased. The tires are much wider with stickier compounds, and their adhesion is so much better that the braking points are now much later, but basically the fastest way around a turn is still the same.

Another book high on my list of important reading is *The Racing Driver, the Theory and Practice of Fast Driving* by Denis Jenkinson. Jenkinson's book is a classic that gives incredible insight into the makeup of a racing driver. Both of these books are still in print.

Other U.S. magazines that will help to keep you abreast of the goings-on in motor-ing are *Automobile*, *Autosport*, *Autoweek*, *Car and Driver*, *On Track*, *Indy Car Magazine*, *Motor Trend*, *Racer*, and *Road & Track*; but more about these later. Back to racing.

After running the Morgan for a season, I graduated to the modified classes, first with a bored and stroked Triumph TR-2 that led against the 3-liter Ferraris and Maseratis and did quite well. After that I raced anything I could get my gloves on. The next couple of years I did everything I could to improve my driving. After studying everything I could find and racing every chance I got (there's no substitute for seat time!), I really started to get quick, and even more important, smooth and consistent. My thoughts were now to go faster. I bought one of the cars used by Kirk Douglas in the movie *The Racers*. It was a 2.6-liter Scaglietti-bodied Ferrari. After two races

(and two wins), I sold it and bought my first Corvette. That was really the start of my learning how to really drive fast and, boy, did I enjoy it!

For me there was, and still is, no substitute for horsepower. Horsepower is really fun to drive. It can get you out of trouble, but just the same, it can get you into as much or more if you don't learn to control it. That 'Vette was a good one, and my mechanic, Don Bachtold, was even better. I won the next 18 out of 20 races and finished second in the other two. That gave me the 1959 West Coast B-Production championship and the Valvoline Corvette Driver of the Year award.

From then on I was driving for other people. I drove a lot of Corvettes, some modified

sports cars like Max Balchowsky's *Ol' Yellar* and Frank Arciero's 4.5 Ferrari/Maserati, and I was well on my way to fame and fortune.

About this time, some petty politics entered the racing scene and because I competed in a race put on by one sanctioning body I was banned from the other one. All I wanted to do was race, not play politics. This sort of thing really sickened me. They took away from me a sport that I really loved. So I said, "To hell with racing!" I quit. I got both my helicopter and private pilot license and became a helicopter pilot. I still fly my beautiful 341 Gazelle to this day!

I tried for a year, but couldn't get racing out of my mind. It was really in my blood. The bad politics had passed, and in 1963 Shelly



The fastest 60 acres in Phoenix. The Bondurant custom-designed 1.6-mile road course and school facility, Rick Scuteri

Washburn approached me to drive one of the new Corvette Sting Rays. I said yes.

Shortly after, Carroll Shelby talked to me about driving his yet-to-be-seen Cobra. At that time he didn't have any money, and worse yet, he still didn't even have a car done. I passed on the deal and stuck with the Corvette. As it turned out, Shelby got some help from Ford and got the Cobra on the track about the same time we brought out the new Corvette. The race was Riverside and the Cobra had Billy Krause at the wheel.

It just flew! It was all we could do to keep up. From that time on, our 'Vettes had problems with this new Snake. After one more race, our fellow Corvette driver Dave MacDonald joined Shelby, and then so did Ken Miles. My work was really cut out for me, just making the Sting Ray stay with them. Finally one Sunday at Pomona, I was the quickest. I thought finally we had it all together. But when we tried to fire the car up for the race, the fuel injection packed it in. Fortunately in those days we used street parts and we took a fuel injection unit off a

spectator's car. By the time we got the car together, the race was two laps gone but they let me go out anyway. I chased after the pack, and as it turned out, I was the quickest one out there. I finished in third place.

The next week I got a call from Shelby to drive in place of Ken Miles at the Continental Divide Raceway, as Ken had to test a new Cobra and couldn't do the race. I told Carroll I didn't know if I could even drive a Cobra. He responded, "Look, here's a ticket. Be on the plane. Do you want to drive the son of a bitch or not?" I drove it, thinking it was a good opportunity to find out about the competition. Well, as it happened, I won the race and stayed with the team. Then I started beating Corvettes myself.

It wasn't long after, that Shelby and Ford Motor Company decided to take an American team to Europe and try to win the World Manufacturers Championship. Typically the budget was shaved slightly, and although the cars and mechanics had been sent from the U.S., they decided to use American drivers who were already in Europe—Dan Gurney, Masten

*Driving for Carroll Shelby
in a Cobra 289 at the
Times Grand Prix, 1963.
Dave Friedman*



Gregory, Richie Ginther, and Phil Hill. I made a deal with Shelby that if he paid me what he paid me in the States and covered my expenses, I would move to Europe and drive the Cobra. He agreed and I left, two weeks before my first race in Targa Florio, Sicily.

I thought I'd never learn the circuit in time, as it was 44.7 miles long and over 1,000 corners per lap. The late Masten Gregory was responsible for teaching me how to learn a circuit. He taught me to first do one full lap, looking at everything, and then do it by section. I drove over each section of three or four kilometers forward and backward, studying the entire circuit for two weeks, eight hours a day, seven days a week. I had every hazard, braking point, and landmark figured out. Fortunately the landmarks I picked were permanent. The Alfa Romeo team painted rocks along the track bright red to designate their various marker points. The night before the race, a practical joker (or competitor) went around the circuit and painted all of their red rocks white like all of the others.

All of my study paid off. For qualifying you only got one lap because the course was so long. I was the fastest qualifier until Shelby gave Gurney a second lap and he just beat me out. For this race, I was teamed with Phil Hill—a very astute, fantastic driver to work with, and now also a good friend. We were leading our class when suspension failure put us out just past the one-third point.

I stayed with the team for the rest of the Manufacturers Championship races in 1964, and we wound up a strong second to Ferrari on our first season's scoreboard.

The 1964 season's highlight was winning the GT category, at the 24 hour race of Le Mans, teamed with Dan Gurney. It was a fantastic feeling, and wherever I'd go in Europe after that, I was thought of as *A Le Mans Winner*. Not only did we take the GT class, but finished a solid fourth place overall. We were in one of the Cobra Daytona Coupes. It was a wonderful season, but it was still a learning season. I would learn a circuit any way I possibly could. At Nürburgring, the Hanseat driving school was in session, and I enrolled. It worked, and I became



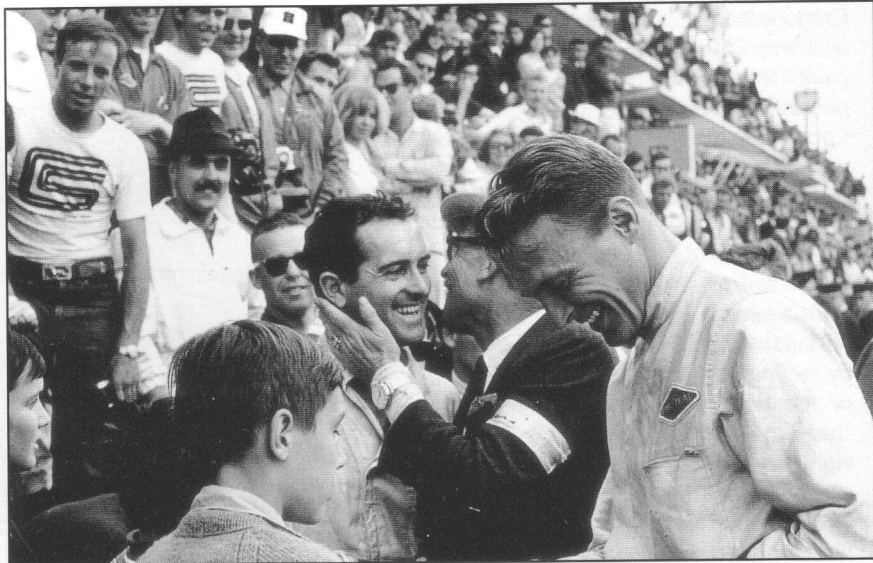
Smoothness is imperative—especially when controlling cars with high horsepower-to-weight ratios, such as this Cobra Daytona Coupe. You really had to be aggressively smooth. We ran 196 miles per hour down the Mulsanne Straight at Le Mans in 1965.
Bernard Cahier

a lot quicker, faster than trying it on my own. At the end of the 1964 season, for the first time, I really considered myself a true professional. The next step, as far as I was concerned, was Formula One.

At the end of the 1964 season, I got a chance to have my first taste of a Formula One car. I was testing the Ford GT 40 at Monza for John Wyer, and was invited by Alf Francis, Stirling Moss' former mechanic, to test the ATS. I wanted to, but John said not until I had finished testing the GT 40. I finished the five days of GT 40 testing and couldn't wait for the next day's adventure. Formula One in those days was far less structured and much less professional. They didn't even use seatbelts yet.

When I took the ATS Formula One car out for the first time, it felt a little uncomfortable. It was set up for Mario Cabral, a 5-foot, 4-inch Portuguese Grand Prix driver. My head stuck out above the roll bar, and there were no seat belts! After an hour of testing, I felt comfortable and confident. It was great! Now all I needed was some time

One of the greatest thrills of my life—winning the GT category at Le Mans with Dan Gurney. Bernard Cashier



to think about the car. The handling, the shifting. It was a six-speed gearbox, and I had never driven those before. I needed thinking time about how the car felt. How I felt. In the meantime, we decided to get together for dinner.

At dinner that night we were discussing who we figured had gotten through the famous Curva Grande flat out, without lifting, and we figured only about six F-1 drivers had done it at that time. It was about a 150-mile-per-hour turn. Well, for the session in the morning, I had resolved to myself that I was going to give it a try. It took about eight laps before I did it, and when I did, I had a rush that was about like swallowing my heart. I held my breath all the way around the turn. At the exit, I glanced at the tach, and I had come out of the turn about 300 rpm faster, which translates to 5 miles per hour quicker, allowing me to get to the next corner quicker. I couldn't do it every lap, only once every seven or eight to start, then I got so I could do it flat out about every three or four. I just couldn't do it every lap. It was scary! Finally I got my last "in" sign and the session would be over. I thought to myself that I didn't know when I'd be in a Formula One car again at Monza, so I'd try the Curva Grande just one more time, flat out, at about 150 miles per hour.

There's a large ancient tree on the right-hand side of the turn. Its roots run under the track, causing a bump right in the racing line of the pavement. I entered that infamous turn as usual and hit the bump as usual. But this time the left rear half-shaft broke, the wheel flew off, and the car swung violently to the left. I tried to spin the car back and forth to scrub off the speed. But there was only one rear wheel working and only one front wheel steering—the right one was totally off the ground because the left rear was gone. No way could I save it. I was just along for the ride.

The car took control and shot through the hedge that lined the curve (no Armco rails then) and backward into a ravine. I got catapulted out of the car, straight through the branches of a tree. I was wearing a plastic bubble-face shield, and it was shredded off my helmet. I landed flat on my back on a huge pile of leaves. I thought I was dead. I remember flying through the hedge thinking to myself, "Shit, Bondurant, you just wrote yourself off."

That was the last thing I remembered before waking up on my back. When I came to, I was gasping for breath. I thought that I'd punctured a lung and broken every bone in my body. My mind flashed back to the crash, and knowing I had been flat out in

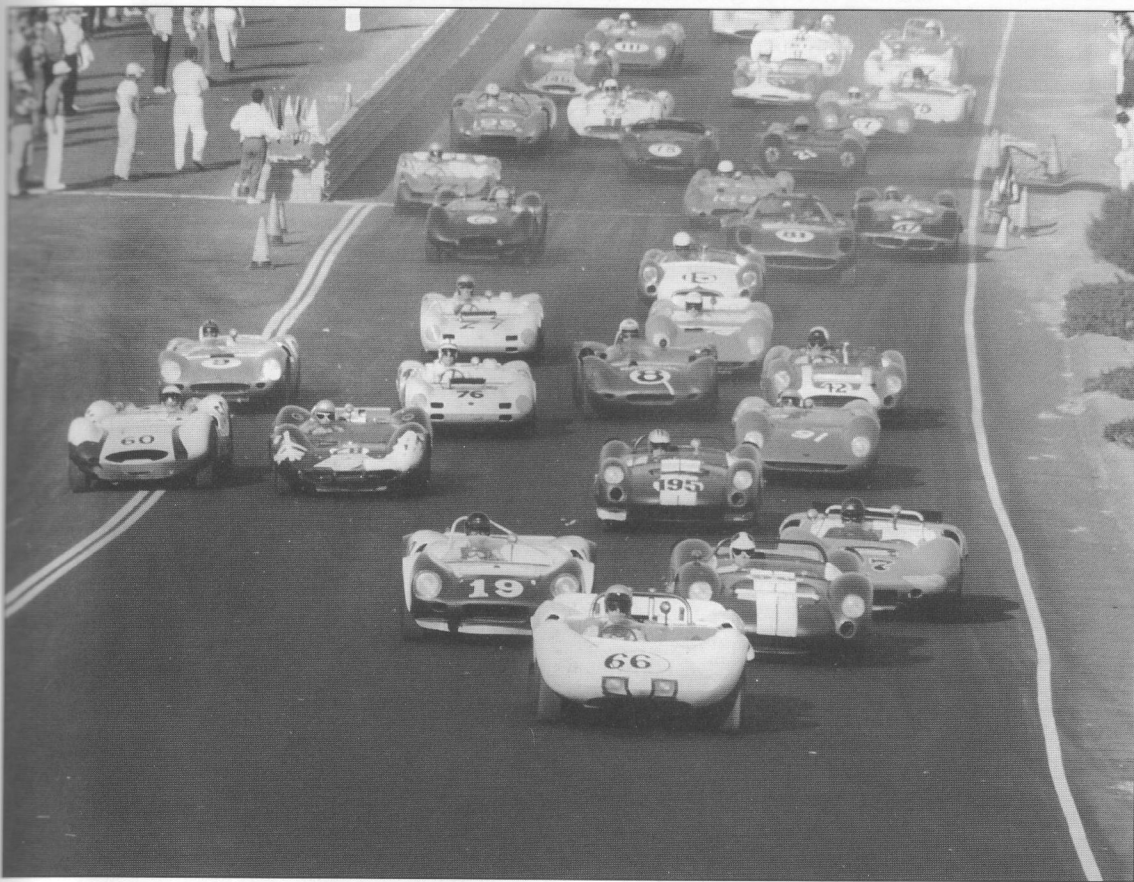
sixth, it had to be a horrific crash. Without trying to get up, and still gasping for breath, I tried to move things. First my toes, feet, fingers, hands, legs, and arms.

Somehow it all worked, and it was still all there. I couldn't believe it. The impact had just knocked the wind out of me. I rolled over on my stomach, got up on my hands and knees, and started looking for the car. I couldn't find it. I thought to myself, "I know I came down here in a car. Where is it?" I crawled back through the hedge, still on my hands and knees. Finally I was able to stand, and I found the car. When I found it, I realized just how lucky I really was. The real luck, in this case, was that I was not wearing a seatbelt. After I was thrown out of the cockpit, the car went

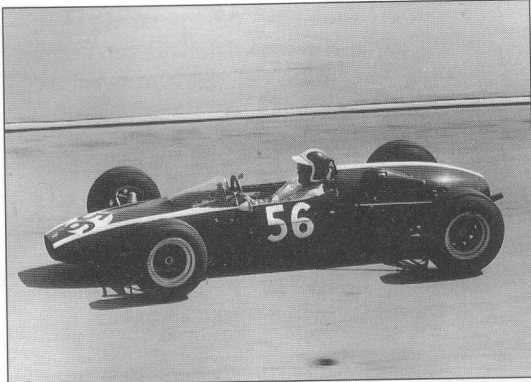
through a tree, taking off the windscreen, the top of the steering wheel, the top of the seat, the top of the roll bar, and even the top of the engine. If I had stayed with the car, I would have been decapitated.

With that experience behind me, I really had some long and serious thoughts. Did I really want to race Formula One? Fortunately, the only injury I sustained was a slight back injury, which was taken care of in England with five days of heat treatments, rub-downs, and adjustments.

From England, I had come directly to the States to drive one of Shelby's rear-engined King Cobras in the West Coast fall races. I really wanted to drive it a lot and didn't tell anybody about my ATS crash at Monza. Riverside was the first race, and we had



Roger Penske, Dan Gurney, and me at the Examiner Grand Prix at Laguna Seca. Dave Friedman



Racing Formula 3 at Monaco.

tire testing for Goodyear for the five days before the race. Every day, on the way to the circuit, I would stop and get my back worked on by a chiropractor before testing. Finally, by race day, I was feeling better.

Everything was looking fine. This was just the Saturday preliminary, but a good finish meant a good starting position for the Sunday main event. Unfortunately, it wasn't noticed until the end of the first lap, but Jim Hall's Chaparral had dropped automatic transmission fluid all over the starting line. Normally an oil flag is displayed some distance before the spill, but this time it was right over it.

The start went well—Bruce McLaren was leading, Dan Gurney was second, I was third, and Walt Hansgen was right behind me. Running so close I didn't see the oil or the flag. I just touched the oil with my right-side tire, started to lose it, just about got it saved, and Walt tapped my left rear. Away it went! Here I was doing 120 miles per hour plus, backward, heading for the turn-one guardrail. Looking over my shoulder I was thinking, "Holy shit! That guardrail's going to shove that engine right through my back!" I pulled a quick reverse 180-degree spin in the other direction and tore the nose off the car instead, but it didn't hurt my back. The race was red-flagged with both the oil and my car spread all over the first corner.

In those days, for the main event of the weekend, there was a catch-all race on Sunday morning for the final few qualifying

positions, to give the top nonfinishers of the Saturday heat race a chance to make the final grid. My car was put back together overnight, and so was Dan Gurney's and Bobby Unser's—they also had failed to finish the heat race. We ran the catch-all with quite a few others. Dan won, I was second, and Bobby third. This gave us 41st, 42nd, and 43rd positions on the grid.

For the main event, as they rolled my car into position, I asked my mechanic if they had changed my brake pads after the qualifying race. No? They forgot! Not enough time now, maybe they'll last two-thirds of the distance. They lasted just slightly longer, then it was metal-to-metal and that didn't slow me down very well. With luck I ended up fifth, and at the next race, at Laguna Seca, a good solid third. That season with the King Cobras was a wild time, and I really enjoyed it all. They were fantastic.

In 1965 I went back to Europe and drove the Cobras most of the time. At Le Mans I drove the Ford GT 40 (351 engine). I was happy, I was third-fastest qualifier. Chris Amon was fastest in a new Ford Mark 2 with a 427 engine, then John Surtees in a Ferrari, then myself ahead of Bruce McLaren in a second 427 Ford Mark 2. Behind Bruce were some more Ferraris, then the rest of the Ford GT 40s.

That could have been a great race, but unfortunately, Ford made some special "super-duper" racing heads and had them sent especially for the race. It turned out they were for the wrong engine block, and the water jackets didn't quite line up and we were all out of the race after the first 2 1/2 or 3 hours. It was a shame. The GT 40 was an incredible car. I remember going down the Mulsanne straight in qualifying at 212 miles per hour. I got so I could do the kink near the end of the straight without lifting, then brake hard for the 45-mile-per-hour Mulsanne corner. Incredible! That car worked so super it was unbelievable. A fantastic car to drive!

The year 1965 was a fantastic year for Bob. He drove Formula Three for Ken Tyrrell, setting the fastest lap at Monaco (a new Formula Three record then and a full second faster than anyone else) and drove

the Cobras in the World Manufacturers Championship. Bob co-drove to win the coveted GT class title in 8 out of 10 races to give a very happy Carroll Shelby and Ford the much sought-after World Manufacturers Championship title over the factory Ferrari team. This championship gave the United States its first World Championship title and beat Ferrari for the first time.

All that was left for Bob now was another shot at Formula One. That wasn't far off. Ferrari gave Bob a contract to drive its sports cars in the Manufacturers Championship races for the following year and a works Formula One drive for the 1965 U.S. Grand Prix at Watkins Glen in October.

Not a bad team for my first Formula One race. The best part about it was the team and the car. The worst thing about the race was

the weather. It was horrible. Rain. Most of the race I ran about sixth, and I couldn't help thinking, "Not too bad." But it got worse before it was over. I only qualified 23rd.

During the race, the heavy rain stretched the elastic band on my goggles (they didn't make full face helmets then), and they kept falling down. If they had been new they would have been OK, but they were old and so was the extra pair I had in my pit, so it wouldn't help to stop and change them. I kept on, with one hand holding the goggles in place and the other driving. When shifting or in a corner I would put my face into the wind to help hold them on. Not a very good end to my first Formula One race. I finished up ninth in a race that I should have done much better in, had it not been for an old but necessary piece of equipment that I took for granted.



Racing in Reims, France, Formula 2, 1965. Tim Parnell

Driving sports cars for Ferrari was rewarding, but it was the other things that happened in 1966 that really made it a year to look back on with good memories. Formula One was to be the direction for my season. Everything fell into place. In 1964 I had done some driving instruction at Carroll Shelby's racing school, and in 1965, after the season was over, I was testing at Riverside. John

Timanus, who was then instructing at Shelby's school, told me that John Frankenheimer was looking for some people to drive in a film that he was going to do about Grand Prix racing. Frankenheimer and I met and he asked me if I would like to drive in his film. I replied, "Sure, but not if it's going to be some 'Mickey Mouse' racing film." He exploded, "It's going to be the best damn film you ever saw!"



Ferrari at the U.S. Grand Prix, Watkins Glen, in 1965. Dave Friedman



Meticulous preparation pays off not only in a good-looking race car, but one that will be reliable—especially important on a high-stress course like Italy's Monza. This Ferrari Dino was fantastically prepared—you could really feel confident about this car at the limit.

I was testing the new GT-350 Mustangs a couple of days later at Willow Springs, and Frankenheimer came along. He asked me all sorts of different questions about what I'd do if this happened or that happened, and one of the questions was what would I do if I went off the road. The first thing, I told him, was to turn the wheel straight so that a wheel wouldn't dig in the dirt and roll the car. All through the day while riding with me, he kept asking all sorts of questions. Near the end of the day I was moving along about 110 or 115, coming through turn nine. The Santa Ana winds were blowing sand across the track and the car's drift angle was increasing. I realized we weren't going to make it through the turn. I was busy driving the car off the road, turning the wheel straight, charging through the sagebrush and sand and I hadn't given Frankenheimer a second thought. Finally we slowed and stopped. I asked him if he was OK. He didn't say a word for a few seconds. "You all right, John?" I asked. He yells, "That was fantastic! You did exactly what you said you'd do. That's really fantastic." I asked him if he wanted to get out and watch, but no, he kept riding with me. I really respect him for that. It wasn't till almost a year later, at the end of the movie

Grand Prix, that I told him that my going off the road wasn't on purpose.

Despite, or perhaps because of, going off the road, Frankenheimer hired me as a technical consultant for his film *Grand Prix*. I did a little bit of everything. I drove camera cars and the race cars in the racing scenes. It was great. I drove just about every day in a single-seater. As I look back on it now, probably the best thing that I did was to teach the actors in the film how to drive. Not just the stars but also John Stevens, the director of photography, and the film editor, too. I taught James Garner, Yves Montand, Brian Bedford, and Antonio Sabato. This teaching, little did I know then, was just a start.

Because of working in the film, I was able to drive every Grand Prix circuit for about two weeks before every Formula One race and again for about two weeks after it. All this worked well for me because by the first race of the 1966 season, I had a Formula One ride.

The year 1966 was a year of change in Formula One, moving from 1.5-liter to 3-liter engines in one big jump. This meant all the cars had to be new, and the engines were sure not to be fully developed until midseason. While awaiting the 3-liter engines, many



At the wheel of the 2-liter BRM at Brands Hatch, during my 1966 Formula One season. Bernard Cahier

of the teams were forced to use existing 2-liter engines in the interim.

I drove for a private entrant, Bernard White. His team was one of those with the 2-liter cars. Bernard had a 2-liter BRM that was built for the Tasman series as a spare car for Jackie Stewart and Graham Hill on the works BRM team. We also used the car for filming in the movie *Grand Prix*. Formula One was great even if I wasn't in a "factory car." I learned a lot and really loved racing in Europe in Formula One.

In the early part of the season, my car was quite competitive with the factory teams, but, as anticipated, by midseason the works teams started getting it right, and we were quickly left behind. The first race was at Monaco, one of my favorite circuits, and it also turned out to be the best finish of my Formula One career. I managed a fourth

place behind Jackie Stewart in a BRM, John Surtees in a Ferrari, and Graham Hill in the second factory BRM. I really felt great. After all, I was racing for the Driver's World Championship. But that turned out to be the season's highpoint. The team was on a very minimal budget, the preparation of the car was nearly nonexistent, and finally at Monza, I quit. It was really a shame, for I really loved racing Formula One.

At the U.S. Grand Prix at Watkins Glen, I drove for Dan Gurney in his Formula One four-cylinder Eagle and wound up the season driving his V-12 Eagle at the Mexico City Grand Prix.

With no hot prospects for a first-rate Formula One ride in the 1967 season, I decided to stay in the U.S. and see what was available, rather than take another shot at a poorly prepared "also-ran" Formula One team. In

the U.S., there was a lot of interest in the United States Road Racing Championship and the Can-Am series (Canadian American Challenge Series).

Each of these series used the same cars, Group 7 sports racers with big engines and lots of horsepower. This caught my interest. The late Peter Revson liked the looks of the series too, and we teamed together for the Dana Chevrolet team. Peyton Cramer ran the team, and we were to get new Lola T-70s (that was the hot number to have). But we wound up with McLaren Mark 2s, and they were dogs. Not at all competitive or reliable, compared with the Lolas or Chaparrals.

Peter and I drove hard at the Riverside opener and only placed third and fourth. That was our best race of the season. It seemed as if some little thing or another was forever plaguing us.

That's what happened at Watkins Glen. Only it wasn't something little, it was a big one! I was traveling at about 150 miles per hour, coming out of a corner onto the top straight, when a steering arm broke. The McLaren steered itself and rocketed straight toward a dirt embankment. I could see a bad

one coming! It's funny what you think about in a split second. First I shut down the fuel pumps so I wouldn't burn. Then I shut off the engine (I didn't want to blow it up). Until the crash is all over, it doesn't really feel as if you are going to be hurt. It's like watching TV; you're just a spectator, and it seems to be happening around you but not really to you.

Since the steering didn't respond anymore, just prior to my inevitable impact, I released my grip on the wheel so I wouldn't break my thumbs, wrists, or arms. I took a deep breath and tried to relax. I was going straight into the dirt embankment! When I hit the dirt bank, the car was launched in the air, and as it started to fly, the impact peeled the aluminum floor pan back clear to the rear bulkhead. These McLarens had complete tubular chassis and didn't have any cross tubes in the driver's cockpit, so my feet fell out the bottom. The car rolled end-over-end then snap-rolled sideways eight times before coming to a stop. Every time it rolled, my dangling feet and legs were smashed. But I was really fortunate. As violent as the crash was, I only ended up with a broken left leg, shattered right heel, two broken ankles, some



Coming over the Pflug-Platz during the German Grand Prix at the Nürburgring in 1966.



Racing for Dan Gurney's All-American Racers at the Grand Prix of Mexico, 1966.

broken ribs, a chip out of a vertebra, and a chunk out of my forehead. The good news was I was alive and could be repaired. But, for the bad news, the doctors told me I would never walk again. I couldn't and wouldn't believe it. What a scary point in my life. I was instantly out of the racing business and in the hospital for months.

I thought, "Bondurant, now what are you going to do for a living?" I decided if I could ever walk again I would take my experience and knowledge in racing and give back to the sport of motor racing and try to rehabilitate myself to go racing again.

The second day I was in the hospital I got a yellow lined-notepad and a pen and started to plan something that I had been thinking about for a long time. Since helping Shelby in his racing school, and after training the actors and crew for the movie *Grand Prix*, I had been

thinking that someday I'd like to have a driving school. That's what I planned on paper, a high-performance driving school.

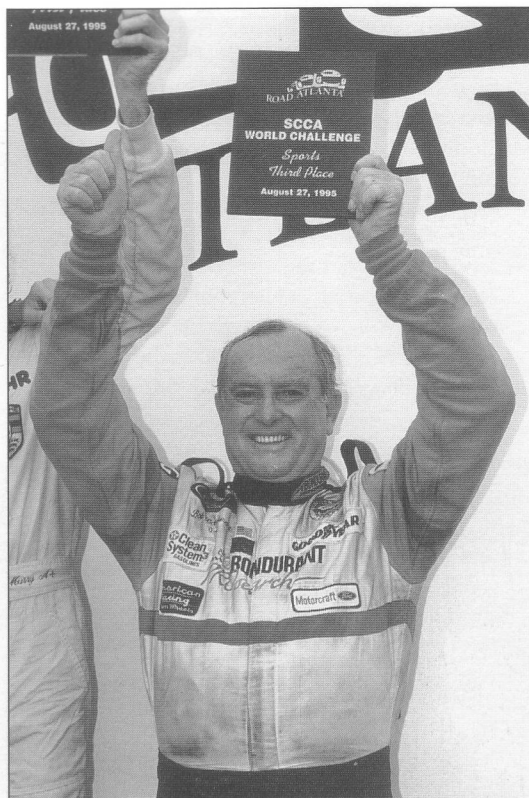
While in Europe I tried some different schools and worked with Jim Russell in order to use his facilities to train the people in *Grand Prix*. This looked like the right time to give this a try. The first experiences I had training people at Shelby's were fantastic. I really loved it. It's a super feeling that you get watching your students learn and grow and get better from what you have taught them. James Garner was a perfect example. For the movie *Grand Prix*, he did a fantastic job driving real Formula One cars. I started him out at Willow Springs Raceway in a Shelby GT-350 Mustang, then put him in a 289 Cobra, then a Lotus Formula Ford, then finally into a Lotus Tasman Formula One car. He did fantastic!

Many of these thoughts crossed my mind while I was lying in that hospital bed, so I worked out a plan to put it all together and start a school.

As I got closer and closer to being well, my mind was more intent on going racing again, and the school idea took a back seat. I formed a company with Don Rabbitt, a former Shelby PR man; Dick Guldstrand, Corvette driver and ace mechanic; and Sandy Sandine, a fine engineer. We called it American International Racing Corporation, and we set our sights on building a turbine car to run in the Federation Internationale de l'Automobile (FIA) endurance races at Daytona, Sebring, and Le Mans. We were all set to go, sponsors and all, when the FIA changed the rules from an unlimited displacement to a 3-liter engine. This would have made turbine cars noncompetitive, and ours illegal, as it was over 9 liters. So we got two Corvettes, but the other partners were each wanting something other than the original agreement, so I resigned. The time had come to start my driving school. I pulled out my hospital notes and went on from there.

Out of necessity, the step-by-step program that I put together in the hospital called for everything to be sponsored, with the exception of the rent. That was the only way I would be able to start. I organized my driving school the way I would a race team, and with the sponsors, I was able to have the best equipment. I put together presentations for all my potential sponsors, and I got most of the ones I wanted to participate. The school is still run this way today.

I reached a deal with Datsun and opened my first school on Valentines Day, February 14, 1968, at the Orange County Raceway near Los Angeles. Not too many cars then—A VW camper, a new Datsun 510 sedan, a new Datsun 1600 roadster and a 2000 roadster, a Formula Vee, and my Lola camera car. I stayed at Orange County for 2 1/2 years, until the new Ontario Motor Speedway opened nearby. When I first moved to Ontario, I also switched from Datsun to Porsche for my school cars and replaced the Formula Vee with Formula Fords.



Bondurant back on the podium after 30 years. I won third place at Road Atlanta with the Saleen RRR race team. Shelly Harris

As time passed, Datsun introduced the new "Z" cars, and we were reunited.

Ontario was a beautiful facility, but it was always burdened financially, and its burdens eventually became mine too. My rent soared way out of reach, and it was either close down or move. Some choice. So, I moved to Sears Point International Raceway, in the Sonoma wine country, not far from San Francisco. When I made the move, Datsun stayed with me.

My fleet continued to expand, and year by year it was upgraded. In 1982, the Datsuns gave way to the very latest Ford Mustang GTs and Crossle Formula Fords. I now use the new 5-liter V-8, five-speed Ford Mustang GTs with specially modified suspension; Ford Thunderbird Turbo Coupes (with 5-liter V-8, five-speed transmissions and limited-slip

differentials); Ford Taurus SHO and Mercury Sables with SHO running gear, as well as new Crossle Formula Fords. All cars in my fleet are specially prepared and modified, including all of the necessary safety equipment for high-performance driving and proper instruction. My Ford Mustangs are clearly the fastest cars we've used for my school, short of the Ford GT 40. The Crossle Formula Fords really fill the bill as great open wheel racers.

In 1991, I decided to move the school to Firebird Raceway in Phoenix, Arizona. Sears

Point is really a fantastic circuit, but my school simply was getting too big for our limited space.

Besides having a lot more facility space at Firebird, I was able to design my own circuit, especially for teaching. We now have over five track variations on permanent circuits, as well as large areas set aside for handling ovals, skid control, autocross, and accident avoidance. Our safety facilities at this track are of the highest standards. Because of the size and design of the circuits, we have lots of run-off area on most corners, as well as energy-absorbing gravel pits in critical corners. Our students can



The Saleen/Allen World Challenge Mustang. Shelly Harris



Driving an IMSA-prepared Porsche 935 Turbo during the 12 Hours at Sebring.

concentrate on driving and learning, not on worrying about what will happen if they get a wheel off course.

The Bob Bondurant School of High Performance Driving has become the standard by which all others are evaluated. After more than 30 years, the Bondurant School has become a school that is unparalleled in the world of driving instruction. Bob's school is highly respected and officially recognized both domestically and internationally in the motor sports community. The driving programs that Bob offers are of increasingly greater variety. There is something there for everyone, from his teenage driving programs to his advanced classes for vintage racers. There is a lot in between too.

The standard bill-of-fare is a one-day

advanced street driving course that includes skid control with ABS brakes and accident avoidance, a two- and three-day high-performance driving class, and a four-day grand prix competition road racing class that will teach you how to drive Ford SVT Mustang Cobras and Formula Fords.

In addition to the programmed classes, Bob offers special one-on-one instruction for the advanced, post-graduate driver, as well as the advanced racer. Most of the CART, IRL, and NASCAR drivers, as well as many other professional drivers, come to Bob's school to refine and improve their skills. Bob's advanced instruction really dials the driver in to just what he or she is capable of doing, as well as the car. The instruction can be in one of the school cars or the student's own car.



Bob hovering over his school fleet in his French-made Air Special 341 Gazelle. Formerly an army attack helicopter, it is also known as Bob's "other" instructor vehicle.

In recent years, Bob has added the Bonduvant Law Enforcement Academy for police officers and sheriffs, and one he calls his "Executive Protection" course, which teaches drivers how to get away from potential kidnappers and assassins. He has designed many group courses (from 5 or 10 people up to 200) for major corporations to promote group spirit and corporate team building. He also offers a stunt driving course and puts together many special programs designed for motion picture production as well as courses for any specialty driving talent needed.

No matter how specialized the area of training that is required, the Bob Bonduvant school has or will make the facilities available for nearly any form of driving instruction.

Over 30 years ago, I experienced the most exciting racing time of my life with Shelby and his Ford Cobras, racing and winning in Europe against Ferrari and the best the world had to offer. Today vintage racing

is very big world wide, and Ford Shelby Cobras have all but priced themselves out of the market. They are worth so much you just don't see many of them racing anymore.

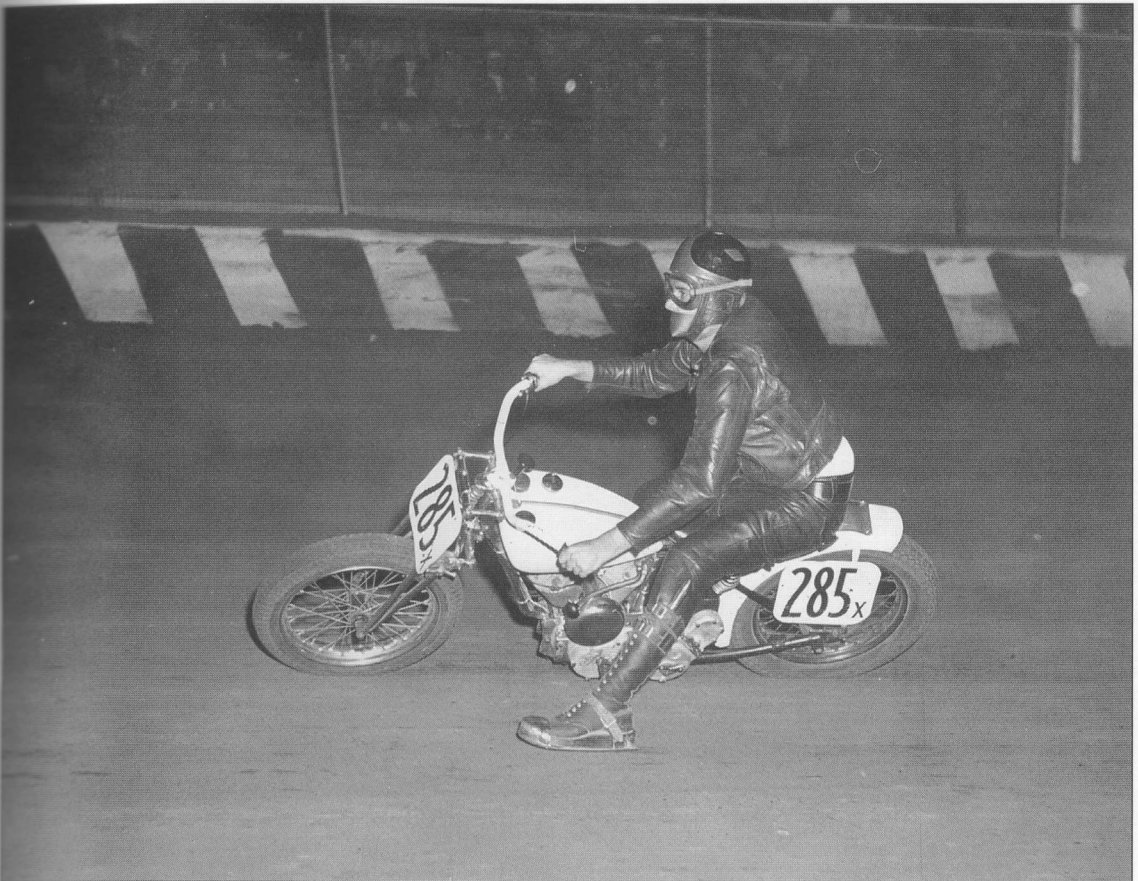
In 1965 I was fortunate enough with my codrivers, Jo Schlessler and Jochim Neerpach, to win the World Manufacturers Championship for the good-old USA and the Ford Motor Company in the beautiful Cobra Daytona Coupe designed by Pete Brock.

Since the opening of Bob's school, racing has perhaps taken a back seat to instruction, but Bob is by no means retired. He keeps his helmet and gloves ready to take to the wheel in competition any time he has the opportunity. By the time he opened his original school, Bob was ready for racing again and jumped right back into Can-Am, Formula 5000, endurance racing, IMSA-prepared 935 Turbo Porsches, sprint cars, Grand National stock cars, and SCCA's World Challenge. He still continues in historic and vintage racing. There is no end in sight to Bob's racing career. He is

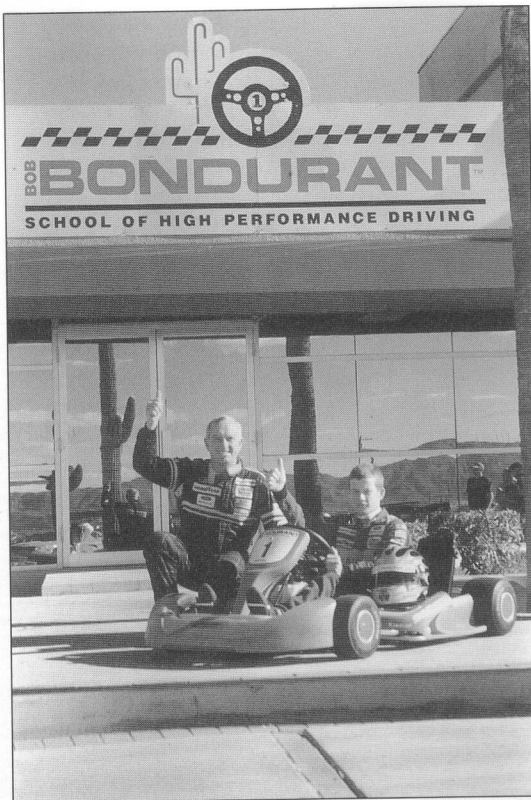
just as sharp and competitive as he always was. He still does many hours at speed each week, testing and developing new school cars and courses, and keeping his instructors on their toes. He still has a trick or two to teach them, even those who have been with him for many years. His feelings are clear when he speaks of racing.

I still race for several reasons. First and foremost, I love to race. It's fun, exciting, and challenging, and it keeps the adrenaline flowing. For me, the only thing that comes close to it is flying my helicopter. It's like driving a Formula One Grand Prix car—you have to be precise and perfect every second. It's all touch and feel—just like racing.

From a more practical view, I also race to keep abreast of what is going on with contemporary cars. I try to race current cars that are competitive in their classes so that I can work that into my training programs. Most of my teaching staff, many of whom have been with me for many years, race regularly in a wide variety of cars—everything from SCCA club racing, Trans-Am, off-road, oval track, and motorcycles to full-blown international competition. I encourage their racing and do what I can to support their careers. Not only are my instructors good competitors, but more important to the learning process, they are excellent instructors and can communicate what they have to teach their students in a highly professional fashion.



An 18-year-old Bob Bondurant racing track dirt ovals. Most race drivers used to come from motorcycle racing, but today most up-and-coming drivers come out of the karting ranks.



Bob with WKF world-champion Patrick Long, the first American to win this championship since Lake Speed 20 years ago. Rick Scuteri

The Bondurant SuperKart School

The Bondurant SuperKart School evolved from a conversation I had with Formula One driver Michael Schumacher while my wife and I were in Europe in 1997. Because I was a Ferrari factory driver (my first F-1 race was for Ferrari at the U.S. Grand Prix in 1965), I was invited to Ferrari's 50th anniversary celebration. It was there that I met current Ferrari factory driver Michael Schumacher. I heard that he still raced shifter karts in his off-time, and I was curious to find out why someone with a multi-million-dollar contract with Ferrari would still race shifter karts. His response was that shifter karts helped him stay in race shape because they handle very much like Formula One cars with

their quick acceleration, track adhesion, and sequential gearbox. This conversation sparked my curiosity about the world of karting, and for the rest of our stay in Europe my wife and I visited numerous indoor and outdoor karting facilities.

After returning to Phoenix, I drove one of my employee's shifter karts for the first time. Wow, what a thrill! The kart was extremely quick, it really kept me on my toes, and was a tremendous amount of fun. I was officially hooked!

I started attending kart races and visiting different karting facilities across the country. Much to my amazement, I found thousands of kids racing karts. Many of them drove harder than the adults I see racing professionally.

Shortly after seeing these young racers, I decided to devise a teaching curriculum that would help bridge the gap between kart racing and auto racing. Similar to little league sports, this program would nurture these young kart drivers through a stepladder of racing success. First, the program would introduce them to the non-shifter karts, next to the shifter karts, and then to the Mustangs and Formula Fords. This ladder of education would better equip these young talents in their pursuit of SCCA Racing, Formula Atlantic, Indy Cars, Formula One, or even NASCAR Stock Cars. Over the years this has been a proven method of advancing young European drivers. In fact, most Formula One and Indy Car drivers have come from the karting ranks and continue to use karts as a way to maintain their driving skills today. I realized the time had come to start the Bondurant SuperKart School.

The SuperKart School opened in April 1998. I decided to train students using two different types of karts: non-shifting ProKarts (a European-style kart) and 125-cc shifter karts. The ProKarts are a twin-engine conventional kart with a centrifugal clutch. They are powered by twin Briggs and Stratton six-horse Vanguard engines because of their exceptional horsepower and torque. As for the shifter karts, they use a Kawasaki 125-cc, six-speed motor with a sequential gearbox, and generate 33 horses. They handle

very well and are extremely quick, accelerating from 0 to 100 miles per hour in six seconds, and from 0 to 100 and back to 0 in 10 seconds! Both kart chassis are manufactured by CRG karts in Italy and distributed in the United States through a company called SSC Racing of Palm Springs. CRG is one of the leading manufacturers of championship winning chassis.

I decided to start students in the ProKarts to give the student the feel of a kart and its quickness. After learning proper steering, left foot braking, and line technique, students graduate into the shifter karts to learn shifting techniques and more advanced racing skills.

Currently, the Bondurant SuperKart School offers two-hour, half-day, and one-

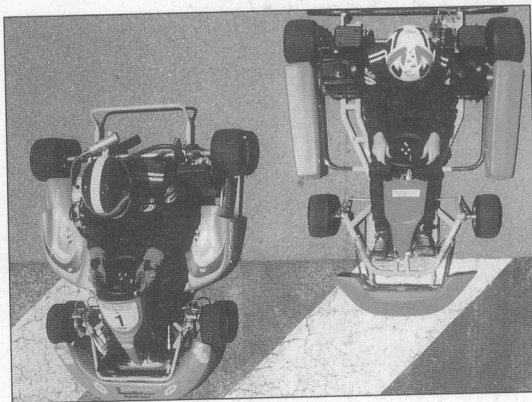


Bob Bondurant and Bryant Stodola in the heat of battle. The CRG Italian Shifter School Kart is powered by a Kawasaki 125-cc engine with a six-speed sequential gearbox. Rick Scuteri

Bondurant and students in typical school practice. Rick Scuteri



day courses as well as an advanced karting course that utilizes a PI data acquisition system. This is the same type of computer system that is used by most of today's professional racing teams. I am also developing a driver education program using our ProKarts to teach kids how to drive and the theories of vehicle dynamics. With over 44,000 people dying in auto-related accidents each year, I feel that a driver-development program for young teens to take before they get their driving permits will help to lower that ever-growing statistic. I believe the ProKarts can provide the perfect avenue of instruction to better develop tomorrow's drivers.



Bondurant SuperKarts School uses two different Karts for training and corporate Kart outings. Rick Scuteri

Karting holds a tremendous amount of growth for the race drivers of the future. It is a multi-million-dollar business in Europe and is just beginning to make its mark in the United States. Indoor karting is a booming business as well, and who knows, sometime in the future you may see a Bondurant indoor karting facility as well. In the meantime, I really believe in karting as a way to get started in racing and to develop better driving skills, thereby becoming a better and safer driver.

For further information on the Bondurant SuperKart School call 1-800-652-KART.

Although there is no substitute for actual behind-the-wheel training, proper driving technique is also arrived at through instruction, thinking, and practice. The goal of this book is to give the reader the insight and instruction to come to terms with self as well as with the car. Although reading and studying is just the first step to actualizing technique, this study helps to form the basics. Practice and utilization will in fact make you a better driver, but it is very important to make use of the basics and proven methods to arrive at your full high-performance driving potential.

A high-performance driver is one who drives, not only to the fullest capabilities of the car, but also to the fullest capabilities of himself or herself, using common sense.

2 Getting to Know the Terms

The following pages introduce you to the world of high-performance driving. By picking up this book, you have taken the first steps to improving your driving ability and, at the same time, your driving pleasure.

Before we get into the hows and whys, it is important to briefly define a few terms that are used regularly throughout the text. To many, these words are already familiar, but to others they may create some confusion as to

what they really mean. Each term will be dealt with in a later chapter of the book, but here is a starter of brief explanations to get you going. All of these terms relate to cornering and/or traction.

Oversteer/Loose: Rear wheel skid or slide

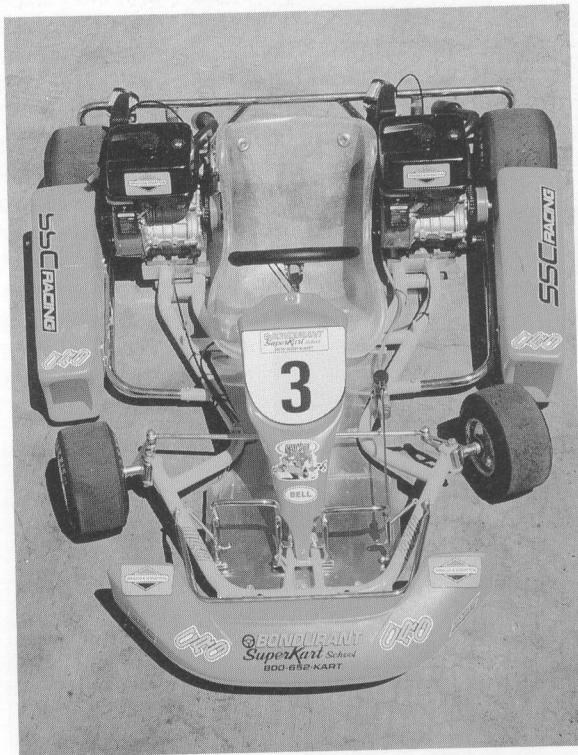
When you have adhesion and traction with the front wheels of the car, but the rear



Exotic oversteer. In 1965, I was the factory test driver for the newly developed GT 40 along with Ken Miles. Here is a prime example of an oversteering vehicle.



Understeer. Rick Scuteri



Above and at right: Ackerman. Rick Scuteri (both)



wheels lose traction and slide toward the outside of the corner. The oversteer can be to either left or right, and its effect decreases the radius of the turn. Oversteer is also referred to as being "loose" or "coming-around-on-you."

Understeer/Push: Front wheel skid or slide

When you have adhesion and traction with the rear wheels of the car but the front



Throttle steer. Rich Chenet

wheels lose traction and, regardless of the steering correction, the front of the car slides to the outside of the corner. Understeer increases the radius of the corner. Understeer is also referred to as "pushing" or "plowing."

Ackerman

Ackerman is designed into all cars, sport utility vehicles, pickup trucks, vans, and buses. Ackerman takes place whenever you turn the steering wheel into a corner. The inside wheel always turns in more than the outside wheel, which helps to steer the car into a corner. You point it with the steering wheel. (I also trail the brake lightly into the corner, maintaining traction longer and helping Ackerman to work even

better, so you really steer the car into a corner with Ackerman.)

Throttle Steer

Throttle steer refers to the amount of throttle applied in a corner. The amount of throttle steer can induce oversteer or understeer with all configurations of engine and final drive layouts. Proper throttle steer is a balance of gas and traction regulated by the driver. The amount of throttle applied will dictate the amount of steering that must be dialed in. There must be a balance of throttle and steering to maximize traction. I steer the car with the throttle. Simply put, throttle steer is something you can use whenever you are entering freeway on-ramps or as you accelerate through any

corner. The weight transfers to the rear tire patches, giving the rear end more traction, taking the weight off of the front tire patches some, giving less front traction. So I steer the car with the throttle. For example, entering a freeway on-ramp, without stomping the gas, I smoothly accelerate and that transfers the weight to the rear and takes it off the front and steers me outward onto the freeway. That same thing applies when you are coming out of a corner. Simply add gas, nice and smooth, and the throttle will steer the car to the outside of the corner. The same is true on the race track or the street.

Line/Path

Line refers to the physical lines of movement that a car takes through any given corner from entry, to apex area, to exit.

A line can be either good or bad, right or wrong. The proper line or path through a corner will always keep the car stable and safe through any given corner on the race track or the street.

Apex Area

The apex of a corner is the *area of a corner* where the car is in its most stable position, not just a clipping point, where the inside front wheel runs closest to the inside of a given corner.

Where the apex area is in a corner directly relates to how the corner is entered and will definitely affect how and where it is exited. An apex area varies in length and location from corner to corner. It can be early, middle, late, long, short, or double.

Very simply, the apex is where the inside front wheel comes closest to the in-



Proper line technique. Rick Scuteri



Proper apex techniques shown here in a Bondurant Superformance Cobra replica. John Blakemore

side edge of the corner, either early, middle, or late. If you've achieved proper apex, when you exit the corner, you should be able to unwind the steering wheel very gently by accelerating. If you had to add steering, you've apexed too early. If you didn't use up all of the road, and end up in the middle of the road, you've apexed too late.

Trail-Brake

After the major braking for a corner has been completed, trail-braking is, essentially, just riding the brake gently into the first third of the corner, gradually releasing the pressure and smoothly moving from brake to throttle.

By trail-braking, you maintain chassis set. The front shocks and springs are compressed and you maintain a forward-direct-

ed weight transfer, creating more downforce on the front tires. This increases the tire contact patches, which maximize traction and provide more control.

Tire Contact Patch

A tire contact patch is the area on the bottom of the tire that is in direct contact with the road. The tire contact patch can vary in size and shape with the tire type, tire size, tire pressure, kind of car, attitude of the car on the road, suspension, and whether you are entering or exiting a corner. Depending on the transfer of weight of a car, acceleration, braking, or turning, one tire can have a different tire contact patch than the other three. Tire contact patch varies constantly.

Ideally, you want the maximum tire contact patch possible in contact with the road.

Trail-braking helps to control the tire contact patches of all four tires while entering a turn, just as smooth acceleration helps steer while coming out of a corner.

Drifting

Drifting is or should be a controlled function. It is directly opposed to sliding or skidding, which are out-of-control conditions.

Four-Wheel Drifting

Drifting is a balance. The rear of the car can drift with throttle control, as can the front. The optimum condition one wants to create is an evenness that permits the entire car, front and rear, to drift in a balanced lateral motion on the border of maximum traction. This drifting effect utilizes gravity forces (inertia forces) on all aspects of the car, allowing it to travel its fastest at

a speed just past the absolute limit of maximum adhesion.

Slip Angle

The angle of drift of a car in a given corner. Ideally, the driver turns in properly while trail-braking, accelerates through the apex area properly- and exits the corner at maximum velocity in a controlled drift.

Transition Time

The time a driver spends in a corner between full brake and full throttle. Transition time, ideally, optimizes the combined techniques of heavy braking, proper turn-in while trail-braking, smooth transition from brake to throttle, using the optimum apex area, correct slip angle, and finally a controlled application of full throttle.

Weight Transfer



Tire patch. John Blakemore

Weight transfer is the forward/back/lateral movement of the loaded weight of a car under acceleration, braking, and cornering. The static weight of the car transfers forward or rearward or side to side (laterally) during the time a car is in motion. A stopped car has a determined weight balance, or bias. A moving car, because of suspension and movement, finds that weight balance or bias constantly shifting. For example, the moving weight of the car transfers forward under braking. Under acceleration, the weight transfers to the rear. During cornering, the moving weight transfers laterally. Simply, the sprung weight of the car transfers to different areas of the car during movement. This in turn controls the tire contact patch (traction of the car) as it



Four wheel drift. Rick Scuteri



Here I am explaining the principles of weight transfer.

3 Getting the Right Fit

One of the most important, and yet most overlooked, basics in driving any car is, clearly and simply, *comfort*. If you aren't comfortable in the car, you just won't drive it as well, nor will you enjoy driving it as much.

When we say comfortable, we don't mean driving from an overstuffed easy-chair. That deadens sensitivity. We want you to *maximize sensitivity*. It is of utmost importance to sit properly, so that you can easily operate all the controls and so your body can *feel* what the car is doing under it.

Proper Seating Position and Posture

The essence of high-performance driving, on the street or on the racetrack, is to control weight transfer in order to maximize traction during the basic functions of braking, cornering, and acceleration. To have that control you must be seated properly. Tilt the back of your seat to a more upright position. When you're sitting upright, your mind is sharper and you think and react more quickly!

All of your sources of input give you your ability to control your car, but the two major factors that affect your performance are *what you see* and *what your body feels*. Everything that the car does is transmitted right back to you through the seat, steering wheel, and foot pedals. The ideal driving position is one that allows your body to maximize the input that is available to it. This input comes from your whole body—

your legs, buttocks, the base of your spine, up your back, neck, eyes, all feeding information to your brain, telling you what you need to do through your arms, hands, legs, and feet. The optimum seating position is one that has as much of your body as possible in contact with your seat.

You should have your buttocks tucked well into the crotch of the seat, so you can feel what the car is doing with the back of your legs, and your lower and upper back. You should be sitting as upright as possible, because it helps to make you more alert.

Sitting more upright in the car, you will sense and feel the car better. Remember, the energy starts at the base of the spine, travels up your back to your shoulders, through your neck, and to your brain. The eyes focus out and send back to the brain what you see. The body senses and feels through the spine what the car is doing with respect to weight transfer. So, by sitting upright you are more alert, you have a keener sense of feeling and better control of the car.

When driving a formula racing car or sports racer, it is a lot more difficult to sit upright—they are designed almost strictly for aerodynamics, and the seating is dictated by the design. When fitting those kinds of seats, if you pad the middle to upper part of the seats to sit as upright as possible, your mind will be sharper and you can react quicker. A production racer or street car is designed with a different purpose in mind, and it is possible to modify the car so

that you are able to sit upright, in the best position possible.

Dan Gurney taught me the importance of a proper seating position in the 1950s, when we were both racing Corvettes. Dan was sitting "bolt-upright." He never moved. He was like a statue sitting in the driver's seat. He taught me, I listened, and he was right.

Sitting upright is where it all begins. The seats of modern production cars are a much better fit than the old bench-type seat of yesterday, but even so, you will want to replace your stock seat with a unit such as a Re-

caro adjustable one that has lumbar support. With a Recaro, you'll really get a better car feel, you will experience less fatigue, and it's a lot more comfortable.

Your seat should be adjusted so that you have a bent-arm driving position and the controls fall into easy reach. Distance from the seat to the steering wheel is really important, and the extremes should be avoided. The first World Champion, Giuseppe Farina, drove in the straight-arm driving style. He sat so far back from the wheel that his arms were unbent and most



Proper seating position. Notice the upright position of the seat and the position of my arms and legs in relation to the steering wheel. Rick Scuteri



Formula Ford seating. Final preparations before taking some laps—we're making the seat nice and comfortable. An excellent time to adjust your mirrors. John Blakemore

of the steering had to be done with his shoulders. It is not only a very fatiguing way to drive but also much less precise. The tires were at that time much narrower and the grip was very poor, so it really didn't require as much strength to steer then as it does now. Today's cars steer harder due to the extra-wide tires. It takes more physical strength, especially with the smaller steering wheels, like those in formula one cars and Indy cars.

The other extreme is Mark Martin driving NASCAR (National Association for Stock Car Automobile Racing) Grand National stock cars. Mark practically sits right on the steering wheel. For the NASCAR ovals it's all right, but if you have to react quickly in a street or road racing situation, you won't have enough room to move freely.

The best position is somewhere between the two. For your distance gauge, you should be able to rest the bend in your wrist just at the top of the steering wheel when you are at rest. While driving you want your hands at about the 3 o'clock and 9 o'clock positions on the wheel, with your elbows bent at an angle of about 120 to 140 degrees. In a street car if your seating position is poor, you will become more easily fatigued, less alert, and more likely to fall asleep at the wheel on a long trip. In a race car, you simply won't be as fast, consistent, or smooth. Combine that with early fatigue and you just won't do too well.

At the start of the 1971 Can-Am season, I was driving for the Paul Newman-sponsored team with Lothar Motschenbacher. We

had brand-new Mk 8 McLarens (that was the right car to have that season). Lothar's car was the first delivered, and it was all completed and race-ready before mine had even arrived. When mine finally came, it was loaded on the transporter and was literally put together at the track at Mosport. It was worked on all the way, in the back of the transporter, and was finally finished up at the track. My dialing-in time was cut to just a few laps. I had 20 minutes in the car to do a shake-down, qualify, feel what the car was doing, and figure out what the suspension and brake bias changes had to be. I got the car sorted, but what I didn't realize was that we hadn't padded the seat at all. I was so intent on getting the car sorted out right and qualifying that I completely overlooked the seating compartment.

As it was, the car sorted well, and Lothar and I turned identical times and took third and fourth fastest on the grid. Even at the start of the race, I still didn't realize that we

hadn't adjusted my seat (the only way the seat of a Can-Am car was adjusted was by adding padding). About a third of the way through the race, I was starting to get tired—I was in great shape then and used to endurance driving. The problem was, I was sitting too far back from the steering wheel and my arms were fully extended to steer the car through the corners. So, I was steering with my wrists and my shoulders instead of my forearms and biceps, as I would have in a normal bent-arm position, where I had more power and strength. So, as my arms got more tired, I would pull myself forward in the seat with the steering wheel, up to a bent-arm position, and drive five or six laps flat out, then relax my arms for a few laps and then do the sequence again.

At the end of the race I was exhausted. I finished fourth, but I know that if my seating position had been normal, I would have been able to finish second or third at least, because the car was working great.



Hand position No. 1: 3 and 9 o'clock. John Blakemore

Seatbelts, Shoulder Harnesses, and Submarine Belts

To maximize the way your body fits the seat, and have it make proper contact, you must also take into consideration your seatbelt, shoulder harness, submarine belt or crotch strap, and arm restraints.

In racing, the importance of tight seatbelts can't be stressed too much. If your belt or harness is at all loose, the forces of cornering and braking will cause you to slide in the seat, causing you to concentrate on bracing yourself with your arms, feet, or body. This detracts from your driving concentration and is very fatiguing. This also applies to street driving.

Seatbelts must be worn at all times, street or track. They are cheap life insurance and help hold you in place, allowing you to

feel just what your car is doing at all times.

Make sure they are snug. Sliding around in the seat is distracting and doesn't let you correctly read the input coming from the car.

Shoulder harnesses also help drivers avoid leaning their bodies into the turns. Remember Dan Gurney in the Corvette: "Like a statue!" If you have to lean into a turn, you are reducing the contact area of your back and body to the seat, thereby reducing the input area for the car to tell you what is going on. Leaning also increases your fatigue rate and slightly alters your visual perspective. If you feel that you have to lean to offset the g-forces because your car corners so well, or perhaps your suspension is so soft you can't see out the window if you don't lean, try just tilting your head, rather than your whole upper body. Remember the



Hand position No. 2: 3 and 9 o'clock, turning right. John Blakemore

Recaro seat gives you more car feel and control.

If you have an open car and are concerned about being strapped in during a roll-over, install a roll bar. Racing cars, open or closed, have roll-over protection as a mandatory rule for safety, even in *Show-room Stock*. If you think that you might need it with your driving technique on the street, don't take any chances. Put one in. Open car or closed car, safe is sane. Roll bars also tend to stiffen the chassis of a car, making it handle better, thus sending more input right up the driver's seat.

Speaking of open cars. Arm restraints are now a must in racing single-seaters and vintage. If your car is open, you will have to have a pair of arm restraints. In a roll-over, this could save you a hand or an arm.

Steering Wheel Grip

Now that you know how to sit in your car, it's time to get your hands on something meaningful—the steering wheel.

The kind, size, and shape of the steering wheel is up to you, but don't get a rim so thick or so thin that it is difficult to get a good grip on it. The size and thickness of the wheel are very important for *car feel*.

I like a one-inch padded, suede leather-covered wheel that has the padding coming down onto the spokes so I can put my thumbs on top comfortably. I like suede because sometimes smooth leather or vinyl becomes too slippery to keep a good grip. Better grip and feel: better car control! When I raced the Cobras, I used to tape sponge rubber there for padding, because



Hand position No. 3: turning tight right. John Blakemore

the bare spokes would tear my thumbs up. When I did Sebring, Daytona, Le Mans—all the long-distance races—I used to have rubber taped to the spokes where they met the wheel. It was crude, but it's a lot better than chewing up your thumbs. Nowadays they make steering wheels the way they should be made.

Don't forget that your tires, the wheels, and suspension are sending input up the steering column, right out the wheel spokes to the rim of the steering wheel to your hands. So, first, the steering wheel should be gripped firmly, but not too tightly, in the 3 o'clock and 9 o'clock positions.

No "white-knuckle-driving" please. Relax into a firm grip but don't strangle it. Don't hold onto the wheel with a death grip. If you grip the wheel too tightly, you will fatigue yourself and you will tighten all of the muscles of your hands, arms, shoulders, and neck, and this will cause you to make small, involuntary movements of the wheel if you are driving really hard. You will also choke off about 50 percent of the feel that translates into control.

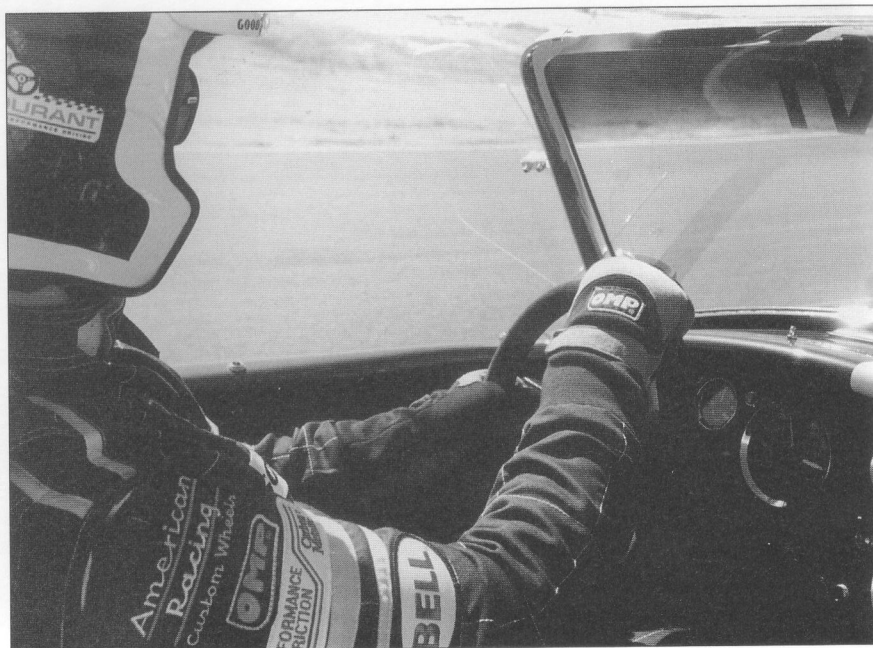
If you find your grip tightening, just ease back your speed slightly, take a deep breath. Release your breath slowly, which will relax the muscles and help to return your feel and control. That will relax your shoulders and arms—and your whole upper body will let you feel the car better. It may really sound simple, but it really works. Not just driving, but anytime. If you are tense and tight, needing to relax, just take a deep breath. A full, long inhale and exhale. Maybe once or twice. You will relax, feel better, and find that your concentration and smoothness are improved too. If you are relaxed, you will definitely be a lot quicker.

Steering Wheel Hand Positions

Think of the wheel as the face of a round clock, picture where 3 o'clock is, and put your right hand there. Fine, now picture where 9 o'clock is, and put your left hand there. This is what is referred to as the *3-and-9 hand position*. If you have a 3-spoke wheel on your car, chances are the spokes run at 3, 6, and 9 o'clock.

If your family sedan's steering wheel is too big and just has one huge bar across the

Hand position No. 4:
turning left.
John Blakemore



center (and your hands keep slipping on the plastic), you might want to get an after-market steering wheel that's padded and covered in leather to make it less slippery and give you better car feel and control.

Most of the new cars today have good sports steering wheels as standard equipment. They allow you to easily find a proper hand position. Most now have airbags built into them. If you have one of these, you just have to live with what you have, because you can't change it. These wheels usually give you a hand position of 2:30 and 9:30, which still gives you lots of control and allows you a driving position that is less fatiguing.

Now, with your hands at 3 and 9 o'clock, try to make a turn keeping your hands in place, without moving them all over the wheel. Now you have created one more source of input. Your thumbs resting lightly on the spokes also give you just that extra little bit of feel and leverage in hard cornering. Be sure to use the heel or the inner part of your palm on the rim of the wheel not for only input but strength and leverage. You use the heel of your hand to help

push slightly, helping your thumbs. Your thumbs can't do the whole job.

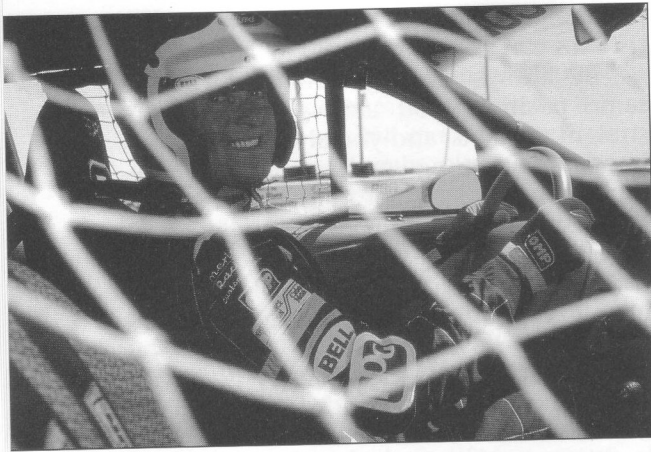
By always gripping the wheel at the same position, you always know where straight ahead is, and you always know just how much steering you have put in. Knowing where straight ahead is doesn't seem that important when you are heading down a straightaway, but when you're in a corner out of shape or you just lost it, that instinct and knowing where straight ahead is can really be important.

Back to input. Another very good reason for keeping your hands in one place is that the more you move them around, the less time they are in contact with the steering wheel, losing the advantage of chassis information being fed in. *Remember to feel what the car is doing through the steering wheel at all times.* Also remember, *Ackerman helps you steer through the corner* without the need to move the wheel more than is necessary.

If you need more steering wheel input to get around a sharp or tight corner, then slide the right hand up to the 11 o'clock position on the right-hand corner, keeping the left hand at 9 o'clock, so that the left



Hand position No. 5: turning tight left. John Blakemore



Safety nets. A must in racing. All of our cars are equipped with Simpson safety nets and belts. Rick Scuteri

hand can smoothly and precisely steer the car out of the corner. Do just the opposite on a left-hand corner, sliding the left hand up to the 1 o'clock position. This is important for precise cornering. If the wheel requires more input (as in a car with slower turning rates), then do a hand-over position, using the thumbs under the opposite side spokes.

Mirror Adjustment

Now that you've gotten your driving position correct, your seatbelts snug, and the correct grip on the steering wheel correctly, let's look around. What can you see? Everything is great out the windshield and side windows. But, can you see out of your mirrors? You have to know what is going on around you—both on the track and on the street.

Mirrors are there as a driving aid—use them! To be able to use them, they must be adjusted properly. Take the time to do it. If you are in a racing car, it will save a lot of

time and aggravation to get them adjusted before you fasten your seatbelts, because chances are you won't be able to reach them afterward.

Mirrors are a lot easier to adjust on your street car, so don't just forget or say that they are almost OK, even though you have to lean almost clear across the car to see out of the right one. Adjust them before you drive away, and keep them adjusted. It is just safer.

If you travel a lot, as I and most people do these days, you probably will rent a car. Adjust the mirrors before you start the car.

Keep your mirrors, windshield, and headlamps clean. Dirt and grime are a real serious cause of night glare.

Some racers don't use their mirrors, and some racers crash into cars trying to overtake them. Use them. or you could be in trouble too!

A student of mine was so intent on watching his mirrors, and especially watching this other student (very fast and advanced) come up on him, that he ran straight off the road. He was looking all the time at his mirrors and not watching in front of him at the upcoming turn.

Glance in the mirrors to get input as to what is going on around you. Don't stare. Pay attention to what is in front of you, but use your mirrors to tell you what to expect from behind.

Adjusting your mirrors may be the last thing you do before starting your car, but do it, and use them.

Now that you're seated properly and have your hands correctly placed on the wheel with your seatbelts snug and your mirrors correctly adjusted, do you feel in control? Almost? Maybe after the next chapter.

4 Getting to Know the Controls

Now you've learned the importance of feeling the input from the car to you. This can't be overemphasized. But, there is another bit of input, the significance of which can't be stressed enough: the input from you, the driver, to the car.

You're all strapped in and comfortable. But before you touch that key, you need to know what your hands and feet should be doing. While your hands are resting at 3 and 9, let's put your feet to work.

Foot Pedal Position and Adjustment

Important Step—Number One: Make sure they reach the pedals, *comfortably*. This can be accomplished by adjusting the seat properly for a bent-leg and bent-arm position at the wheel. If your feet still don't reach the pedals, you can fix the pedals. It's easy in a race car, as they are usually adjustable.

In a street car, it's a little more difficult but it can be done. A plate can be welded, spot-riveted, or bolted onto the pedals to move them closer to you. With many cars, there is room to remount the whole pedal assembly closer or farther away. As with the distance from the seat to the steering wheel, the distance from the seat to the pedals is crucial, *especially in a race car*.

Like your bent-arm driving position, you want to have a bent-leg driving position. You want to be able to reach the pedals with the balls of your feet, *not your toes*. Never have your legs so straight that you have to stretch to work the pedals with the tips of your toes.

You should be positioned so that when you have the brakes or clutch fully depressed, you still have your knees bent. What if your leg is fully extended when the



Know your pedal controls.



brakes were on full and the pedal level dropped or the brakes started to fade during a real heated drive? You'd really be in trouble. The same goes for throttle. So, modify the car to fit the driver. You want to be able to reach everything and feel everything when you're properly seated in the car.

Like the seat, the pedals are extremely important in conveying what the car is doing. The ball of your foot should be used when braking or operating the clutch. It is the strongest and most sensitive part of your foot.

Dead-Pedal

When not using the left foot (clutch foot), it should be near but not on the clutch pedal. Some cars have a "dead-pedal," or foot rest, just left of the clutch, but most don't. It is important to have a place

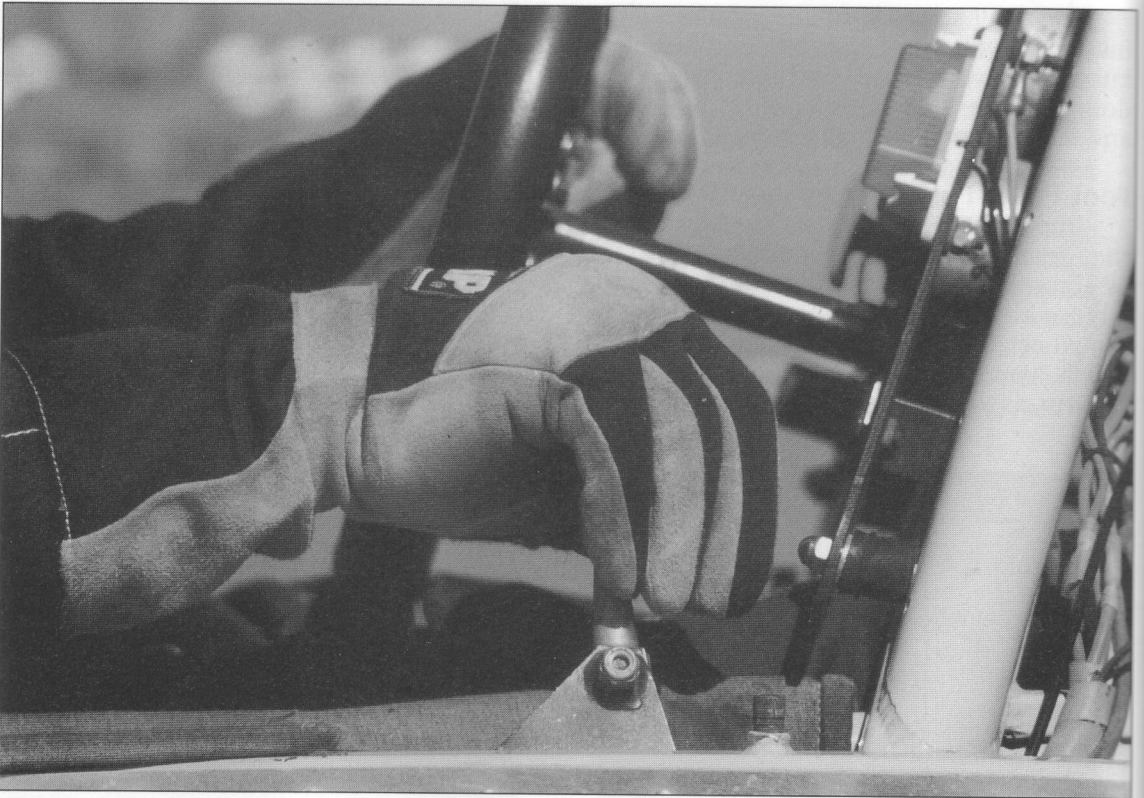
to put your left foot to help brace you during hard cornering. You want to use both the ball and heel of your foot to brace yourself in the seat.

If your car has no place to brace and rest your foot, you would do well to consider putting a "dead-pedal" nearby at about the same height as the clutch pedal at rest. It's easy to do. Or, you can use your wheelwell to rest your foot on.

Brake Pedal Position and Use

Maximum braking efficiency is just before a wheel locks up. Your foot must be taught, through practice and experience, what is the perfect pressure and what is too much. More about braking later.

Like all the other controls, it should be operated smoothly—squeezed on, not jumped on.



The proper hand position for shifting from first into second and third into fourth on a normal H-pattern gearbox. Treat the shift knob like an eggshell. John Blakemore

Throttle Pedal Position and Use

The same can be said for the throttle. Smooth. Jump on the throttle of a 427 Cobra and see where you end up!

For operating the throttle, your heel should be firmly placed on the floor. This provides a pivot point to operate the throttle with the most feel and control. It enables you to feed in the throttle in a smoother fashion. In a high-speed drift, you are delicately balanced with throttle control. Just a bit too much or too little can quickly send you off the road.

Before leaving the subject of pedals, it should be stressed that before you fire up your car, be sure that your foot pedals and the bottom of your driving shoes (street shoes too) are dry and clean. It is distracting and dangerous if your shoes or pedals are slippery or wet. If your shoe slips off the brake in the middle

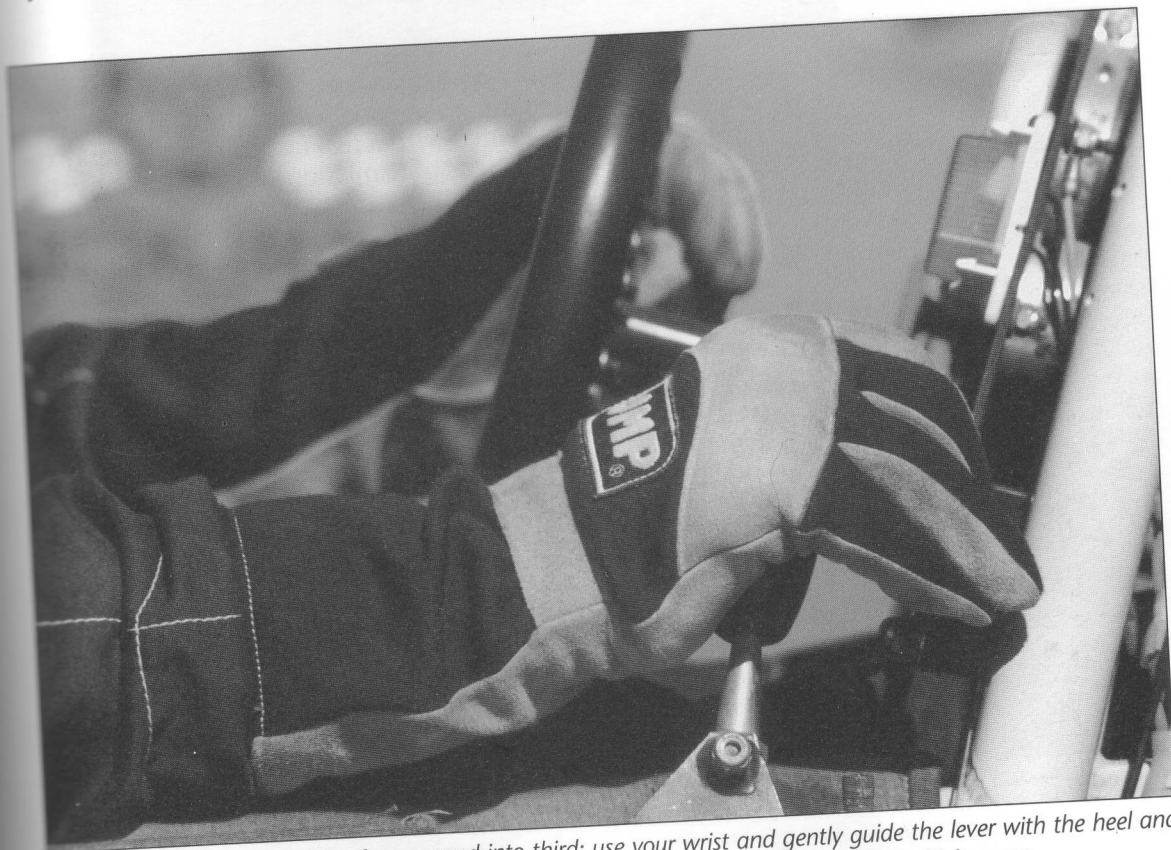
of the pack on the first lap, coming into the first corner at 100-plus miles per hour, you are in for a lesson you'd be better off without. The same thing applies in street traffic.

There are aftermarket pedals that you can put on passenger cars as well as race cars. They are available at all of the sports car accessory stores and catalogs. You might want to check into them.

Gearshift Position and Use

Shifting—Let's give your feet a rest for now and put your hand (the right one, unless you drive a right-hand drive car) to work. Shifting is one of the most basic things about driving a car. Shifting up to a higher gear is easy, but many people even do that incorrectly.

You should treat the gearshift knob as if it were a fresh raw egg. By that we mean don't



The correct position for shifting from second into third: use your wrist and gently guide the lever with the heel and palm of your hand. Smooth, clean shifts are much more important than fast shifts. John Blakemore

strangle it or attack it, and don't slam it from gear to gear—you'll have egg all over your hand. Cup the palm of your hand over the top of the knob, and let your fingers extend down the lever shaft to provide guidance.

Secrets of Upshifting

With a typical four- or five-speed-forward gearbox, you'll have a basic H-pattern shift arrangement (with the fifth gear placed usually to the upper right, above reverse). To shift from first to second, place the cupped palm of your hand on the knob, fingers down, and use them to guide the lever back into second, gently.

From second to third, just use the heel of the palm and the wrist, making sure to give it the necessary movement to the right at the neutral gate. Do it gently and smoothly; don't slam it.



Outlined in this series of photographs is the correct technique for the heel-and-toe double-clutch sequence.

For the shift from third to fourth, again use the fingers and the wrist to guide it back; and for fourth to fifth, again use the heel to guide it up. You want to be firm and positive, but still gentle and smooth. Remember to always use a gentle hand and wrist action, rather than a "death grip" and strong arm.

I learned this method of shifting quite by accident. I was driving a BRM Formula One car that was set up for a smaller driver. My arms were considerably longer, and the only way I could get it in gear was to use a wrist action and the palm of my hand and my fingers because there was so little room in the cockpit. It worked so well I kept on doing it.

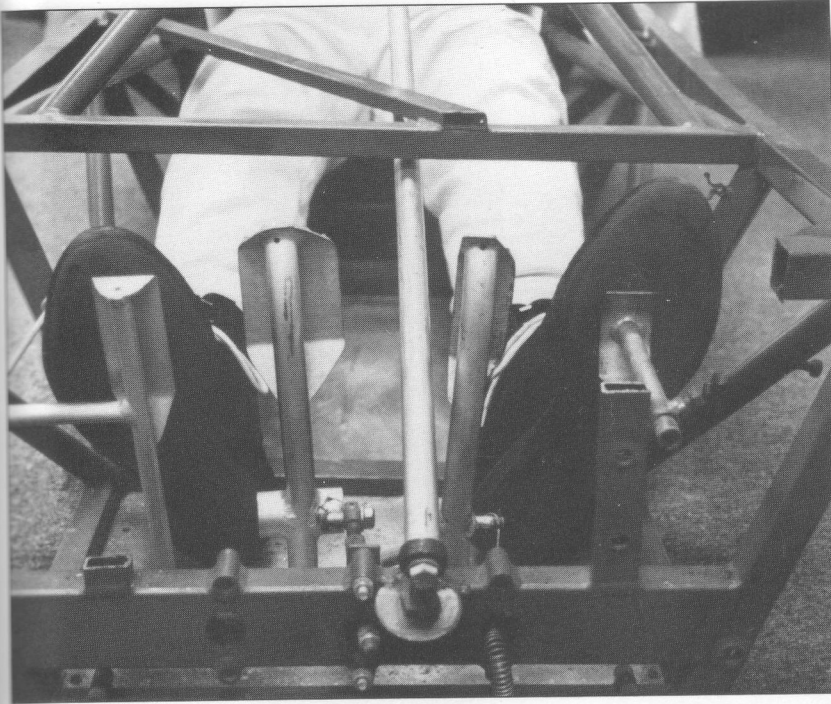
Before that I, like most others, was trying to force it into gear and making a fist around the lever. As it turned out, I was doing it right by mistake, and it was not only easier, but it really saved the gearboxes as well.

Speed in shifting is not really as important as a good clean shift. Not much is gained with a real fast shift, and it may cost you a transmission. Many transmissions and shifting linkages just won't be shifted fast. They require a slight hesitation at the neutral gate or they grind. In a proper race car, the gearbox is designed much differently, and the gears are straight-cut and without synchromesh, so you really have to be smooth and precise. In a race car, you must shift quickly and at the right rpm, but you also must be smooth and gentle so the gearbox lasts. In all of your driving, be smooth and gentle on your car, and it will be that much more reliable and fun to drive.

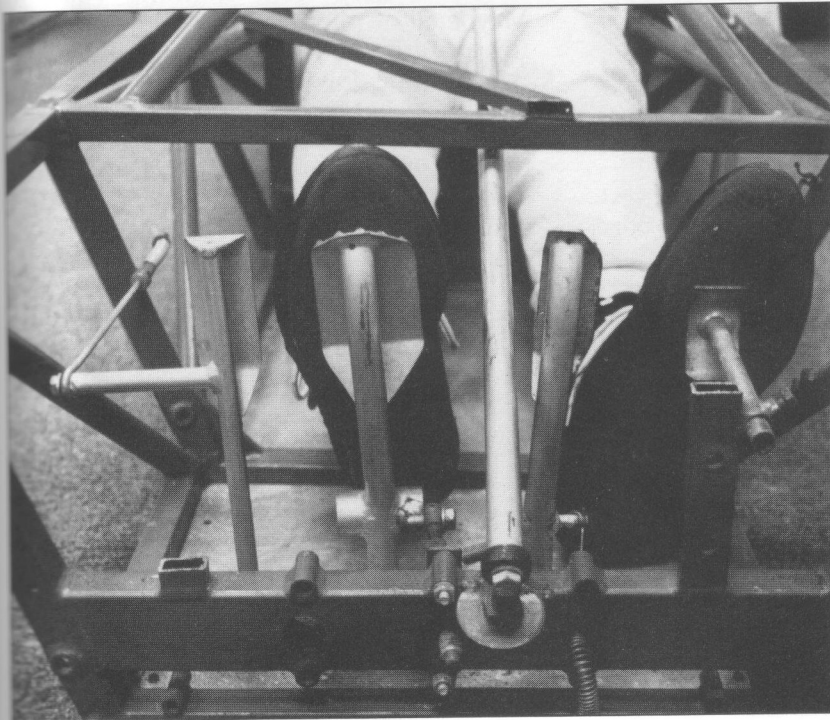
Secrets of Downshifting

Proper heel-and-toe downshifting is just as important on the street as in racing. Especially in wet weather so as not to lock up your drive wheels and go for a spin. In front-wheel-drive cars, if you lock up your front wheels, you also lose your steering momentarily, which can be pretty hairy too.

Proper downshifting is very important not just in going fast, but also in driving your car to its full potential. Unless you

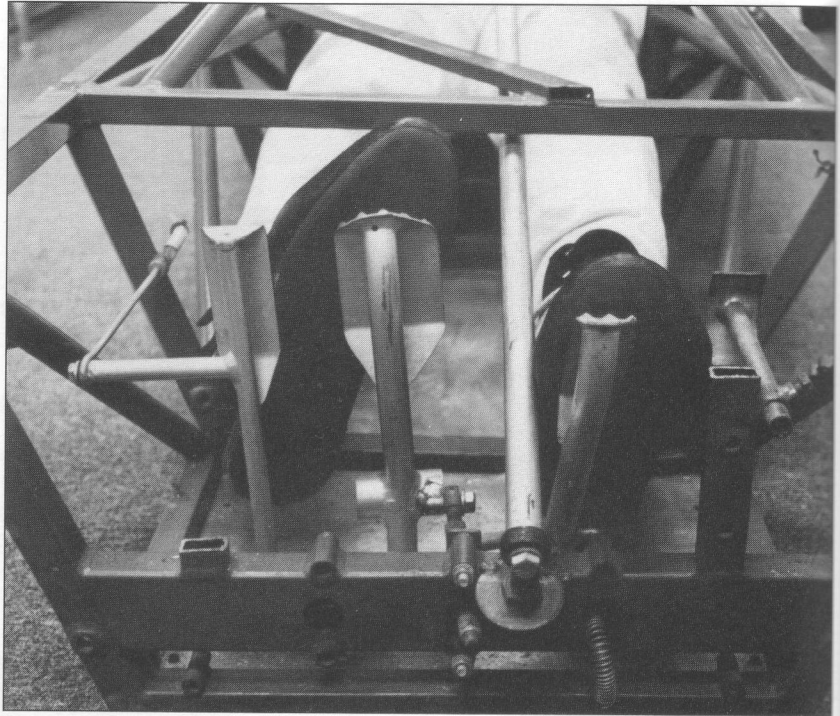


Coming into the corner, you are under acceleration with the ball of your right foot on the throttle and your left foot at rest.



Your right foot squeezes on the brakes, slowing the car and transferring the weight forward onto the front tires. Your left foot readies for the double-clutch and the shift. The clutch is not yet depressed.

Your right foot is still braking while your right heel pivots and rolls over onto the throttle to rev the engine as the clutch is going in. Your shift is passing through the neutral position.



learn to down-shift correctly, you will never go really quick.

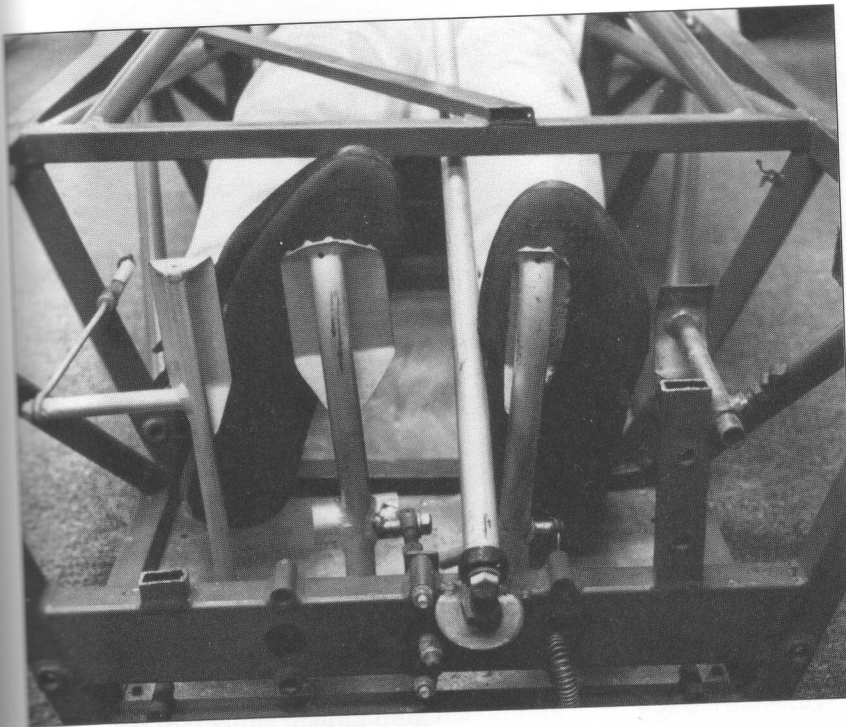
Proper down-shifting is not easy. It requires lots of coordination, concentration, and practice. This is the time to get everything working together: both hands, both feet, and most importantly (and most difficult for some), your mind. Your left hand is steering, your right hand is shifting, your left foot is working the clutch, and your right foot is not only braking but also rolling on and off the throttle smoothly, and your mind is telling you to keep up the proper revs. That's not all—your ears are listening to the engine and gearbox sounds; your eyes are looking for your turn-in point for the corner, at your tach, and maybe at the car in your mirror.

All of this is happening at the same time, and to make things even a bit worse, there's even more going on. Entering a corner, you may be trying to pass someone, or the guy behind you might be putting a move on you, or you may be trying to avoid some oil or another car spinning, or

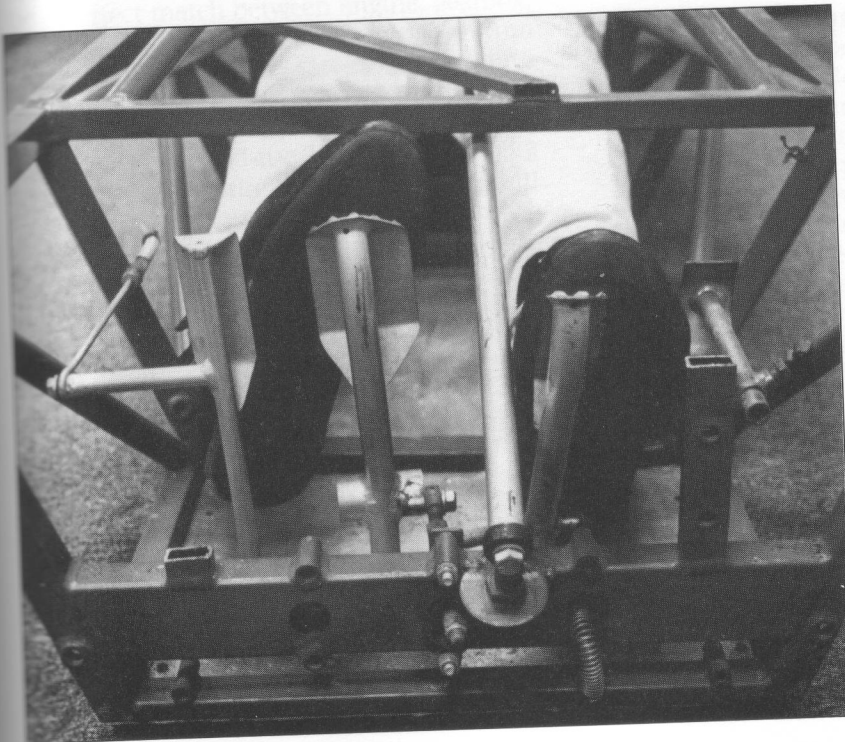
trying to keep from spinning yourself. Maybe all of this at once. An awful lot going on, and you've just been introduced to heel-and-toe downshifting.

Fortunately, on the street it is a little easier than on the racetrack, but the procedure to carry out a proper downshift is the same. The best way to learn your shifting and heel-and-toe downshifting is to practice it (a lot) before you ever turn your car on or roll it out of the garage. If you can't do it right sitting still, you'll never get it right with the car moving. After you've mastered it in the garage, practice it on the street and get it perfected. On the racetrack it will be easy.

I find that the first problem that my students have with heel-and-toe down-shifting is a misconception. Many think that an important reason for downshifting is to take advantage of the engine's braking effect. That thought has somehow survived from the days of skinny tires, fat drivers, and rapidly fading drum brakes. Modern ventilated disc

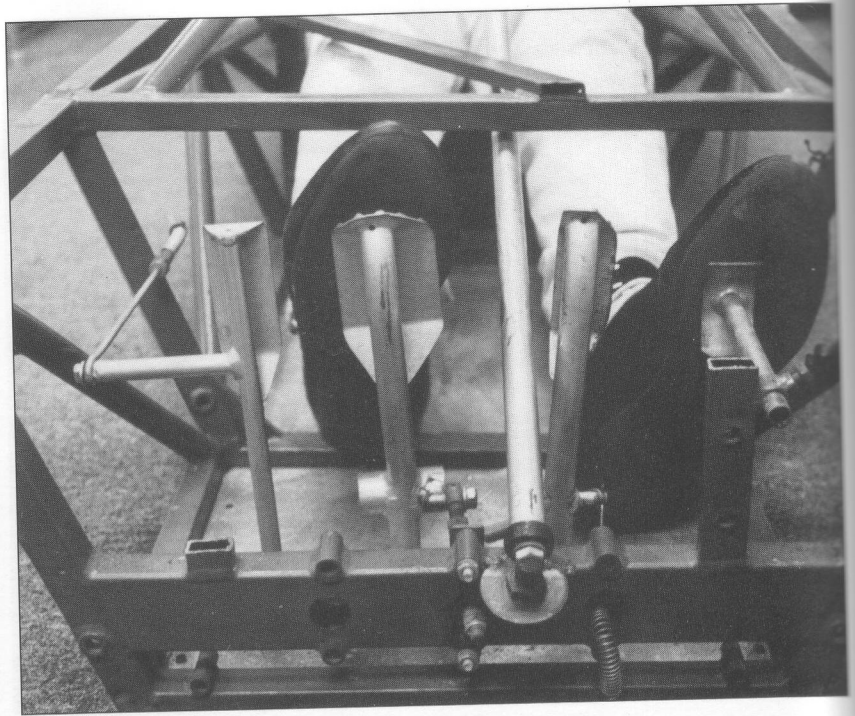


Your left foot releases the clutch halfway. Your right foot continues braking with the throttle still on. The shift passes through neutral.

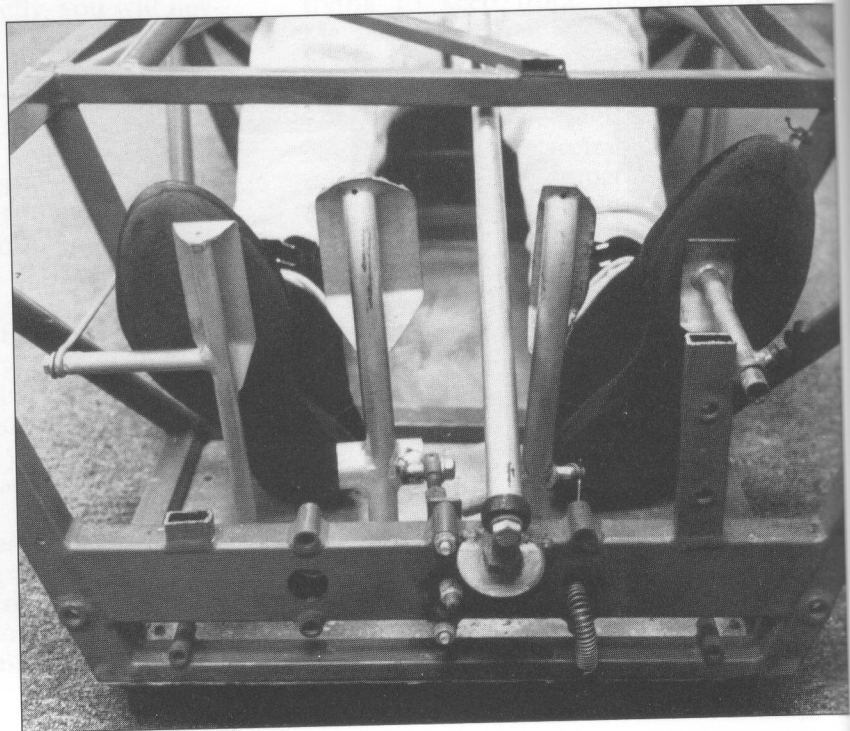


Your left foot fully depresses the clutch with the ball of your foot. Your right foot continues braking with the throttle now at your desired rpm. The shift is completed into the lower gear. Pivot your right heel back under the brake pedal and continue trail braking for the corner.

Your left foot releases the clutch smoothly as the shift is completed and the throttle is released as the clutch plate takes hold. Your right foot pivots off the throttle and starts trail-braking.



As the trail-braking is completed, your right foot is back on the throttle.



brakes have really changed that. With the great stopping power of modern brakes, it is unnecessary, and with high-stressed modern engines, it is a good way to break them.

In racing, rev-limits only work during acceleration, not during deceleration. That is, they cut the motor out at a fixed rev-limit while under acceleration, but when a downshift is made at too high of an rpm, the engine has no choice but to over-rev if the clutch has been let out too soon and proper braking hasn't been completed to balance the gear and engine speeds. If you over-rev, you may not break the engine right at that moment, but maybe a valve will be bent or stretched, and before long it will show up and you'll need a rebuild, probably not even realizing why.

For our school Mustangs, 4,000 rpm is the magic number. Your car may be exactly the same, or something fairly close to that.

The goal when 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 must be a perfect match between engine, gearbox, and rear wheel rpm (or the front wheel rpm on a front-wheel-drive car), which requires your foot to do "double-duty."

The technique required is called "heel-and-toe." Heel-and-toe is something of a misnomer. The term actually was started in the 1950s with Ferrari.

Once, at Riverside, I was testing a 4.9-liter Ferrari, and the pedals were actually set up for doing a true heel-and-toe. It was really a different pedal arrangement; the clutch was on the left as it should be, but the throttle was in the middle and the brake was on the right. The reason was the brakes in those days didn't stop very well, not like today. So it took a lot more muscle and foot pressure to slow it down. With that car you could literally operate the gas with the heel while you pressed the brake with the ball of your foot. It seemed logical, but the pedal arrangement didn't last too long, as it was just opposite to the normal procedure on all of the other production cars. I thought it was OK until one

time I was entering the very high-speed Turn Nine at Riverside and forgot which was where for a second, and I nearly crashed. I prefer the normal setup. This pedal arrangement has long since disappeared, but the name has survived.

As previously discussed, you should brake with the ball of your right foot, *not your toes*. This is equally true for proper heel-and-toe.

Secrets of Double-Clutching

Heel-and-toe is a function of down-shifting, so along with this, the procedure of "double-clutching" is used at the same time—the British refer to it as "double-declutching." Double-clutching can be done on the upshift as well as on the downshift, but it is generally thought of as a downshift function.

To double-clutch by itself is a rather simple procedure. First you push in the clutch, move the gearshift lever out of gear and into the neutral gate, release the clutch about half-way, then depress it again *instantly*, then continue your shift to the next desired gear and let the clutch out.

Secrets of Heel-and-Toe Downshifting

Now, to heel-and-toe. First the simple description of it alone, then we'll combine it with double-clutching and you'll have the complete downshift.

The simple function of the right foot in heel-and-toe is to, with the ball of your foot, brake for any given corner. Now comes the tricky part. At the same time your braking is being accomplished in a straight line, it is necessary to also rev the engine a predetermined amount with the heel of your right foot so that the clutching and shifting procedure can be accomplished at the same time while still slowing the car.

In simple terms, while braking with the ball of your right foot, the heel pivots to the right, still maintaining full braking pressure, and squeezes the throttle the proper amount of revs, then pivots back below the brake pedal to finish the braking or trail-braking procedure.

Now for the combined function, we'll move from fourth gear to third gear, a simple

straightforward downshift, but the procedure is the same with any gear combination.

- 1: Start your braking procedure. Use the ball of your right foot, squeezing on the brake, increasing the pressure as necessary. Squeeze on the brake, like you are pushing down on a tennis ball, a little bit of pressure, and just keep pushing gently. Have your left foot in position to depress the clutch. (Don't push it in yet, just be ready.)
- 2: Move your hand to the shift lever, just the palm of your hand cupped over the shift knob with your fingers extending down the shaft. Continue your braking. Now push in your clutch and move the shift lever from fourth to the neutral gate. As your clutch goes in, pivot your right heel and roll the heel of your right foot onto the throttle.
- 3: Continue braking, while letting the clutch out halfway (double-clutching), squeeze on the throttle with the heel of your right foot, and rev up to a level just above where it was in fourth gear ready to shift down to third, about 4,000 rpm in most cars.
- 4: Continue braking and push in the clutch again and complete the shift. Pivot and roll your right heel back below the brake pedal completely after finishing the shift from neutral to third. As you ease the clutch back out, keep trailing the brake through the first third of the corner to maintain the chassis set.
- 5: The clutch plates have taken hold and the revs weren't too high or too low. Just nice and smooth. Continue braking and start to turn into the corner, gradually easing pressure off the brakes and by one-third of the way into the corner (trail-braking). Then you can smoothly bring in the throttle, and accelerate through the apex area and to the exit out of the turn.

Smooth—Use the brakes to help you steer into a corner along with Ackerman, and use the throttle to help you steer out of a corner. I use the brakes and the throttle as handling devices.

As mentioned before, it's best to practice with the car parked first. It seems like a lot of things to do in a very short time, but you'll get so you can do the whole operation in little more than one second, maybe even less.

The revving of the throttle is very important during the procedure. The amount of revs somewhat depends on the individual car, but the important thing is to match the speed of the engine to that of the drive wheels (front or rear, it doesn't matter). If the clutch is engaged with the rpm too low, the drive wheels will lock up, causing a skid. The best that can happen is you will mess up the corner. The worst is you might damage your drivetrain, spin out, crash, or all of the above.

If you have too much rpm when you let the clutch out, the car will be forced into acceleration, transferring the weight to the rear with driving force (the engine is usually more powerful than the brakes), so you can run the car right off the corner. The best place to begin practicing is in an empty parking lot. Don't try it fast, just practice until you feel confident. Don't worry—it'll come!

The real keys to doing this right are, first, that the engine rpm be matched with the drive wheel rpm when the gear change is made and, second, that the clutch be released positively and smoothly. Don't pop the clutch out, and don't slip it. Just be smooth.

With some very responsive street cars, you want to squeeze the throttle and hold it until the shift is complete. Then, as you ease the clutch out, ease off the throttle smoothly as the clutch is taking hold, for a smooth shift.

Maximizing Brake and Throttle Pedal Setup

Of course, to heel-and-toe properly, the car must be set up correctly. That is to say, the throttle and the brake pedal must be arranged in a proximity to each other so when the brakes are fully compressed, the brake pedal is still slightly higher and directly adjacent to the throttle.

One problem you can experience is brake fade, and a drop in pedal level. If your

pedal level drops significantly during a heel-and-toe operation, it is likely that you will inadvertently accelerate at the same time you are braking by catching your ankle on the side of the throttle pedal. This can be very detrimental to your braking effort! One solution is to *learn to double-pump your brake pedal to bring it back up to pressure*. But the best method is to make sure your brakes—like all parts of your car—are in good order so you can be reasonably sure you won't experience brake fade or unexpected problems.

To repeat, practice heel-and-toe with the car stopped and the motor off before you try it on the road. Get it down while you aren't moving in traffic.

One more word of caution: If you have a carbureted engine (not fuel injection), chances are that while you sit in your car practicing the heel-and-toe and double-clutching, you'll probably flood your engine and have trouble starting it after a half-hour of practice. Let the car sit for a few minutes to allow the raw fuel to evaporate. Then start the engine. If you have trouble starting the engine at that time, press the throttle to the floor and hold it there till the engine starts. If you have fuel injection, you won't have *that* problem because it only operates when the ignition (key) is on.

Automatic Transmission Shifting

How about an automatic? Jim Hall's Chaparral had one, and so do the Williams, Ferrari, and McLaren Formula One cars. Maybe your BMW or Ferrari has one too.

Most people put their automatic transmission in drive and leave it there forever, except to back up. Use the gears. That's what they are there for. For accelerating, use each of the gears. Wind it out. Make the car work as it was intended to.

I have a 1998 Jaguar XK-8 that has an excellent automatic transmission. I use second, third, and fourth gears around town and drive on the freeway. It always gives me good torque/acceleration when I need it. It's a great car.

As for downshifting, you can't heel-and-toe, but your braking procedure is still

the same. Use the ball of your foot and trail the brake into the first third of the corner, just as if you were driving a stick shift. When you've braked sufficiently for a downshift, move the lever to the gear you want and wait for the transmission to shift itself down, transferring the weight back to the rear of the car. This could help your braking, but remember to slow the car with the brakes, not with the engine; and when you accelerate, just ease on the gas.

With an automatic in top gear (drive), the engine back pressure (slowing force) is minimal. You only use this back pressure in the lower gears. For example, coming down a steep grade, you should use your engine, as it will help to reduce brake fade. In cornering, the lower gears of an automatic help the car's stability and responsiveness. Rather than using drive, use an appropriate lower gear along with the throttle, and the car will steer around a corner much easier and safer.

Left-Foot Braking

I don't recommend left-foot braking unless you learned it when you first learned to drive and have continued from that time on. You're using the throttle all the time with the right foot, and you develop a real delicate touch and feel with that foot which carries over to your braking, too. If all of a sudden without a lot of previous practice, you start using your left foot on the brake, you'll find that you haven't developed the needed sensitivity, and you'll be locking up the brake or not depressing them sufficiently to stop in time, especially in emergency situations. In the Chaparrals and the Williams, it worked OK, but you weren't dealing with power brakes, and the drivers, like Phil Hill, were World Champions too.

When I ran Indy, you had left-foot braking, so I had to practice especially for that technique. I practiced with an automatic and left-foot braking for two solid months before I ever got into the Indy car.

In Shifter Kart racing, you learn to left-foot brake. You have a tight-fitting racing



Above and at right
My new 1998 Jaguar
XK-8 features an excel-
lent automatic trans-
mission. I use second
through fourth gears
around town and to
drive on the freeway.
Rick Scuteri



seat to hold you in place to keep your concentration on the job at hand.

Left-foot braking is really different, depending on which way the corner goes. In a left-hand corner, it can work pretty well, because your right heel is on the floor bracing your body. In this direction, you are not upsetting your body position in the feel of the car, and you can meter the brake on quite nicely with the left foot.

A right-hand corner is a different story. Your body tends to fall to the left in a right-hand corner, and if you are trying to left-foot brake, you are also putting your weight on your left heel on the floor while trying to brake. It doesn't work so well, and it's just not as smooth. You need to brace yourself in the car with your left foot, which makes a big difference.

You can practice and make it work, but unless you have a real definite reason

to brake with your left foot, I wouldn't bother. I'll bet if you get into any kind of emergency situation, you'll end up stomping on the binders, locking up your front brakes, locking up the front wheels, and running yourself off the road. Pump the brake, get the steering back, and continue braking smoothly. Use your practice time wisely, but you have to make the final decisions.

As you've figured out by now, downshifting is not easy to master and once you do get it right, it needs a lot of practice and attention. The best thing about shifting is that it can be practiced every day in your normal driving.

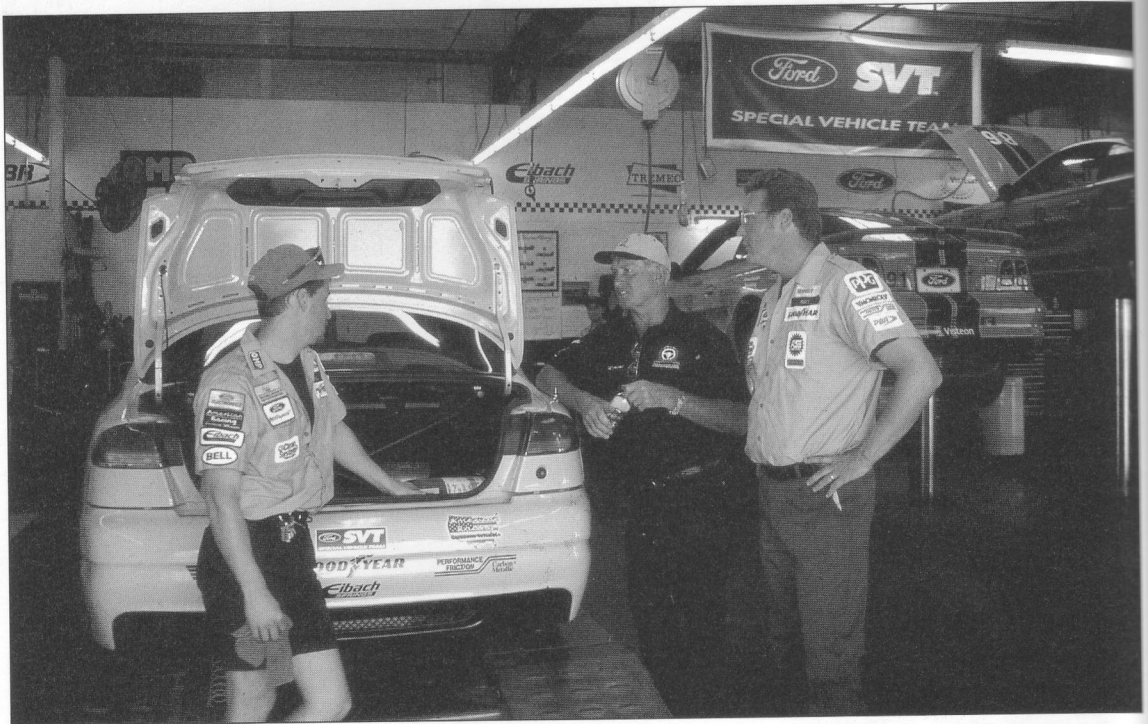
To go really quickly you have to get all of the parts to work together. Practice them. Give them your time and attention. Feeling more comfortable behind the wheel now? Great. Now let's get to know your car even better!

5 Getting to Know Your Car

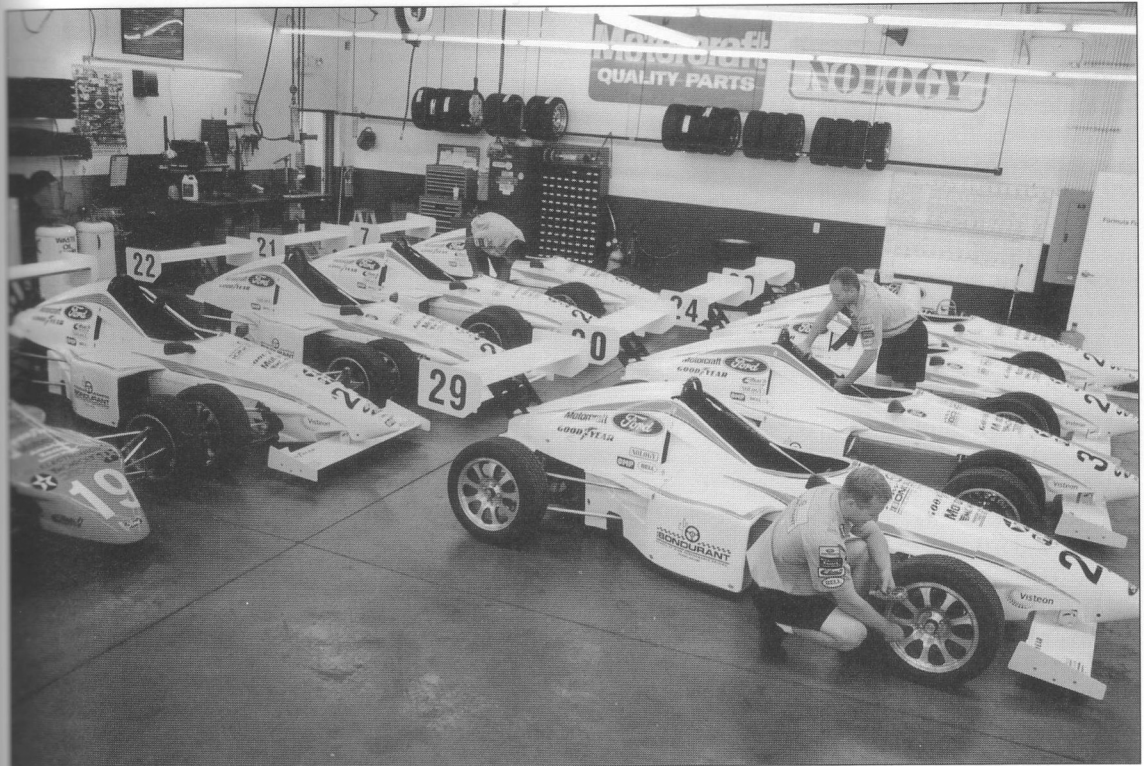
Your car's particular balance is monitored by the tires, steering and chassis. Your seating and steering wheel position are vitally important, because these are your sensory probes, telling you just what your car is doing at all times. These sensory probes enable you to make full use of all available traction.

Car Preparation

To make full use of all your sensors, you must have faith that your car is giving you correct input. This means that your car must be properly prepared and maintained. The value of proper preparation and maintenance really pays off. You will have fewer problems, more enjoyable driving, and a



Discussing maintenance procedures with my shop managers. Proper maintenance is vital to any high performance vehicle. Rick Scuteri



Bondurant mechanics maintaining our newly rebodied Formula Ford fleet. Rick Scuteri

substantial savings of money. Proper maintenance will catch most costly repairs early enough to keep them minimal. Fix it before it is broken—don't wait until it's too late.

When racing the BRM Formula One car, I was confronted with the problem of maintenance. At the Nürburgring, I was having a great battle going with the factory Ferraris of Lorenzo Bandini, Ludovico Scarfiotti, and Mike Parkes, when a camshaft broke. I missed the next race, at the Dutch Grand Prix, because the engine was being rebuilt and it didn't get finished in time (two engines would have been a luxury for the underfinanced team).

The car arrived at Monza "ready to race." I found that the only thing that had been touched on the car was the reinstallation of the engine. At Nürburgring it had rained during the whole race. When I looked over the car, it was covered with spots of rust.

I couldn't believe it. All they did was take the engine out, push it into a corner, and when the engine came back, they just put it back in.

They hadn't touched the car other than that. So, I walked around the car, found a few nuts that were a half-turn loose, a few more a full-turn loose, and some that were missing entirely. I was disgusted. I grabbed a handful of wrenches and went over the entire car. I reset the chassis and tightened every nut and bolt.

It didn't go well that day. I really didn't trust that car. During the race I could never get the car going up to full potential. I think I ran about ninth. That was my last ride with that team. Seeing that things weren't going to get any better, and not being able to trust the team or the car, after the race, I quit.

Proper preparation of your car, be it a racing car or the family sedan, is vital. In

Bondurant fleet tech bay. All of our cars are inspected twice a day to ensure safety and drivability of the school fleet. Rick Scuteri



racing, a driver is certainly not going to win unless he finishes. A well-maintained car is a must. The costs of having a car properly maintained and prepared are high, but not as high as letting it go.

At our school I make sure each of our cars is well prepared, properly serviced, and safe to run on the track at all times. I won't cut corners on maintenance and preparation. Neither should you.

We do a monthly inspection for all of our cars. First it comes in, goes on the rack. All fluids are drained. While they are draining, we check and tighten every nut and bolt under the car. This includes all suspension, brakes, exhaust, and the complete drive-train. Everything. Then we let it back onto the floor and we check every nut and bolt, first in the trunk, then the driver compartment, then the engine bay. Nothing goes unchecked.

By doing this monthly inspection, our cars last three to four times longer than if we simply did an oil change and checked the other fluid levels. Each car is assigned to a mechanic, and after everything is checked out, that mechanic test-drives the car he works on. "Self-preservation prevails!" By handling our maintenance program this way, I know that every car is safe and sound, as

does every student, mechanic, and instructor. Ford Motor Company can breathe a lot easier too.

Assuming that you have a certain amount of mechanical competency, do as much of the maintenance and preparation as you can. This goes for both the street or the racetrack. The better that you know your car, the better and safer driver you will become. If you know nothing of mechanics, try to find the time to take a class at your local college or high school—you are investing in yourself.

Tools and Workspace

Before you attempt to work on your car, make sure you have a complete set of the necessary tools. In addition to the standard tools, make sure that you have the specialized ones required for your particular car. Nothing is more discouraging than wasting an hour to do something that, with the proper tool, could have been done in a minute. Of great importance: Be sure to buy good quality tools.

Quality tools = Quality work. A cheap wrench or socket will spread, or round. It can do expensive damage to the part you are trying to fix.

While you are becoming a first-rate mechanic, with meticulous work habits and

good tools, it is also important to have a good place in which to work. Nothing, and I mean nothing, can make working on your car more unpleasant than a cramped, cold, dirty, and poorly lit work area. Try to have a place that has enough room, that is clean (the way your car needs to be), and has plenty of light and is well heated or cool, to make what you are doing both easier and more pleasurable.

At my school I require a "super sanitary" shop to work on all of our cars. A clean shop encourages a clean, positive attitude.

Preparing a race car will take lots of hours; make sure your investment is secure in a properly laid out, well-lit, clean, and comfortable work area. Those preparation hours will be both much more pleasant and definitely more productive.

When preparing a race car (not a bad idea for maintaining a street car either), use a check-list. Actually, it will take three separate ones:

- 1: A specific list of work to do on the car.
 - a.) Routine checks and maintenance
 - b.) Repairs to be done
 - c.) Potential trouble spots to be checked
- 2: A standard list helps in the preparation process.
- 3: A list of items that you will be taking with you to the races.

Without check lists, trying to prepare a race car and getting it to the track with everything you need can be a chaotic undertaking. Race car or street car, small problems left unattended have a way of producing major consequences. A leaking fuel line, little hang-ups in the throttle linkage, a decreasing brake fluid reservoir—all these things and many more can lead to expensive or disastrous confrontations of one kind or another.

Safety, Reliability, and Performance

If you work a full-time job and do all of your own car preparation and maintenance, your time will be at a premium.



Tools: Proper tools are a necessity in order to get the job done in a quality manner. Rick Scuteri

Work on a priority basis. First, take care of everything that could adversely affect your car's *safety*. Check again every nut and bolt on your car. Check everything after your last practice, and check again before you race. Check all of your fluids. Re-torque those lug nuts. Make sure your

tire pressures are correct, and make sure your tires are wearing evenly, inside and outside. Then concentrate on those things that will affect your car's *reliability*. Your last concern should be with modifications for *performance*.

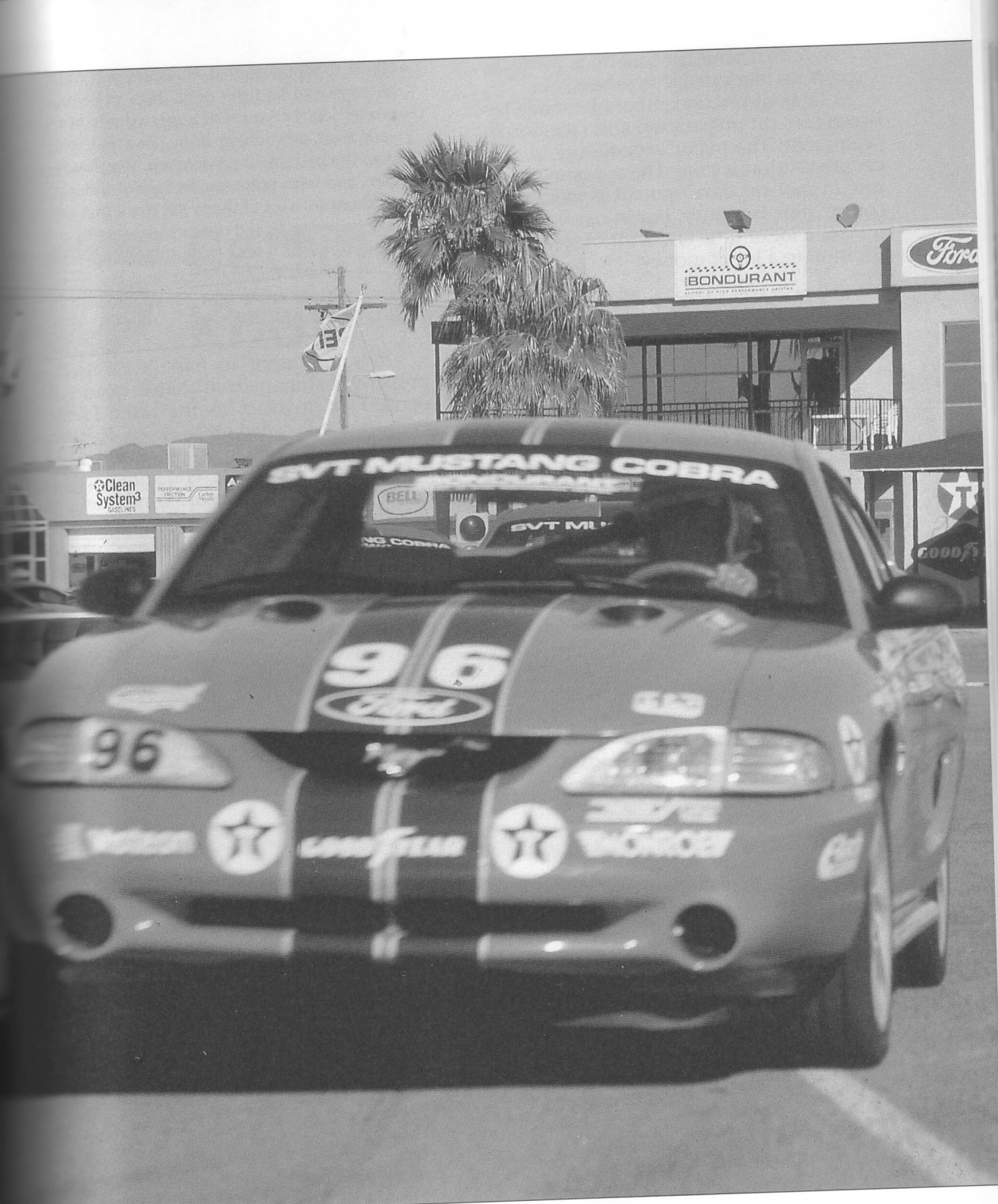
When preparing for racing, what wins is meticulous and methodical preparation



Porsche's legendary car preparation pays off again, allowing Paul Hawkins and me to finish solidly in third place at the Nürburgring in 1966.

Right

Proper maintenance allows for more time driving and less time in the shop. Rick Scuteri



to ensure that your car functions properly. There is no black magic involved.

A large distinction should be made between race car preparation and race car development: The major expenditure in race car preparation is time. The major expenditure in race car development is money. Of course, time is money, but in development it takes a lot of time and a lot of testing, in addition to a lot of money.

If you are interested in race car preparation, I recommend the books written by Carroll Smith, Shelby's crew chief for the factory Cobras and GT 40's. The books are titled *Prepare to Win*, *Tune to Win*, *Engineer to Win*. They are excellent. Smith's books outline step by step what should be done, how it should be done, and what tools are necessary to properly prepare a racing car. Required reading! They are all a great source of information. You can never get too much good information.

Performance modifications and having the "trickest" car at the circuit are neat, but they are also very expensive. Also, if you are continually trying new trick parts, there is a good chance that you won't know how your car should be actually running or handling, and you won't know where to pinpoint your troubles because of confused or mixed input coming back to you.

What you should be primarily concerned with is learning how to drive your car the best that you can. If you are on a tight budget, use your money to become a first-class driver. Keep your car clean and well maintained, but if it comes to a choice of \$200 for a trick part or \$200 for a day of practice, spend the money on practicing. In a year or two, that car will probably be sold and you'll have a faster, trickier, and better one, but your skill as a driver will always be with you. Invest in yourself. . . it always stays with you.

If you really don't know how or don't have the time to set your car up properly,

take it to a professional. However, you must be careful to find the right shop to do the proper job for you. Get some names from your local sanctioning body. Find out who does the best job at preparation. Watch who wins and who prepares. Be careful though, for there are a lot of shops out there that will take your money and not provide you the results you want. Some think they know how to set up and prepare a car, and there are some that do know how to. Watch the results. There's the answer.

It is important to have a car that is properly maintained, so that it can be depended on to react in the same fashion each time it is called on to do so. By doing your own maintenance and preparation, and doing it thoroughly, you know your car better and can trust it more completely.

Along with good maintenance goes cleanliness. Keep the car clean—not simply the outside, but keep it clean in the engine compartment and underneath too. Don't let dirt build up. If it does, you won't be able to spot a problem. I like to paint my engine compartments and chassis gray so it's easy to spot a problem like a crack in the chassis, a loose nut or bolt, or an oil leak. You have to be able to tell where that oil leak is coming from. It may be from the pan, or a main seal, or oil filter gasket, or maybe your sump plug is about to fall out and dump all your oil on the track.

Getting to know your car well takes a lot of time learning and checking everything, but it pays off. You will have a mind at ease, that can concentrate on driving, not worrying about what's going to fall off next, or if the brakes are going to work at the next turn. If you know your car well and can trust it and its preparation, you'll be miles ahead of the competition. And that goes for both on the street and on the track.

6 Getting to Know Yourself

Total Concentration

Making your car perform up to its full potential requires a total effort. The delicate balance between braking, cornering, and acceleration is a balance of self.

This balance, as you learn and practice it, permits you to recognize and maintain

100 percent car control at all times. Every bit of practice, on the street or the racetrack, helps to facilitate a full and complete blending of functions, ultimately arriving at precise control of the car. The old adage "Practice makes perfect" is correct when it comes to driving. Practice builds smoothness and



Concentration is a critical point to remember in racing. A driver must focus on car "feel" and what's going on around him. This paid off for me when I won 18 of 20 races in 1959 in a Corvette. George Robitschek.

consistency, but they are governed by a very important element that enables it all to happen: *concentration*.

Perfecting Your Concentration

Many distractions constantly bombard your concentration while you are driving on the street. At normal speeds these lapses are into the never-never land of radios, CDs, cellular telephones, billboards, neat-looking cars, attractive pedestrians, and hundreds of other distractions to your concentration. On the street, usually all that happens is you slow down to take it all in. The possibility of a fender-bender is an ever present danger if you really become occupied with something that distracts you from your driving. That's on the street . . . it's a lot different on the racetrack.

In racing, concentration is an absolute 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 an apex or a shift, spin off, blow an engine, or crash. If you lose concentration, all of this can happen, and more. Most top racing teams have radio communication with the drivers, but many only allow the driver to talk to the team, not the team to the driver so that his concentration is not broken by such a distraction. As a driver today, you must train yourself to get used to the radio. You will have to use it to pass along important race information, such as an accident ahead of you.

As important as your concentration is, it is no guarantee that you will go quick. Your



The late Dave McDonald and Bob Bondurant Corvette racing.

concentration may be flawless, but you may be doing the same thing wrong in precisely the same way time after time. Practice building concentration. Then concentrate on the proper way to drive and on being consistently smooth. This is why our advanced racing course is an important step in helping you to reach your ultimate goal: to learn how to go quicker and win races safely.

Concentration + Technique + Preciseness + Consistency = Smoothness.

The Ultimate Goal: Smoothness

Smoothness takes a lot of self-discipline. But, smooth is quick, and smooth is safe. Smoothness is more than just an aspect of technique, it is virtually a state of mind. Cars respond positively to firm, consistent, and gentle treatment.

Smoothness is not doing just one thing smoothly, but everything. It is the way you handle the steering wheel, the relaxed but alert way you sit, the way you squeeze on or ease off the brakes or the throttle. It is the precise way you change gears and the sensitivity you have to everything your car is doing under you. Some people are very quick and have natural ability, and other people will have to work at it but still can become very quick. Some have more sensitivity and feel and are just naturally smoother. But, lots of practice and good instruction can only make you better. When driving slowly, it is not as noticeable, but when driving a high-performance or race car quick, smoothness really makes a difference in how quick you go.

Being smooth equals quick. If you talk about being fast, you are talking about being sloppy and sliding around all the time. Fast is not quick! Quick is precise and consistent.

The most difficult factor in the equation is consistency. All that you do while driving a car is interrelated. If you are inconsistent or erratic in just one aspect of your driving, it will negatively affect all the rest. Consequently, smoothness is lost. Smoothness is the sum total of everything you do while driving. *A positive attitude is a must.*

Smoothness is derived from sensitivity, prolonged by consistency, and made possible by unrelenting concentration and car feel! If you want to race, smoothness is helpful . . . if you want to win, it's *essential*.

I remember when the late Dave MacDonald and I were racing against each other in Corvettes. Dave was fast, one of the fastest drivers around. But he would be slipping and sliding all over the track, spending about as much time going sideways as he did going in a straight line. Part of it was his car, but most of it was his style. Dave and I both went about the same speed most of the time. If Dave would have refined and smoothed out his style, I know that he would have been able to go even that much quicker. He was a great natural talent.

Natural talent is having a certain sense and feel about the control of a car. A few up-and-coming young drivers who exhibit a lot of natural talent are Darren Law, Buddy Rice, and Terry Borcheller. Darren, Buddy, and Terry are instructors at my school, and they all



I trained the Beverly Hills 90210 star Jason Priestley, and became his race coach in 1996.

came from Kart Racing. Also Jason Priestley, although he's mostly known for his acting ability, has a natural talent and drives very well. It's having the control over your own emotions and the discipline to drive with complete car feel and the will to win.

Motor racing is an extremely disciplined sport, and it's really hard not to let yourself slip into the area of driving with a lot of oversteer

(loose). Oversteer is great fun but usually not as fast as if you drove smooth and clean. It's really fun to pitch a car sideways and it really looks neat, but it's just not as fast. Gilles Villeneuve was a great one to watch, but his son Jacques is a lot smoother. He has to be. These second-generation drivers, like Al Unser Jr., Geoff Brabham, and Damon Hill have learned from their fathers and most come from Kart Racing.



Smoother is faster . . . and it also saves your tires. Here, I'm driving for Dan Gurney's All American Racers at the 1966 Mexican Grand Prix. Note the amount of tread still on all tires.

Derek Hill (Phil Hill's son) has lots of talent. I have given him personal instruction during the time he worked for me. He learned a lot, and quickly too. He had the misfortune to crash one of my Formula Fords. He fixed it himself, tested it, was quicker than before, and learned a lot. He has now gone from go-karts to a Spec-Ferrari series and even won the final championship in Italy. He is now racing in the Toyota Formula Atlantic Series and is doing well. He has really learned to be smooth like his father.

Smoother is faster and saves your tires. Today's tires and their ultrasticky compounds lose their adhesion capabilities a lot sooner with hard driving. With the older and harder compounds (still used for many vintage racers), you could get away with a lot more oversteer without damaging your tires. Today, you have to pace yourself more to take better care of your tires if you want to win. Which means you have to be even smoother at the controls than with earlier race cars.

If you're too aggressive, you will wear your tires out too soon, and then no more traction. Today you have to be a smarter driver than in former times. You have to conserve your tires. You can't forget to save your car and your tires for the end of the race just to have a good but short battle at the start. You have to be there at the end. Plan your race. Think!

Early on, drivers like Michael Schumacher and Nigel Mansell learned how to control their cars in adverse conditions, when their cars or tires didn't work well, or their cars just couldn't be set up properly. But later in their careers, they became much smoother and even more precise driving at the absolute limit, perhaps even a fraction past their car's limit, because of their great car control.

As you go quicker and quicker and as cars become better and better, the margin of control becomes much finer. That's where the self-discipline comes in. You must have the delicate feel for keeping the car at the balance point. The bottom line is that even natural talent still has to be trained. It has to mature. You still have to learn, to perfect, and to refine.



If you want to win, smoothness is essential. And winning has its privileges! Ken Parker

You Have to Finish to Win

Just because you see a stab-n-steer driver going the same speed or faster than a smoother driver it doesn't mean that the two styles are equally effective. All it means is that the stab-n-steer driver is driving well below his potential and could be going even quicker. If speed and safety aren't reason enough, driving smooth is also much more reliable. It usually gets you there to the finish, and it's a lot easier on the car.

When you look at the records of some of the world's best drivers you will notice that they had an exceptionally high finishing rate. Drivers like Juan Manuel Fangio, Jackie Stewart, Jim Clark, Alain Prost, Ayrton Senna, and Michael Schumacher have not just been fast, their finish records have been fantastic. Fangio competed in 51 Grands Prix, and won 24 of them, 5 World Championships and averaged 5.44 World Championship points per race in which he competed. That's not too bad when you consider that all you got for a win was 9 points. Stewart won 27 out of 90 races, 3

Jackie Stewart.



World Championships and averaged 3.64 points per race. Clark won 25 out of 72 races, 2 World Championships and averaged 3.81 points per race. Consistency is a characteristic of great competitors.

Of the more current drivers, Prost and the late Senna stand out. Prost contested 184 Grands Prix, won 3 World Championships, finished in the points 62.5 percent and in the top 3 positions 51.09 percent of those events, with an average of 3.80 points per race. Senna showed a similar consistency, with three World Championships out of 126 events contested, in the points 61.11 percent, and finished in the top three 52.38 percent, with an average of 3.90 points per race. Unfortunately, Senna was killed in his Williams Formula One car, due to a mechanical failure. What a shame to have an end like that for such a fantastic driver.

Finishing records speak for themselves. Finishing in the points, (the top 6 positions) is an even harder achievement. Carlos Reutemann holds the all-time record for

consecutive races finished in the points: 15 in a row. This spanned two seasons of racing, 1980 and 1981. Fangio comes second, with 14 straight in 3 seasons, 1953, 1954, and 1955. Clark reached 12 in a row, and Niki Lauda 11 without a miss. As they say, you can't win if you don't finish. You must be smooth and consistent to finish. One season, when Bob was racing Corvettes, he won 18 out of 20 races and finished second in the other 2. For Shelby in the Cobra during the 1965 season, he ran 8 World Championship races, won 7 of them, and finished second in the other 1.

Setting a Regime for Practice

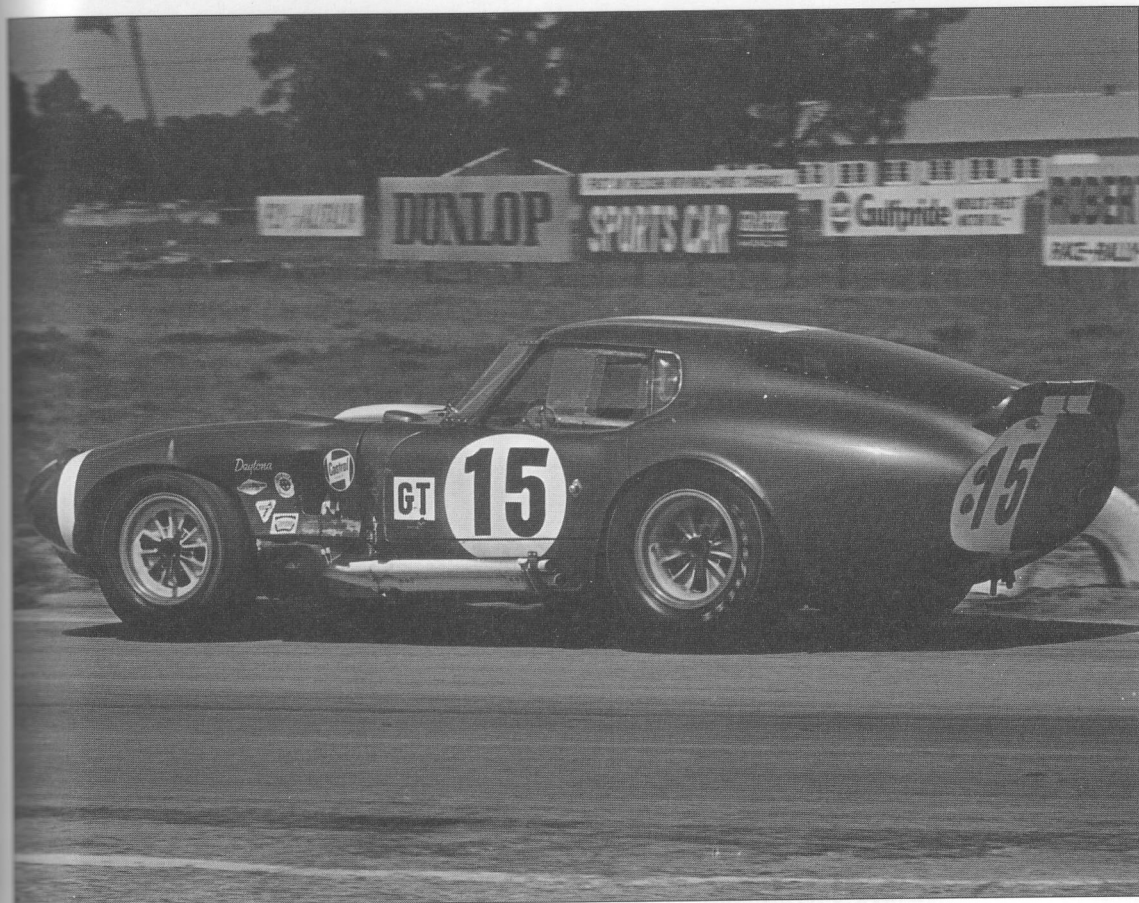
A smooth, fluid driver who effortlessly blends one function into the next is easy on his car, saving it unnecessary stress and wear. The brakes, engine, transmission, suspension—the entire car—have a better chance of lasting if you are smooth. That is just as important for driving on the street. Make your car last.

Developing good concentration, proper technique, and the all-important smoothness requires practice, practice, practice. Just like the piano lessons you took as a kid. Practice whenever you drive. If you are a racer, use the time you drive on the street as practice. I don't mean blasting around town at high speed, but do take the time when you drive to practice your smoothness and concentrate on what you need to improve. Practice doing everything correctly. It is easy to improve your braking and downshifting, double-clutch, and heel-and-toe while on the street. It is also a good place to practice cornering—not by going excessively fast but just by doing it properly, trail-braking, *looking ahead* for the turn-in, the proper apex, and exit.

Practice all of the correct techniques every time you drive.

I was to drive Germany's Freiburg Hill Climb, which was one of the FIA World Manufacturers Championship events. I'd never run a hill climb before, and this road was a normal highway that would be blocked off for the hill climb on race day only. I was to drive the Cobra 289, but there was no way I could before the event.

I wanted to get to know the road so I took the little VW Bug that I had and every morning for about a week before, about 5 a.m., I drove up and down the hill. It was a real rough climb, with lots of sharp bends, and it ran for about eight miles. I made diagrams of it each time, both up and down the



Cobra Daytona Coupe at Sebring in 1965. That year I finished second in one race and won the other seven. Dave Friedman

hill, so I could study it after I was finished driving each day. Even though I was driving the little VW, what I did was to think and to react and to put in my mind what the Cobra would be like at all the different parts of the course—where it would understeer, where it would oversteer, where it would be in four-wheel drift, where it would be light. I was amazed how much I learned flogging that little Bug up that hill. It was a challenge of mind, not of speed. I timed myself each run so I could see my improvement.

Smoothness is the work of methodically blending functions. In the beginning it is infinitely more important to be smooth than to be quick. Quick comes later. Concentrate on learning to drive smoothly and properly before concerning yourself with quick.

When you first try to make all the functions blend together, you'll probably feel like a cow on ice. Don't be discouraged and don't worry about speed or how long it takes you to develop the skill. You must learn how to go smooth slowly before you



Whether it's on the race track or on the street, looking ahead is extremely important. Here I am entering the carousel at Elkhart Lake on the way to victory! Gordon Jolley

will ever go smooth quickly. It takes a lot of time and it is difficult to achieve. That's probably the reason that so few drivers ever really accomplish it.

Enhancing Hand/Eye Coordination

Your eyes are extremely important—a major part in achieving this smoothness is your *hand/eye coordination*. Certainly you can steer the car with your hands and arms but *your eyes tell you where you are going—your eyes actually lead your physical movement*. Your hands act upon the information that your eyes feed them. 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. Focus all of the time on what's happening ahead so if there is an emergency, you have plenty of time to make the necessary corrections to the car. If there is a turn coming up, you have to have the proper time to read how to enter it.

Train yourself to look well ahead down the road (on the street or the racetrack) and as far ahead around an approaching corner as possible. Don't just keep your focus there. You must vary it. Give yourself a visual range of 3 to 5 car lengths, then out 50 or 100 yards or more. If there is a car in front of you, look through his rear window and windshield to see what is happening ahead of him too. Also, try using the vision out of your quarter windows to see further around a corner, not just through your windshield. Check your mirrors all the time so you know what's happening beside and behind you as well. *You must take it all in. You must see it all.* The more you practice, the more you will see.

Good hand/eye coordination is a skill that is developed through practice. The more you can practice it, the better it will become. There are exercises that you can do with your eyes to improve them and what they tell you. There are also many activities, sports, and games that will, while affording you a good time, improve your coordination and, at the same time, your physical condition.

For the eye exercises, contact your eye doctor for recommendations to improve your vision, and the strength of your eyes. There are exercises that will increase your

peripheral vision and others to improve your eye muscles. Keep them strong, for they are your Number One source of information. There are several very good sport vision doctors who can give you eye exercises that work very well.

As for coordination, sports such as handball, racquetball, tennis, ping pong, and the like do a lot to help improve coordination and reaction time. All of them enhance your driving skills. They all involve the basic physical requirements for driving and racing: endurance, balance, fast reflexes, and good hand/eye and foot/eye coordination. It is just as necessary to have these assets available to you driving on the street, especially in heavy traffic or if you fancy driving the back roads hard and fast.

Developing Your Physical Fitness and Nutrition

On the racing circuit, if you are to be any good at all, you must be in good shape. Good physical fitness is not just desired, it's required.

You must be in good physical, ocular, mental, and emotional shape to successfully race competitively. You must eat excellent foods, such as vegetables, pasta, and high-protein foods that give you the strength and durability you need to race. Driving a race car at speed is far more mentally and physically demanding than any one not involved in racing could ever imagine. Your very life can depend upon your degree of fitness. Coping with g-forces in cornering and working the steering or brakes, while functioning at the limit in extreme heat, take strength and endurance. The heat generated by a racing car through levels of a heavy driving suit amplifies the exertion required. And all the physical exertion is nothing compared to the mental exertion.

The real sapper of strength and the primary reason for being in prime shape is the very intense and unyielding concentration that you must maintain. A driver who is not fit will be worn down by the mental exertion. This produces exaggerated fatigue, and that makes your concentration and coordination suffer even more. The



Physical fitness training is very important in today's racing and must not be overlooked.

best you can hope for is a poor performance, not to mention the greater possibility of an accident. And if that's not bad enough, the worse condition you are in, the greater the chances are that you will be more severely injured in an accident.

The better your physical condition is, the better you will do at driving. Likewise, the better you get at other sports, the better you will do in a car. You want to develop a good mental and physical condition, increase your coordination and concentration, prolong your endurance, and improve your reaction speed.

Pacing Yourself and Learning Your Limitations

In racing you must know where your physical and mental limitations are. Part of this can be discovered through other sports

and competitive activities such as skiing, bicycling, jogging, and some weight training. In making his comeback to racing, Niki Lauda spent the better part of six months improving his physical condition. He did miles of jogging and cross-country skiing in addition to other exercises and regular workouts. It made him World Champion again for the third time.

Running, especially in competition, is a lot like car racing. At the start, you push to go quickly for the first third of the race and size up the competition, see what they are going to do. You settle into a groove for the next third and keep yourself within striking distance and a good finish. The final third you push hard for a strong finish, making sure you have enough left for the finish-line sprint, having paced yourself the whole way to make sure you do indeed finish. Sports and working out teach you self-discipline and how to pace yourself. It all helps you to learn your limitations and to exceed them.

If you are in good physical condition you can drive long and hard and not tire. On the other hand, if you are overweight and not very physically active, then you'll tire quickly. It gets very hot in a race car, and during a long race, it is easy to lose 8 or 10 pounds just in fluids. This is demanding and exhausting. If you aren't in good condition for those kinds of demands on your body, you just won't hold up. Racing or not, get in the habit of drinking water, lots of it. Try to drink at least one or two quarts of water daily.

Endurance racing magnifies your conditioning even more. Daytona is a prime example. Recently at a 24 hour event, one team had a young driver in first-class condition, while his two teammates were middle-aged and in less-than-prime shape. It wasn't a question of age, but a question of conditioning. The young, fit driver ended up doing double-duty at the wheel, and finally toward morning the other two drivers quit entirely and turned their drive over to another driver who was fit enough to finish. It was an expensive waste, but at least they knew better than to continue and jeopardize themselves or another driver by their fatigue.

If you want to race but are not in good physical condition, you are wasting both your time and your money. Don't impose unnecessary risks and limitations on yourself. Get in shape. It's work, but it can be fun too. Give yourself a full-body exercise. If you're on the road a lot, try to find hotels with gyms. If you have access to a sauna, use it regularly. A sauna will help your body get used to the heat of a race car. Working out with weights is great. So is mountain biking, jogging, or long brisk walks. You really want to elevate your heart rate and get that blood pumping around.

Here is a basic exercise program that can be used at home or on the road:

- 10 minutes warm-up (stretch and jumping-jacks)
- 30 pushups
- 100 leg-raisers
- 100 abdomen crunchers
- 10 minutes step in place
- 25 squats
- 25 toe-raisers
- 10 each, side stretches
- 30 minutes brisk walk, bike, or row

You want to practice eye exercises too. One really good one is to focus 50 feet away for a bout 10 seconds, then focus on your out-stretched hand for another 10 seconds. Repeat this exercise for about 5 minutes each day and you'll really improve your vision.

There are many games that can really increase your reaction speed as well as your hand/eye coordination; not just the physical sports like tennis, skiing, and handball (all of which are great for your body). A very good and popular alternative that won't even break much of a sweat are video games. They are excellent for the mind. They are great for learning to anticipate

what is coming up and for greatly improving your reaction speed.

Mental conditioning is unquestionably the most important conditioning that you can do. Keep sharp, fast, and alert by keeping your mind active. When you race, you have to use strategy. Many leisure games help to promote this. Good examples are chess and backgammon, as well as some of the more sophisticated computer games. These kinds of games help you to make decisions—and make them quickly. One wrong decision in a race car can quickly cause you to lose, oftentimes in a big way. A delayed reaction or decision can be just as costly. Do all that you can do to improve your *total conditioning*.

Remember that your car is but a small part of driving. You are what makes the car last or what breaks it, the one who maintains it or lets it go. You are the one who learns to combine all the driving aspects into a smooth and flowing motion or is herky-jerky. You are the only one responsible for your ultimate performance. Build on yourself. Improve all that you do, physically and mentally. Discipline yourself. The more you know and the better condition you are in, the better you will become at everything. Add that to driving practice, and who knows, you could become great.

Since you are your best judge and worst critic, do it for yourself. Racing is a total commitment if you are to be successful. On the street, you can perhaps be a good driver even if you are a little out of shape and your reactions are a bit slow, but on the track it can kill you, or someone else.

Enough lecture. Let's get out of the garage and feel what it's like to combine all your braking and shifting practice on the road. Let's try to get you into the corners—better yet, out of them—safely and quickly.



Getting Behind the Wheel

It doesn't matter what kind of car you have; if you get to know it and learn to drive it properly, it can be a great source of enjoyment. There are an increasing number of engine/drivetrain configurations on the road today—from the old tried-and-true front engine/rear-wheel drive, to front engine/front drive, rear engine/rear drive, mid-engine/rear drive, four-wheel drive, and even four-wheel steering. Each performs somewhat differently and has its own handling characteristics.

What it takes is getting used to a particular car through actual driving time and practice. You must learn and remember the real basics of car control. We can give you that training of why and how cars act in a particular fashion in a given circumstance—theory backed up by practice, testing, and lots of experience.

Practice, Practice, Practice! That gives you plenty of experience, and you'll learn more that way than any other.

Maximizing Traction

The key to successful high-performance driving, on the street or on the racetrack, is one easy, simple thing: *maximizing traction!* Traction is the cohesive factor between the tires and the road surface. The primary goal of a driver should be to control his car in a fashion to consistently take advantage of every bit of traction that is theoretically available. The basic functions of braking, shifting, cornering, and accelerating have one prime objective: *Maximizing traction.*

In racing, the closer a driver gets to complete utilization of the theoretical limit of traction, the quicker he will go.

During the functions of braking, cornering, and acceleration, each car has its theoretical limit of traction. This limit is determined by the tires, suspension, chassis, weight, and balance of the car in addition to the abrasive level of the road surface. Notice that I first mentioned tires. You want to have the best tires possible. In my experience, Goodyear has always been the best race and street tires. I still use them today on my race cars, school cars, and all of my personal vehicles. The other components of this limit, each in its own way, affect the tires to either add or subtract traction.

Controlling Weight Transfer

Maximum traction is achieved by controlling weight transfer, which is, in essence, getting the shifting and moving mass of the car over the desired wheels to push those tires into maximum contact with the road.

The area of tire in contact with the road surface is referred to as the "tire contact patch." All you have between you and the road are four tire contact patches about the size of your hand. The maximum traction that you can possibly have is limited to or enhanced directly by the total tire contact patch area. It is possible to have your greatest area of traction where it is not even wanted, causing all sorts of problems in

cornering and braking, not to mention those of acceleration.

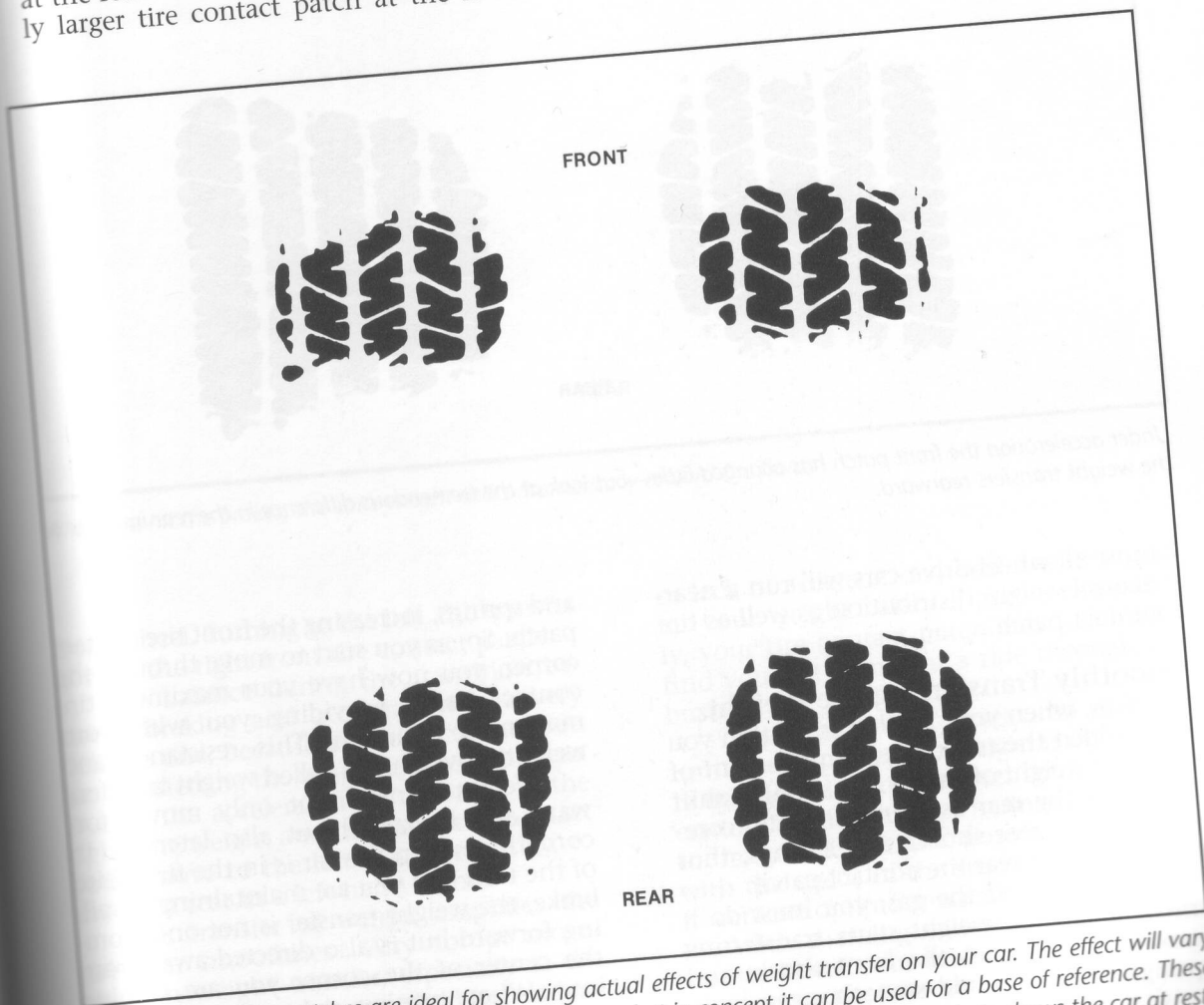
Maximizing the Tire Contact Patch

When a car is sitting motionless, the largest tire contact patch areas are determined by the physical weight balance of the car. The ratio differs depending on your car's drivetrain layout:

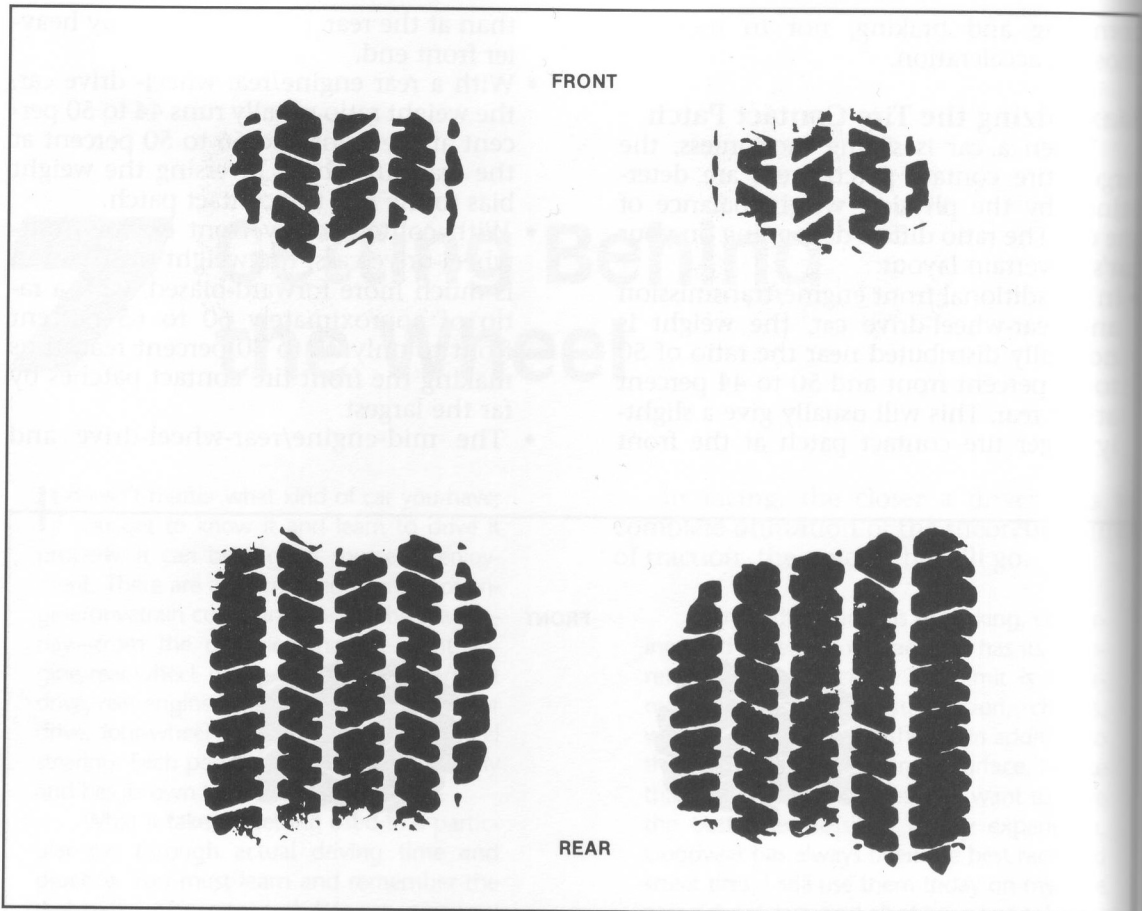
- In a traditional front engine/transmission and rear-wheel-drive car, the weight is normally distributed near the ratio of 50 to 56 percent front and 50 to 44 percent at the rear. This will usually give a slightly larger tire contact patch at the front

than at the rear, due to the slightly heavier front end.

- With a rear engine/rear-wheel-drive car, the weight ratio usually runs 44 to 50 percent at the front and 56 to 50 percent at the rear, just about reversing the weight bias to the rear tire contact patch.
- With contemporary front engine/front-wheel-drive cars, the weight distribution is much more forward-biased, with a ratio of approximately 60 to 65 percent front to only 35 to 40 percent rear, thus making the front tire contact patches by far the largest.
- The mid-engine/rear-wheel-drive and



These images of tire patches are ideal for showing actual effects of weight transfer on your car. The effect will vary slightly with the size and type of tire as well as the car, but in concept it can be used for a base of reference. These examples are from a Formula Ford, as the rear tires are larger than the front tires. This photo shows the car at rest.



Under acceleration the front patch has changed little—but look at the tremendous difference in the rear imprints as the weight transfers rearward.

most all-wheel-drive cars will run a near-neutral weight distribution as well as tire contact patch.

Smoothly Transferring the Weight

Now, when you put this in motion you have added the resistance to movement of the basic weight of the car. This weight shift moves to the rear as you accelerate, compressing the rear shocks and springs, thus expanding the rear tire contact patch.

As you lift off the gas, you must do it smoothly so the weight starts transferring forward to compress the front shocks and springs. Then you add smooth, even braking that further compresses the front shocks

and springs, increasing the front tire contact patch. So, as you start to move through the corner, you now have your maximum tire contact patch providing you with your maximum adhesion. This resistance and weight movement is called weight transfer.

Weight transfer not only moves forward and backward but also laterally. In cornering, when the car is in the first third of the turn and you are maintaining a trail-brake, the weight transfer is not only coming forward but is also directed away from the center of the corner you are turning into. When turning right, the transfer of weight will be to the left front corner, increasing the tire contact patch on the left

FRONT



REAR

When you hit the brakes, the car's weight shifts dramatically toward the front.

front wheel. Turning to the left, the transfer goes to the right front tire contact patch.

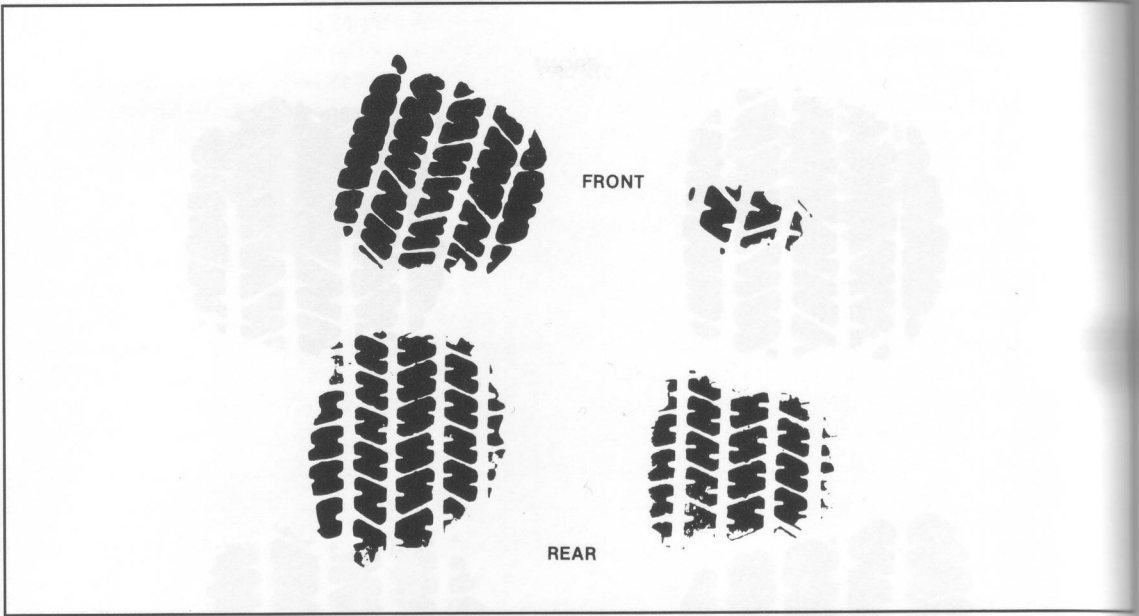
The balance during the transition between braking and acceleration is a very delicate one, because as you accelerate you are transferring the weight again to the rear. During the acceleration in a corner to the right, the weight and increased tire contact patch move to the left rear; conversely, to the right rear in a left-hand corner.

This transfer of weight amplifies the need for smoothness. Any abrupt movement in weight transfer, especially at the time of transition between braking and acceleration—this is, too much, too fast of either braking, lack of braking, acceleration,

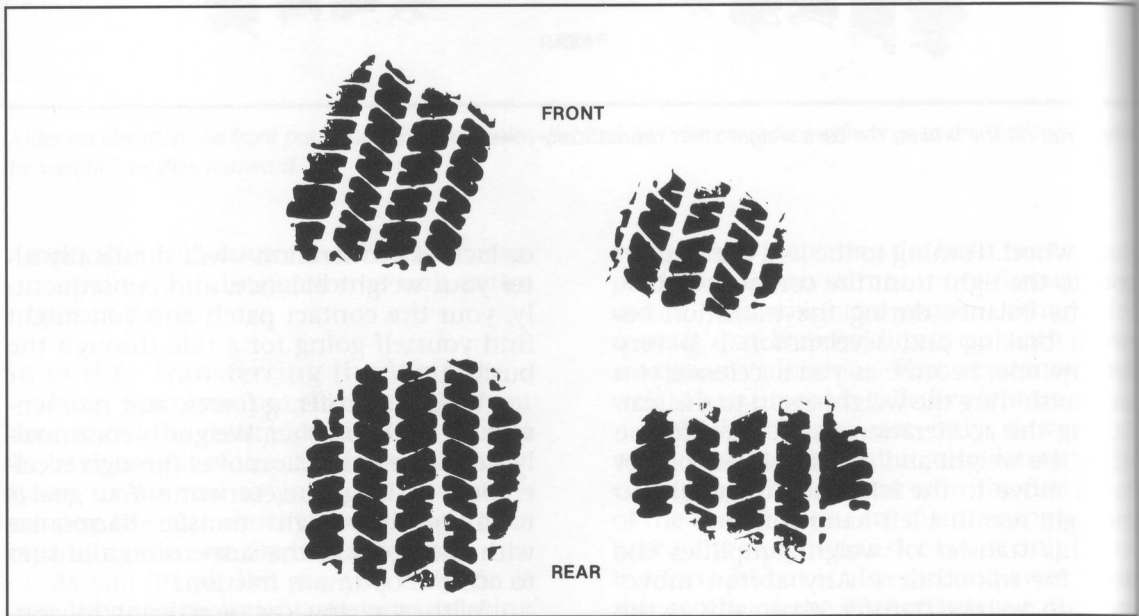
or lack of acceleration—will drastically alter your weight balance, and consequently, your tire contact patch and you might find yourself going for a ride through the bushes.

Weight transfer, g-forces, and momentum all work together. Weight is continually transferred as a car moves through acceleration, braking, and cornering. Your goal is to make the weight transfer harmonize with the needs of the suspension and tires to achieve optimum traction.

With a racing car, you want to constantly blend your braking into cornering, your cornering into acceleration, and your acceleration into braking, keeping in mind



This next series of three images shows how the tire-contact patches change during a right-hand corner. Lateral weight transfer in a corner is pronounced. Note that even on the left front tire patch, the outside (left) edge is being forced into the pavement more so than the inside edge of the tread.



Here are the tire patches in the middle of the corner, showing a further lightening of both the front and rear inside (right) tires. Here are the tire patches in the middle of the corner, showing a further lightening of both the front and rear inside (right) tires.

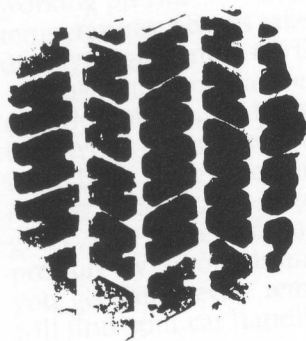
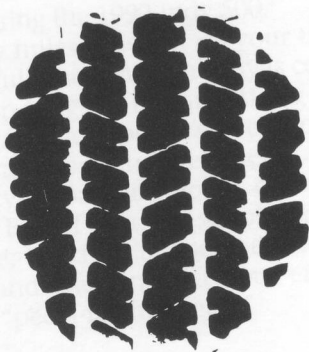
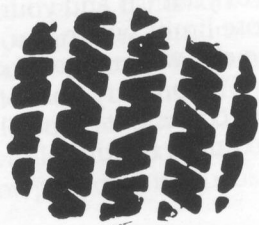
all the time that you want to be at, but not past, the limit of maximum traction. You use the same basics on the street, but without the high speeds.

If you are not accomplishing these transitions in one fluid motion, then you might be one of those that I refer to as the "stab-n-steer" group. Most highway drivers fall into this category if they are trying to drive fast. Likewise, the vast majority of racing drivers (and that includes many top national competitors) don't put the whole package together either; and a

good percentage of them are also of the stab-n-steer variety.

The stab-and-steer theory is simply to go as fast as the car can go, brake as hard and as late as possible, then drive around any given corner as fast as they can and get as much power on as fast as they are able. Those guys are fun to watch and fun to photograph because their cars are always out of shape, and you can expect them to run off a turn or two sometime during a race. That's fun to watch, but you must be smooth to go quick and do it consistently to win races and stay in one piece. The stab-and-steer drivers are not truly

FRONT



REAR

As progress is made to the exit of the corner, all four patches begin to show weight transfer back to a more stable position.

quick drivers in terms of lap times, nor are they quick with any consistency—and they are awfully hard on their equipment.

A typical stab-and-steer driver charges into a corner, executes a late, banzai braking attempt, does a herky-jerky downshift, and jumps off the brakes (transferring the weight abruptly to the rear thereby reducing the available traction for steering). Then he pounds on the throttle (throwing even more weight transfer to the rear, losing even more steering control), then has to come off the throttle because the car starts to either oversteer or understeer too much (coming off the throttle transfers the weight again to the front so the steering comes back). Then he is on and off the throttle and correcting the steering all the way around the corner. This is not quick, nor is it safe.

Discovering Your Car's Limits

In the next chapter we'll detail an actual cornering sequence. The main point now is to get you to realize the importance of weight transfer, because it is weight transfer

that determines the amount of traction you will have available. Once you get weight transfer working for you, you must keep it working. This is accomplished by smooth, very precise, almost delicate, management of the car's controls.

As you get to know your particular car, you will learn its particular balance. Learning how to drive your car the best that you can is your primary goal—the foremost reason you bought this book. To really get to know your car means lots of time behind the wheel, finding out about the limits of your car and of yourself. If your car is used primarily on the street, then it's difficult as well as dangerous to find those limits. Look for competitive events such as slaloms, autocrosses, rallies, driving schools, or club outings that will allow you to find the limits of your car and yourself, safely. Discover those limits where you, or your car, or anyone else will not get hurt.

The primary goal of a driver is smooth and consistent control, and that means maximum traction!

8 Getting to Know the Road

Now that you are seated properly, holding your steering wheel correctly, have your pedals adjusted just right, have gotten yourself in good physical and mental condition, and understand the importance of maximizing traction, let's move down the road. Remember the basics: Concentrate and be smooth, precise, and consistent. If you can put all that together then you have already become a better driver than when you picked up this book.

Warming Up Your Car

Before you get on the road, think about your tires. When you start out in the morning, or any time your car has been sitting for several hours, everything is cold. Your engine, transmission, differential, brakes, and tires, are cold. Cold tires don't make for good traction. Just ask any of the drivers who crashed after the many caution flags during the 1992 Indy 500.

Drive a few miles to warm up your tires so you'll have full traction. If the day is cold, it will take even longer. The same thing applies on the racetrack, but it's even more crucial. On a track you can speed the process by gently swerving back and forth, during a warm-up lap. But, if you are simply going out to practice, build up to speed carefully, warming up and checking out your entire car before it's "pedal-to-the-metal."

Tire Pressure

First of all, if you have a street car, with regular tires, before you ever think of driving hard, make sure you have good wheel

bearings and sufficient tire pressure. At my school I run all of the car's tires at least 35-40 psi in each tire. Use this as a starting point.

If you don't have enough air in the tires, you can pull a tire right off the rim during hard cornering, which will most likely cause a real nasty accident. More about that later, but make sure they have enough air; I typically run my tires at about 10 psi more than the recommended street pressures, or the sidewall will deflect or move around and the car will feel real sloppy through the corner.

If you have a race car, work with your race tire supplier's recommendations as a place to start. Get a pyrometer and take tire temperatures immediately after each session to determine your setup and optimum working pressures. When you take your tire temperatures, always take them hot, immediately after coming off the track.

Take the temperature of three areas: the outside, middle, and inside on top of the tire. Write them down so you can refer to them later. If they look like this: outside 180 degrees, middle 290 degrees, inside 200 degrees, you have too much air. Drop the pressure by 5 pounds and try it again until you get fairly even temperatures and you will find your car handling better.

Elements of a Corner

Welcome, now, to the most difficult corner in the world! That reference could apply to any turn in the world as viewed by



Entering a late-apex area. The car is stable but in a four-wheel drift under full acceleration. All four tire patches are working at their limits. Rick Scuteri

any driver. Every driver has his own kind of problem corners. Do you have a particular kind of corner in which you feel clumsy and slow? One you never quite feel that you got right? Do you know how to read a corner properly? How about getting it right after you read it correctly?

What is a corner anyway? Simply put, it's an entrance to or an exit from a straightaway. I'm going to tell you how to do it the safest, most stable, and quickest way possible.

Any given corner can be broken up into three segments: entry, apex area, and exit.

The Corner Entry

The entry to a corner (your turn in point) is the most important part. Your entry dictates all that will follow—where, how fast, and how stable you exit. Also, it is the primary factor in how fast you go down the

following straightaway. The entry of the corner is where you combine braking, and double-clutch, heel-and-toe downshift (that you've been so diligently working on) into one fluid movement, and then make your transition into trail-brake.

Before we get into the proper line through a corner, good ones and bad ones, let's concentrate on how to do the steps of a corner properly:

I'm in a race car and heading down the straightaway at 140 miles per hour, and ahead is a simple 90-degree right-hand corner that can be completed at 90 miles per hour. As I approach the corner my eyes are feeding me input about the road, the turn and the traffic, while the input I'm receiving from the car is telling me exactly what it is doing.



Parking lot autocross or gymkhana events can teach you a lot about controlling your car. Here I am following a student through a similar setup at my old Orange County facility in our original Datsun school cars. Petersen Publishing

Approaching the corner from the extreme left edge of the available road, (about one foot from my left wheel to the road edge), I am under full acceleration. I sight my braking point (shut-off point). I ease off the gas (don't jerk off the gas or you *pitch* the car's weight forward rather than smoothly transferring it forward) and firmly but gently squeeze on the brakes with the ball of my foot. The weight is being smoothly transferred to the front wheels as the springs and shocks are compressed, thus increasing the tire contact patches' traction. I apply maximum brake, but I balance my pressure so that the wheels don't lock up. I use the brakes (*not* the engine) to slow the car down. Now, before I enter the corner, it is necessary to complete the down-shift. For this corner I have gone down from fifth to fourth.

Because of the heavy braking, maximum traction is on the front tire contact patches, assuming that you haven't locked up the brakes. If the front brakes are locked up just release your calf muscle and that should unlock the front wheels, which in turn should give you steering control. Remember to keep looking where you want to be going around the apex of the corner and then down the exit.

The Corner Turn-in Point

With the car going its slowest (almost 90 miles per hour), I reach my turn-in point, continue major braking (trailing the brakes), and turn into the corner, transferring the already forward-moving weight laterally, which "sets" the chassis—further compressing the springs and shocks again and increasing the tire contact patch. The left front (outside) tire now carries most of the adhesion for the steering and cornering.

I've used maximum braking while entering the corner, but now begin to trail-brake, usually into the first third of the corner. Trail-braking keeps the chassis set and maintains the down-force (or tire contact patch) while I aim for the apex area of the corner.

Remember, trail-braking is what happens after you have completed your

major braking for a corner. Essentially, the moment you start turning into the corner you start decreasing the brake pressure, riding the brake into the first third of the corner, gradually releasing the pressure, and smoothly making the transition from brake to throttle, maintaining the balance of the car.

When setting up for a corner, get your downshift completed during the major braking, just prior to turning in. That is, start your braking and, while braking, execute your heel-and-toe downshift from fifth to fourth. If the corner is so tight that you need to go down one more gear, just continue your downshift one more gear. (If you choose, you can go directly from fifth to third, but just be sure you have slowed enough for a third-gear turn.) If you complete your downshift too soon and let the clutch out before you should, you may well over-rev the engine and lock up the rear wheels, putting you into a spin.

As soon as the downshift and major braking are simultaneously completed, the clutch pedal is smoothly released and *the right heel pivots back below the brake pedal*, which allows you to start easing pressure off the brake pedal ever so smoothly and gradually; finish the release at about the first third of the entry into the corner, then bring up the throttle smoothly and head for the apex area and the exit onto the straightaway.

As the car tracks into the first third of the corner, heading for the apex area, my right foot, slowly and precisely, starts to ease its way off the brake. All I'm doing by this time is dragging the brake pads on the rotor. The dragging pad keeps the chassis set. I'm not using this last stage of trail-braking to slow down; that was done as I first entered the corner with my major braking, then with the tire sidewalls scrubbing off some speed too.

In a low-speed corner, you must be careful not to overbrake and lose your exit speed. If you do this, you are either braking too early, too long, too hard, or a combination of all three.

In a higher-speed corner, one way to tell when I've reached the limit of trail-braking is when the back end of the car starts to become a little light and just begins to slide out. When it reaches that point, I smoothly come all the way off the brake and start to squeeze the throttle on, transferring the weight smoothly to the rear tires. I do this in two distinctly separate motions. Don't just slide your foot from the brake to the throttle. Lift it positively and smoothly.

The first third of the corner is nearing completion as the throttle is being eased on, and I'm looking toward the apex area. The balance of throttle is very important at this point. I feed in as much throttle as the rear wheels will take (smoothly). If the rear wheels start to lose traction, I ease off the throttle a bit to recover the adhesion. If I take my foot all the way off the throttle and/or do it too abruptly, I lose my chassis set and tire contact patches, and the car goes into a slide.

The Apex Area

Passing through the second third of the corner, the apex area, the car is now in its most stable condition during the corner, until after the exit onto the straightaway. The car is now under complete throttle control, and all four tire patches are working for me. My steering is set for the exit and I have started to look for the exit point. If I do the first two thirds right, my exit should be perfect, and I will be able to carry my speed down the entire straightaway.

My line through the corner has been set and I am committed. Too much throttle will cause too much weight to come off the front tires, causing me to lose front tire adhesion and cause the car to push or understeer. The weight transfer is being *gradually* moved to the rear of the car during acceleration. I modulate the gas to maintain the forward stability and the suspension set.

As I feed in more throttle, I am increasing the rear tire contact patches

while at the same time adjusting the weight transfer from the outside front to the outside rear of the car. My acceleration is picked up more now and is smoothly increased to full throttle heading for the exit of the corner. Continually, I am focusing my eyes, not just where I am, but *where I want to go*.

To backtrack just a bit, (just in case you forgot the term), exactly what is the *apex area* we keep referring to? Most books just call it "apex" or "clipping point." This, however, is a little bit of misrepresentation. True, there is a geometric apex of a corner that is right in the middle of the turn. And the clipping point is where your inside front wheel physically is closest to the inside edge of the corner.

When you are driving a car, we are talking about the driving apex area. Some street apexes are halfway around the corner. Almost the full length of the corner. You come out of the apex area almost at the exit point, when you can see down the straightaway or the race track. That's the way you determine the apex.

What you need to learn about is the driving *apex area*. We say *apex area* because, unlike the *geometric apex*, the *apex area* varies in length. Every freeway off-ramp, mountain curve, race track corner, or highway turn has an apex area. Some even have two. But every corner has at least one.

The variable factor in an apex area is the speed at which you arrive at the apex area combined with the length (or radius) of the curve. If, for example, you have a 90-degree corner, say on the street, you might have a very short apex area. But on a very high-speed corner on a race course, you could have an apex area five or six car lengths or more. It really depends on the speed potential of the given corner. A street apex is going to be twice as long because the road is narrower and your speeds are lower.

Slow or fast, street or track, you want to hit the apex area properly to get maximum traction, stability and acceleration out of the corner. The apex area is the part of the



A composite of a corner. The numbers on the photo indicate the following actions: 1: Under full braking. 2: Start heel-and-toe downshift. 3: Complete downshift. 4: Start trail-braking. 5: Complete trail-braking. 6: Begin acceleration. 7: Under full acceleration. 8: Exit point. 9-10: This is the apex area. To put all of this in perspective, this section lasts approximately six to seven seconds in a Formula Ford.



approaching the start of the race, the driver will
have to maintain the way and the car's position.

the driver will have to maintain the way and the car's position.



The proper entry and exit of a typical 90-degree corner. Note the long apex area is almost six or seven car lengths. A proper late apex area allows you to set-up easily for the next corner.

corner when your car is in its most stable position and your tires are the closest to the inside edge of the corner. A longer apex area is necessary when driving or racing in the rain because of less traction and slower speeds. Let's get back to the 90-mile per hour right-hand turn.

I am now feeding in full throttle, and the centrifugal force is pushing my car to the outside edge of the corner. I have full traction for acceleration and I'm heading toward my chosen exit point. The apex area that I chose was about two-thirds of the way around the corner. My turn-in point to the corner was

deeper and later than if I had had a mid-corner apex area. By having a relatively late apex area, I have ensured that I will be on full throttle a little earlier, and when I am on full throttle, the g-forces acting on the car will not push it too far to the outside, and off the road, at the corner's exit. The car is heading pretty much in a straight line as I approach and exit the apex area.

The Corner Exit

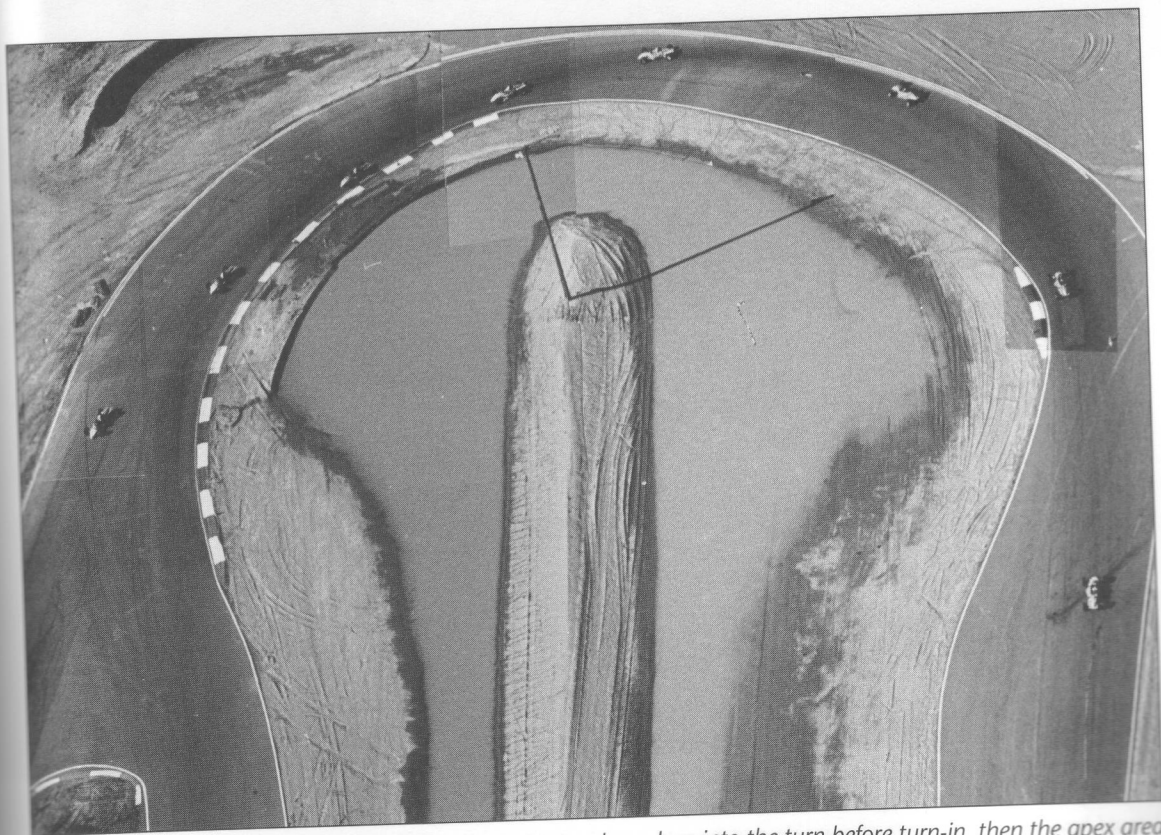
This last third of the corner, the exit, is the easiest part if I did every thing preceding it correctly; if I didn't it will become the most difficult.

I take care to feed in the throttle smoothly and evenly, carefully avoiding wheel spin. Remember, you always want to exit long and wide in pretty much as straight a line as possible, in order to dissipate the unsettling forces that pick up momentum when the speed increases.

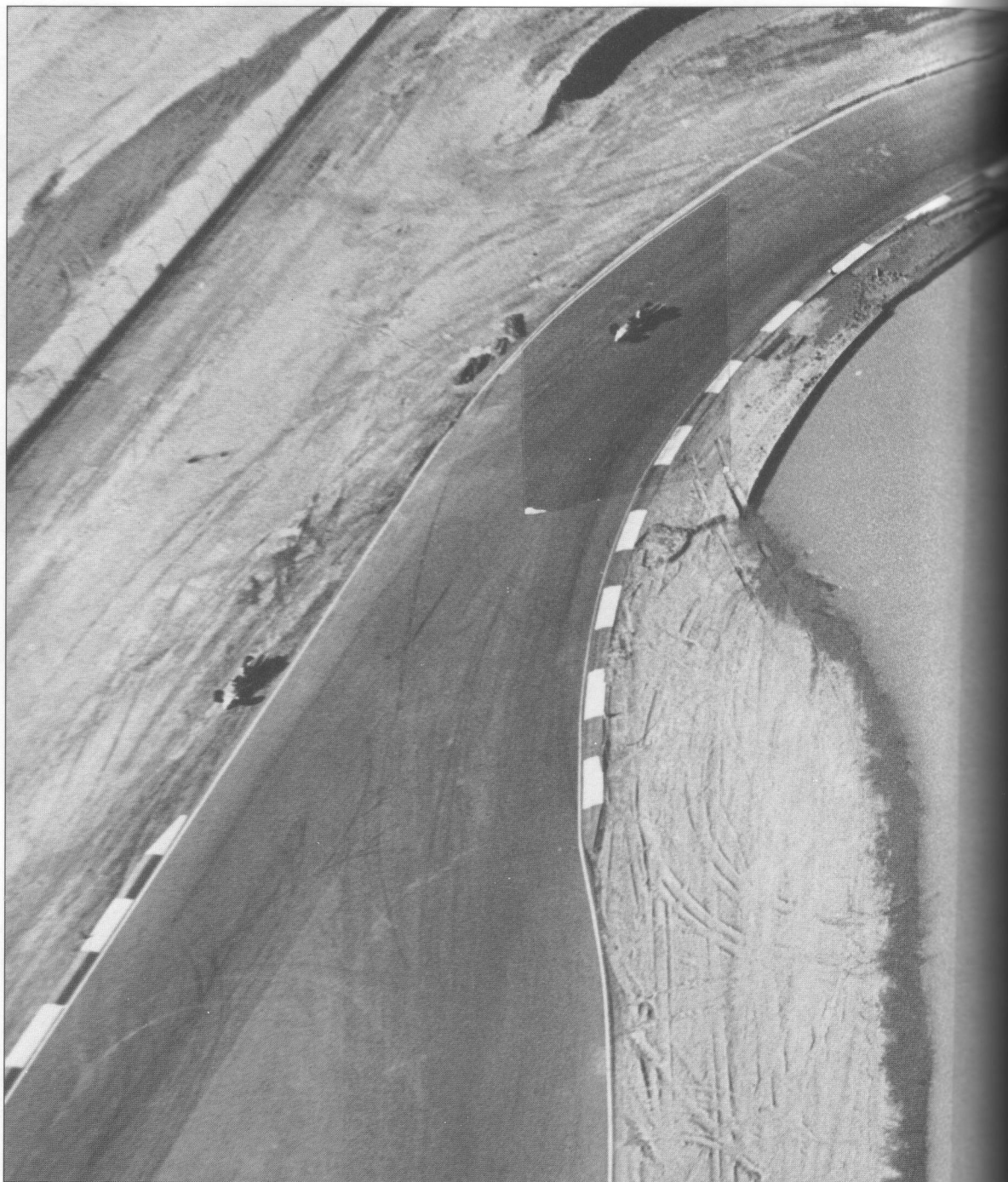
I have chosen a long and wide exit, using all of the road possible. I will be easing out the steering and feeding in the throttle smoothly, as I aim in a straight line for the exit point. Under full throttle, my car is just on the border of maximum traction, and I am now in just a slight four-wheel drift—almost to the exit point. As I arrive at my exit point, I am already looking down the straightaway for the next corner with a nice 3 and 9 o'clock position with my hands.

If you're practicing this corner and your turn-in point was correct, you hit the proper apex area for your speed and your car, then you should still be on the correct line to be able to use the maximum road available at the exit. If you did everything right, you were definitely faster than you were before you began using these techniques. You have left your old driving habits behind and now you drive a lot smoother with much more control.

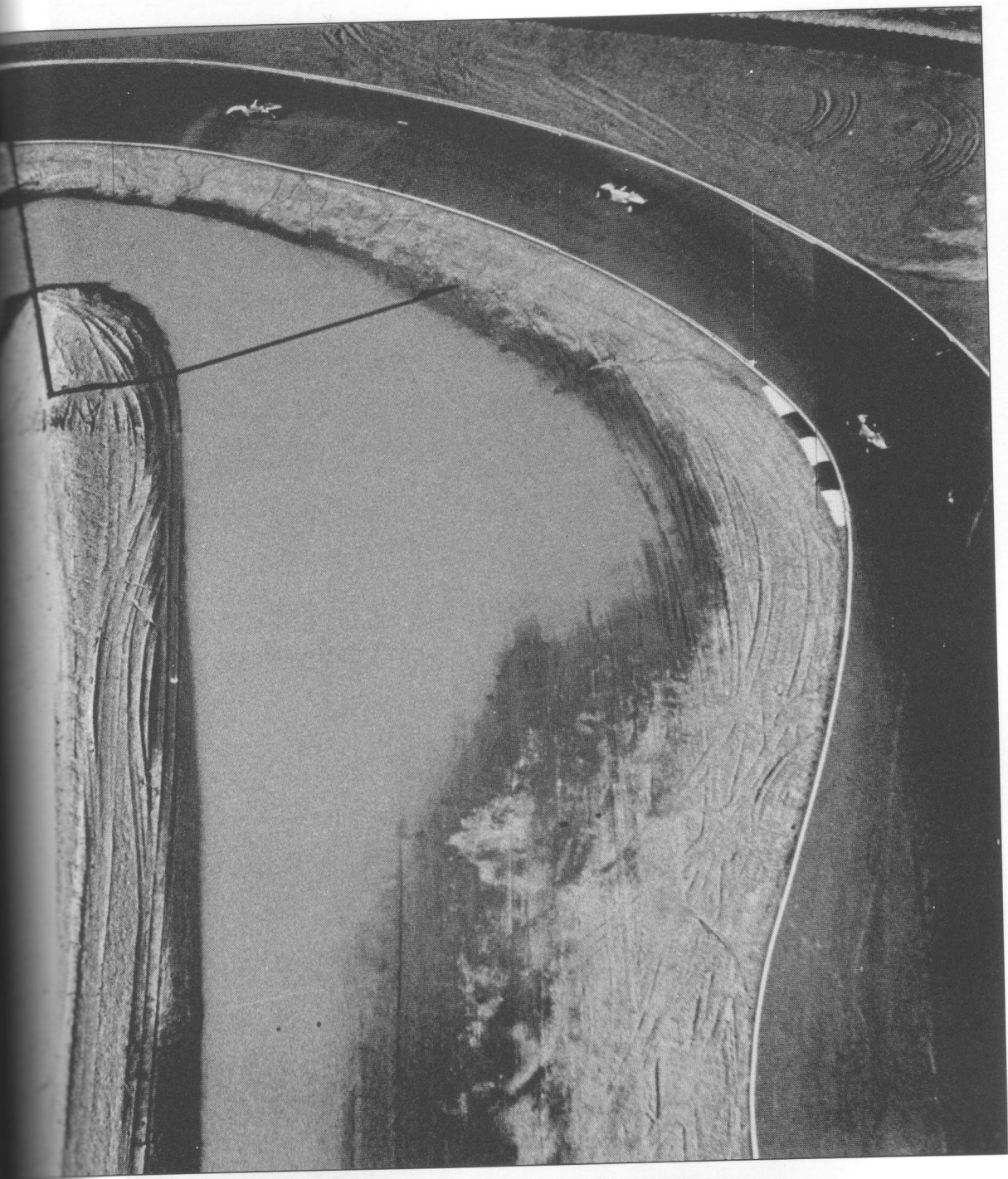
In racing, remember that the earlier you can ease into full throttle in a corner, the quicker you will enter the straightaway. The quicker you enter the straightaway, the sooner you will reach maximum speed. The sooner you reach maximum speed using the all-important *apex area*, the quicker you get to the next corner. If you can reach full



A long hairpin exiting and entering a straight-away. Note how deep into the turn before turn-in, then the apex area about three-quarters of the way around the corner. A fast and easy on exit. No problems.



The same turn as before but here I turned in too soon, entered too fast and too early, and apexed way too soon—the centrifugal force of cornering pushed the car to the outside and off course. If I had trail-braked to the middle of the turn I could have forced the car to stay inside and it could have been brought back to the proper exit line—slower, but safer than running off the road. This entry, if executed properly, could become a passing line but you have to get the exit right.



speed 30 yards earlier, you can carry that speed for the entire distance of the straightaway. On just one corner you might gain 2 or 3 tenths of a second. It really adds up. Add that little bit from one corner, plus 9 or 10 more corners and, surprise, you've knocked a couple of seconds off your lap time.

Think of it this way: All the corners do is tie the straightaways together. The quicker you can exit a corner correctly, the quicker you can get down the straightaway and to the next corner. The quicker you can move down the straightaways, the quicker you can get to the finish. Get the picture? But if you enter the apex area too early or don't hold the car in long enough, you'll be slower, you will be doing more work, and you'll have worse results. So think, figure out your corners, do them right, be smooth, and you'll be quick!

Just don't forget to set up and enter the corner properly to be able to have a quicker exit. On the street you will want to approach the corner the same basic way except to make a shallower entry. And remember, the street apex areas are usually at least twice as long, because your speeds are so much slower. Also the roads or lanes are usually much narrower than a racetrack, minimizing the amount of road you have

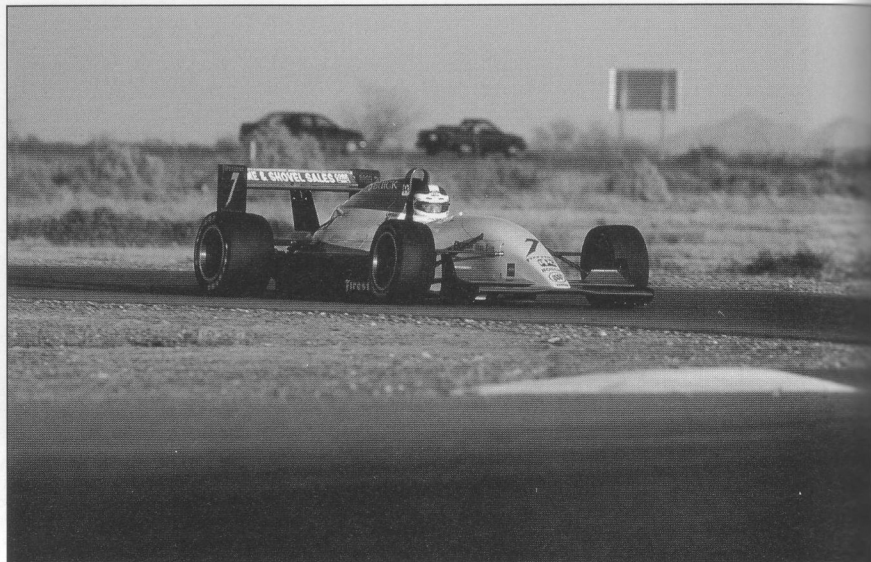
available to use. Most street apex areas start in the middle of the corner and continue to exit on the straight. On the street, you really should be keeping your speeds down anyway. But, if you get that urge, you had better be smooth and precise, have a good check in your mirrors, know the area well, and make sure you don't cause someone else, who doesn't have your abilities, to have an accident. Most of all, use your head and be careful, if not for yourself, for the others on the road. Remember, there is usually a run-off area on a racetrack, but there are none on the street.

Choosing Gears and Downshifting

Always slow the car first with the brakes! When downshifting, you must choose whether you need to go from fifth to fourth to third or directly from fifth to third—it all depends on the situation.

One of the most important factors to consider is that you make absolutely sure you have the proper rpm when you release the clutch if you've skipped one gear in your down-shift. If you go through all of the gears, you shouldn't have that problem, but it's easy to have too many revs if you come down, say fifth to third or fourth to second without using the gear in between. It is a bit faster, but

Right and facing page
Any given corner can be broken up into three segments: Entry, Apex, and Exit.





be careful and save your equipment. An over-rev on a downshift is usually what breaks engines. No rev-limiter in the world can help your engine when that happens.

The nature of the race course can also make the decision for you. If, for example, you have a wall at the edge of the track, or no run-off area, you use all the gears. If you have lots of run-off area, or the barriers are set well back from the track surface, go ahead and go directly into the lower gear.

One thing I might do is (if I'm really going in deep when I'm shifting from fourth directly to second) just pass through third gear; if I feel that my braking is OK, then I'll skip third and go on to second. It just gives a little more margin for error if the braking isn't quite sufficient. I could use third too, to put a little more weight transfer on the rear tires to help slow me some before second gear. I want to *slow the car and stabilize it **with the brakes***, not the engine.

Early, Middle, and Late Apex Areas

When it comes to *apex areas*, there are *early, middle, double, and late apex areas*. Each corner is slightly different, but as a rule, the apex area on the racetrack is usually about two-thirds of the way around the corner. On the street, it will usually start in the middle and exit all the way around the corner on the straight.

The way to tell if you chose the right apex is quite simple. If you set up for the corner and come out of it having to add more steering to keep from running off the road, then you had too early an apex. Or, perhaps, you hit the right apex but let the car drift out of the apex area too soon. The same thing happens: You end up with not enough road. Your front tires will have to be turned to correct for your mistake and it will slow you down.

If you've picked too late an apex, then you most likely have slowed the car down much more than was necessary, and your car will be in way too tight. With a late apex, you will not be able to keep the speed up enough to drift the car out to the edge, to take full advantage of all of the road. This is safer and OK for the street, but decidedly slower.

Ideally, you want to come out of the corner long and wide. If you are coming from a narrow road to a wider one, you will have an earlier apex area because you will have more road to use when you exit the corner. Just the opposite situation occurs when you come from a wide road to a narrow one: You will have a very late and long apex area.

Find a safe place to experiment and practice. Start slow and build up speed as you can handle it. Find out what happens if you apex early, late, or properly, but do it where you won't damage your car if you go off the road. And, more importantly, where you won't hurt anyone else. That is one of the most important priorities of high-performance driving. It is a responsibility. Use your head and good common sense. A good place to practice these basics is to enter some local SCCA autocrosses.

At racing speeds it is very important to hit the proper apex areas. If you don't, you'll find yourself off the road, or very slow.

I remember one time while I was tire testing for Goodyear. I was at Daytona in a Cobra and it was early morning and the car was warmed up, but I wasn't.

With the Cobra, it first understeers badly, then it goes into oversteer as the power is applied, then it reaches a nice, smooth four-wheel drift. It feels great once you get the hang of it. But, this particular time, I was into the turn a little too fast, didn't turn in quite as soon as I should have (didn't warm the tires up properly either), and all of a sudden I found myself sideways. Very embarrassing! Right in front of all the Goodyear people, the first lap of the first day of a week's worth of testing.

I spun. God, did I spin! I went for a hell of a ride. I did two 360s off onto the grass. I hadn't set up right for the apex, so the centrifugal force took over and pushed me right off the track. I slid to a stop, put it in the proper gear, and got going again. Simple as that. Had I been a little sharper, I would have turned in a little earlier and eased back on the throttle a little, saved it, and saved a lot of embarrassment.

Controlling Oversteer for Drifting

That brings us to *drifting, oversteer, and understeer*. In a properly balanced car, properly set up, the optimum handling characteristic is neutral. For these examples we are assuming a neutral-handling car.

Drifting through a corner means that all four wheels are sliding through the turn with the desired throttle control, making it nice and smooth. In this condition you are at the "limit," just a fraction past the point of maximum traction, but in balance and in control. If the car is oversteering, the rear wheels are starting to slide. In understeer, the front wheels are starting to slide and the car won't go where you steer it.

You control the oversteer and understeer with the throttle and the steering, creating what is known as a four-wheel drift. Getting into a four-wheel drift is a lot of fun, but not quick these days.

You can have power oversteer or simple oversteer. Power oversteer is when you come into a corner, set up trail-braking, and let the rear end slide out a little as you feed the throttle in, controlling it by the amount

of throttle you feed in. Too much throttle and your power oversteer turns into simple oversteer and a spinout.

Simple oversteer is a situation that usually indicates you're in trouble. You come into a corner braking too late and too hard, turn into the apex area with the front wheels sticking OK, but the rear end is too light and you might lock up one or both of the rear tires. With all of the weight transfer on the front tire contact patches, the rear end might want to come around. More often, when you don't keep enough throttle on while heel-and-toe downshifting (sometimes even too much throttle), you'll momentarily lock up both rear wheels and go into a slide.

Sometimes you can still save it by easing in a bit of throttle, which transfers weight back to the rear wheels. Not a lot, or the corner is history! That's not a lot of fun.

If you are in a power oversteer situation and come off the throttle too quickly, the rear end of the car will be gone. It will come around on you so quickly you won't have time to correct it with the steering.



Controlling an oversteering condition at the Times Grand Prix in 1963. Dave Friedman

Controlling Understeer

Understeer (pushing or a front-wheel slide) is a situation in which you either turned in too early, at too high a rate of speed, in too high a gear, or got on the throttle too soon or to hard. If the latter was the case, too much weight transferred off the front tire contact patches and they lost adhesion so the car wants to push you out of the corner.

If you turn into the corner a bit too early, hit too early an apex area and are going too fast, the car is being pushed to the outside of the corner by inertia. You want to get the car into the proper apex area, or you will run out of road at the exit. You add steering, but your car is still pushing to the outside. You are under throttle, but the gear you are in doesn't have sufficient torque to bring the rear end around enough to get you pointed right—the front wheels are still sliding.

Here's what you do: Ease off the throttle; this will lighten the rear wheels and transfer some of the weight back to the front tires. The deflection of the sidewalls will scrub off some of your speed and give you back your steering. The rear end will come around now, changing the angle of the car. Correct as much as you need with the steering and ease back into the throttle. The car will stabilize again, but you lost your speed advantage out of the corner because you had to get off of the throttle due to a miscalculation. Downshift and get going.

Practice, Practice, Practice! Learn your car and yourself! Take part in competitive activities, such as slalom and autocross, that will get you to know what you and your car will do in any given situation.

Choosing a Line through a Corner

In a warm-up session, before the race ever starts, I will try different lines through different corners to see what will happen if I have to go there during the race. I want to have possibilities available to me, before I have to do it out of necessity. I want to know if I can pass someone on the inside or the outside, going into or coming out of a given corner. I want to know if I can go high or low

in a corner if there is someone spinning ahead of me. I want to know where I can go safely if I need to. That's just another aspect of knowing yourself, your car, and the road around you.

Experiment to find out what happens if you turn in too early, too late, or too deep. Find out what makes each apex area work in any kind of corner for you and your car. Find out in which types of corners your car works best and which kinds of corners it doesn't work so well. The kinds of corners are unlimited—increasing radius, decreasing radius, negative camber, positive camber, banked, hairpin, high-speed—and each is different.

Every corner you approach will be different. There is no miracle formula that will teach you one standard way for every corner. The procedure, yes, but the line and the apex area, no. It depends on you, your speed, your car, and how your car is prepared.

At the Grand Prix of Belgium (Spa) several years ago, a novice Formula One driver remarked how he had difficulty doing a particular high-speed corner flat out in his Formula Ford; in his Formula One car, flat out (about 70 miles per hour faster) it was easy.

To learn to mathematically calculate your corners, I strongly recommend that you read Taruffi's book *The Technique of Motor Racing*. Use his calculations as a base. Then use your head and work it out from there.

On paper, corners can look simple and easy. The little figure in the drawings always makes it around the corner whether the diagram is correct or not. The photographs of cars actually going through corners under power and g-force loading in this chapter give you some real examples. But remember, your speed and your car (plus the amount of tire contact patch) and the way it is prepared will cause it to be slightly different. What we are giving you are the basics; the rest you'll have to find out from practice and experience.

If you do find yourself getting into some trouble (almost everyone does sooner or later), then we're about to tell you how to (we hope) get out of it, or at least make it less of a problem.

9 Getting to Know Trouble

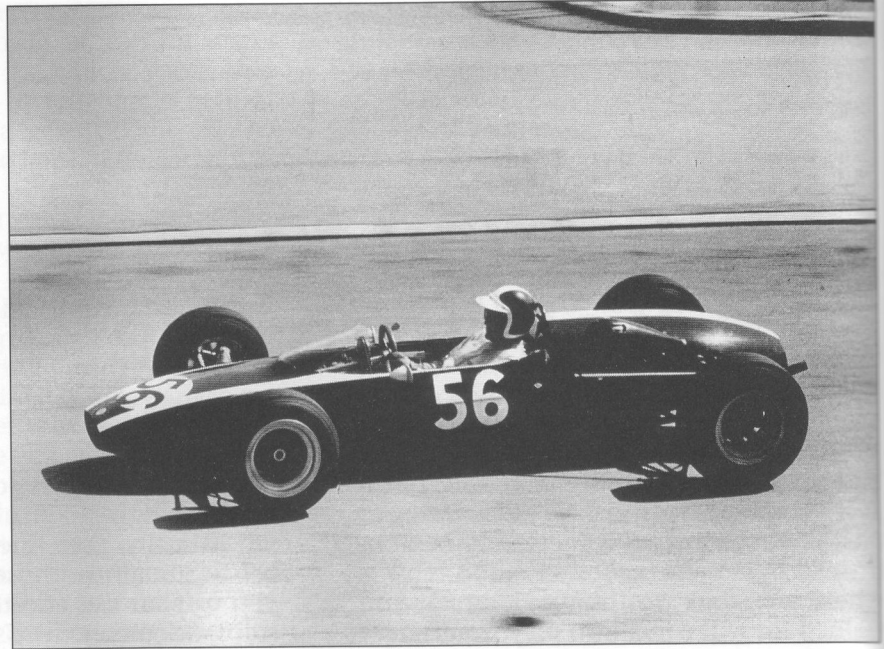
No one wants to get into trouble, but if you put many miles on a car, racing or on the street, you will inevitably be confronted by an emergency situation. This is where all that you have learned and trained for will come into play. You'll have to make a decision—quick! Your reactions will have to be lightning fast. Your judgment will have to be correct. You will only

have a split second to do everything! It had better be right.

Basically, there are two types of emergency situations: those that originate with you or your car, and those that are the result of someone else's actions. The most common is one that occurs from you or your car, usually because you become careless, fatigued, or sloppy—not just in your



Wet grass forced me into an oversteer at Daytona while tire testing.



*Driving a Cooper F-3 at
Monaco 1965.*

driving but also in your car's upkeep and preparation. Maybe you lose a wheel, the throttle sticks open, or the brakes fail . . . you know, the usual things that can go wrong. There are a lot of things that can go wrong when you are driving. So, as we said before, do the best you can to properly maintain your car.

If you do that, then the only thing you'll have to worry about is yourself . . . and the other guy who maybe doesn't care as much for his car or his driving technique.

Avoiding Trouble on the Racetrack

As mentioned in the last chapter, if you are racing, make sure that you try various lines in the corners to give yourself an option if something happens in front of you.

At Monaco in 1965, I was driving a Cooper Formula Three car for Ken Tyrrell that Jackie Stewart campaigned the year before. I had set the fastest qualifying lap and was running well in the race. I was just taking second place from Peter Revson. Monaco is really a tight circuit, even for a Formula Three car. To squeeze both of us through a turn, I

had to use every bit of the road . . . and a bit more. I had two wheels on the pavement and the other two on the edge of the hay bales at the edge of the circuit.

I passed Peter and was so scared I didn't move the steering wheel or make any correction on the throttle. If I had, I would have gone over the bales and into the harbor. I didn't feel like going for a swim. So I smoothly and gently kept my steering and throttle just where they were and eased the car back down onto the road again. I completed my pass as I was coming down off the hay bales and into Tabac corner.

After I got by Peter, I had Roy Pike, the race leader, in my sights and decided I was going to catch him. There were only about six or eight laps left in the race when I finally caught up to him and pressed him as hard as I could. He started driving harder, and I was driving harder, too. For me to catch him meant that I was obviously quicker. If you are in the lead and all of a sudden there is someone out of nowhere on your tail, you know he is a lot quicker; so that really makes you try harder. In Roy's case, even though he was leading, the harder he

drove, the slower he went. Remember, smoother is quicker.

I wanted that lead. I had two spots picked out to pass him. One was out of the tunnel, and the other was out of the casino bend. As we headed up the hill to the Casino, I was about two feet behind him, and I went deeper into the corner, as deep as I could, even over my head. He went in even deeper, and I knew he wasn't going to make it. He didn't. He started to spin into the guardrail, and I dove underneath him.

What I didn't count on was, after he hit the guardrail he shot right back across the track, right in front of me. Some choice I had: I could run right over the top of him or put my car sideways and spin myself. I threw my car sideways and hit him wheel to wheel. That was the end of my right rear suspension . . . broken. And, for both of us it was the end of the race, on our last lap. Peter went by us as we were climbing out of our cars, and he won the race. I should have used my head more. It was a two-heat race, but because I was so determined to beat Roy Pike, I didn't make it to the second heat.

When I crashed, the first thing I saw when I got out of my car was Fangio—Juan Manuel Fangio, the only five-time World Driving Champion. I had met him the day before and he had invited me to race in the Temporado series in Argentina, strictly an invitational series of races. And, here I am, crashed right in front of him. He was sitting on the veranda of the Hotel du Paris. I thought to myself, "Oh, my God, how embarrassing." That was the end of Monaco for me for that year.

That kind of thing can happen easily to anyone in a racing situation, but it is unnecessary and expensive. In racing, once you've committed to a decision, there's usually no second chance. Experience will help you to make the right decisions, but getting that little bit of experience can at times be very costly. You must be sharp, alert, and quick with the proper decisions. A moment's lapse of concentration, and away you go.



Always look where you want to go. Here I am looking ahead while driving a vintage car event at Firebird. Mario Andretti won the F-1 Championship for Lotus in this car. Bob Dunsmore

Stay in Control—Concentrate

Most out-of-control situations are a result of lack of concentration, trying to go too fast too soon, or simple carelessness. Sure, sometimes you'll do something wrong just because you don't know better, but usually it's from driving over your head, or above your ability, or your car's.

If you're about to get into a situation that's going to be more demanding than you can handle, get out of it before you get into trouble. Listen to that little voice in your head that is trying to tell you to use your common sense. As your driving ability and experience become more refined, you will be able to read a situation before it happens (in most cases).

In the situation at Monaco, it was my first single-seater drive and the information that I was acting on was from Corvettes and Cobras. I didn't realize that when a single-seater with open wheels hits a guardrail, the car gets shot right back into the way. Full-fendered cars usually stay against the wall longer.

Most accidents and spins come from doing something wrong or doing nothing at all, rather than from making a wrong decision of where to go. Most of the time, a spin or an accident can be avoided if you know what to do, which takes practice and learned experience. One of the most important rules to remember in an emergency situation: *always look where you want to go, not where you are.*

Avoiding Skids, Slides, and Spins

Now comes the hard part. Skid, slide, and spin all mean the same thing—you are

out of control, or almost. We'll try to give you some control over those problems, so you don't have to be just a passenger, watching it all happen around you.

One of the first things that you probably were told when you started driving was that if the rear end of the car starts to slide out or skid, *turn your steering wheel in the direction the car is sliding.* That's right; it works! How well it works is up to you. Your reactions have to be fast, very fast. Lightning fast!

Again, you have to be in fine tune with your car and know—as soon as the skid starts to happen—how much, how fast, and when to correct. The main thing is, *quickly*, as fast as you can, *move that steering wheel!* Immediately turn it in the same direction the rear end is starting to slide so you can start to stabilize the slide. If you react too slowly or turn the wheel too slowly or not far enough soon enough, you still will probably spin out.

The Times Grand Prix in 1963. Allen Grant spins, Bonduvant wins. Dave Freidman



There is a way out! If you get into a slide and don't correct it either soon enough or quick enough, simply turn the wheel back straight, front wheels pointing straight ahead. Put the clutch in (or shift into neutral with an automatic). The car will do a 180-degree spin and come out straight, going down the road backward. *Gently* squeeze on the brakes, coming to a stop. Don't worry about the other people; believe me, they will be watching out for you!

There are a lot of different things that will make a surface slippery or slicker than normal: rain, snow, ice, or other weather conditions, oil, gas, sand, gravel—with any of these, you will lose traction. The tires don't have enough adhesion and the car slides.

The most common skid that you will be confronted with is when the rear end of the car slides out on you. Left or right, it's the same. Usually it has happened as a result of going into a corner too fast, or incorrectly, or hitting a slick area causing your rear wheels to oversteer. This can happen also from not adding enough throttle on a heel-and-toe downshift causing the rear wheels to lock up; or putting on too much throttle in a corner before the direction and set of the car can handle it; or jumping on the brakes too hard, locking up the rear wheels. Whatever the cause, here's what to do to correct it.

Stay off the brakes! If you don't, you might lose your steering and make it even worse. Then, *quickly*, steer in the direction that the rear of the car is sliding. If you have full throttle on, ease off enough to bring traction back to your rear wheels. Don't pull all the way off of the throttle or it will take what weight you have on the rear wheels and transfer it forward, making the rear end even lighter.

In wet weather ease *all the way* off the throttle to lessen the skid or slide. If you caught the first slide, be ready for one in the other direction (caused by overcorrecting). If it happens, adjust for the slide in the other direction. This, in a very quick situation, can happen back and forth several different times. Be ready each time and keep the car going in a forward motion or



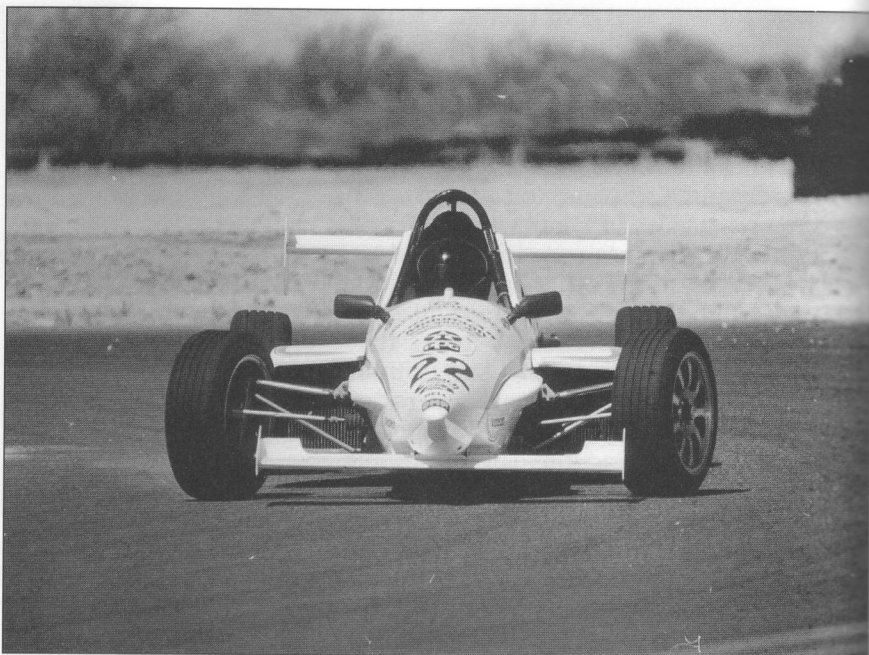
Front-wheel skid . . . stay off brakes and gas. Let the tires scrub the speed and allow the vehicle to straighten itself out. Rick Scuteri

direction. Correct each skid by turning into the direction the back end is sliding, *as fast as you can*.

If the front end of the car is skidding in understeer, the correction to keep you from going off the road is simple, but be careful because you'll find oversteer when you come out of an understeer condition. If the front end is pushing to the outside, you will have to ease off the throttle to transfer the weight back to the front tires to gain steering control. The rear of the car should get lighter, and your steering will come back. But the rear may then want to move out, so get ready to correct the steering in the same direction the rear end is sliding. If you can't correct your rear-wheel slide, you will end up going the wrong way.

Remember to look in the direction you want to go, as quickly as possible, and you will end up going in that direction. When the slide is corrected, straighten your steering wheel, fast! You easily know where straight ahead is, because you always grab your steering wheel at three and nine, so when your hands are there you should be going straight ahead.

Quickly turning into the skid will effectively control a rear-wheel slide.
Rick Scuteri



When you make corrections in a skid, make them quick and positive. Keep your car going in that direction. If you are racing, it makes a lot of difference in lap times, so try not to skid. Every time you have to correct in a major fashion, you are losing time. Being consistent and smooth saves time.

What if your car reaches an angle of 90 degrees or more to the direction you were traveling, and it looks like you won't be able to catch the slide? Don't worry yet—you can, hopefully, still save the car, but the fast lap is now history. Again, *stay off the brakes!* Remember, the faster you are traveling, the bigger the spin is going to be, and the faster you will have to correct it.

As soon as the car gets past 90 degrees (it's too late to keep it from spinning), what you want to do now is spin the car the rest of the way around and create a forward 180. This is where you are now traveling in the same direction as before but backward. Straighten the wheel, put the clutch in, and put the car in neutral. If you don't keep the clutch in or put the car in neutral, the drive wheels will push against the directional movement of the car. That's a good way to

flat-spot your tires, stall your engine, and get into even more trouble.

You are still going in the same direction you originally were, but now you're backward (a 180-degree spin). At this point, there are two things you can do. One, carefully drive (back up) the car to a safe place to stop it, or two, spin it back around (if you have sufficient speed) and get going in the direction you had planned to go originally (a reverse 180-degree spin).

If you still have sufficient speed while heading backward and have enough room to negotiate without endangering someone else, then it's time to execute a reverse 180-degree spin. This is where you start out backward and end up going forward. It's not that difficult, if you stay off the brakes. If you don't, you won't have enough speed to execute the maneuver.

So, here you are, heading backward at over 70 miles per hour. What to do? While looking in your mirrors to see where you want to go, give the steering wheel crank quickly toward the object you want to miss (clutch in, no brakes) to a complete full-lock position. Turning the wheel either direction



The Bondurant skid car.
Rick Scuteri

will work. If there is a wall or barrier on one side of you, steer that direction and, since you're heading backward, you'll spin in the other direction. As with the forward 180, when the car gets past 90 degrees, straighten the wheel . . . you know, 3 and 9. When you straighten the wheel to go straight again, it *must* be done fast and firmly.

Don't forget that during the whole procedure, the clutch is in and/or the car is in neutral, and the engine is kept running. While the car is coming around to straight ahead again, keep the clutch in but shift it into the gear that's going to handle the speed of your exit. That means you'll have to have your revs matched for your next exit speed just like a normal downshift. As soon as you're heading in the right direction again, ease out the clutch, ease on the throttle, and away you go.

To do a 360-degree spin, you just combine a forward 180 and a reverse 180, and you'll be heading in the right direction, if you're fast enough and do it right. World Champion Keke Rosberg accomplished this at the Long Beach Grand Prix one time when he spun going for the lead, and only

lost one position. It works! It just takes practice, like everything else. The best place to learn is on a skid pad. There you won't hurt yourself, your car, or anyone else.

At my school, skid control training is a very important part of the overall program and is found in each of my driving courses. We use specially designed skid control cars that can simulate any given emergency skid condition. The next step after skid control is accident avoidance.

Avoiding Accidents

The most important thing to understand is that you can't stop as fast as you can avoid, even with antilock brakes (ABS). This is especially true at racing speeds. In my first sports car race, driving my Morgan Plus-4, at Santa Barbara in 1956, I was coming into Turn Nine at the old airport course, and some guy in a Mercedes 300SL Gullwing lost it right in front of me. First race—great! Right in front of me. I swerved to miss him and ended up spinning myself. Everyone said, "Oh, wow, you did great—a great job spinning to miss that guy." The fact of the matter was I really didn't try

to spin, all I wanted to do was miss him. Well, I missed him.

That was my very first incident in a race. There have been many more, but through experience I learned how to avoid a problem, usually without having to spin to avoid it. On many occasions I've had to swerve to miss other people spinning, or to miss oil dropped from a blown engine, or whatever.

It can be done safely and usually without incident if you are *really alert*, if you're *looking far enough ahead*, and if your *reactions are quick enough*. Here we are again, right back to *concentration, alertness, anticipation, and reaction speed*—everything that you need and have if you are physically and mentally fit.

Avoidance is usually quite easy. Someone spinning in front of you is a typical situation on a race circuit. On the street it may be a car door opening, a child chasing his ball, or a dog running in front of you that must be avoided.

First, *don't use your brakes*. Lift off the throttle, immediately! This transfers the car's weight and momentum forward, giving you a larger tire contact patch. Second, turn or steer to avoid the object. Usually, you should aim for where it has been, *not* the direction it is going. At speed, a slight turn of the wheel is enough, then immediately correct to your straight-ahead direction (3 and 9 on the wheel) and squeeze back in the throttle. This now transfers the weight back to your rear tires, giving you straight-line traction.

Object past. Where to steer to? It depends on what you are avoiding, but in the case of a spinning race car, the best place to head for is where it has already been. That's to say if the car in front of you spun to the left and hit the wall it will go to the right in front of you; so head where the car has already been, to the left.

In a real high-speed situation you'll have to be faster than you can imagine.



The Bondurant accident avoidance simulator showing the technique known as lift, turn, squeeze. Rich Chenet

And, you'll have to be perfect. If you stay off the throttle too long in an avoidance maneuver, the rear end will get light and you can spin too. Therefore, it's really important to get the power back on (smoothly) as soon as you can see that you are going to miss what's in front of you.

If you can't avoid the object and you are forced to stop, make sure your steering wheel is turned straight ahead. Get ready . . . we are about to stop . . . fast—Panic City! If there's no place to go, and it's either stop or crash, you'd better know how to stop. *Cadence Brake*. Nice term? Nice procedure. It is the only thing that might stop you. And there is no guarantee. It depends on how fast you are going, how much distance you have in which to stop, and how well you cadence brake.

Cadence Braking

The cadence braking procedure works well, especially in wet weather, but it works in the dry too. Very simple. Your foot comes off the gas, weight transfers to the front, increasing the tire contact patches. If you ease on the brakes, as in a normal braking situation, you simply won't have time to stop. If you panic and lock up your brakes, you've just lost your steering, and you'll slide right into what you're trying to avoid. Using cadence braking, you'll stop in half of the distance of normal.

Here's how it goes: Put the brakes on full, just to the locking point, then rapidly come clear off of them, then on again full, then off again full, on, off, on, off rapidly—very rapidly. The faster you pump them on and off, the faster the car will stop. Don't pump ABS brakes! Just step on them hard and steer where you want to go. But race cars don't have ABS, so cadence brakes.

The wheels must rotate to give you steering control. When they are stopped from turning, the tire patch comes down to about the size of a silver dollar and you have no steering control. When you are pumping the brakes, it will start to give you back your steering control. This is what ABS brake systems do for you, only here you're doing it manually.



Using ABS brakes. Rick Scuteri

It takes some practice but it works, if you do it fast enough. Pump them as fast as you can on and off till the car comes to a stop. Those cars equipped with an ABS braking system do this for you, except electronically, all the time. ABS is a great braking system and in most situations on most cars, is a wonderful option.

Maybe you don't want to come to a complete stop, or maybe you want to change direction as you're slowing down. Here's how: You must be able to keep your steering ability. Come completely off the brakes for an instant, make your steering correction and continue your cadence braking till you have stopped or slowed sufficiently to avoid the problem. If, for some reason, you are in a full-locked braking situation (which you shouldn't be but you are) and you must change your direction slightly (say if you're on ice), come off the brake, make your steering adjustment, and then cadence brake. Don't just hold the pedal to the floor!

The key is to feel everything your car is doing and anticipate what might happen, because when it does, you aren't going to have much time to make more than one decision. Practice, practice, practice! Find somewhere safe like a vacant parking lot, and see what your car does.



Using non-ABS brakes.
Rick Scuteri

OK, here's what you've been waiting for, a plug for my school. It takes practice on a skid pad to find out what it really takes to cadence brake, correct massive oversteer, spin 180 and 360 degrees, and the like, safely. My school has fantastic skid-control instruction. Most of the other schools don't. Some don't think that it's necessary, others just don't have the facilities or the room that is required. It is, however, a really important step in learning complete car control. You have to know exactly what you and your car will do when the situation presents itself. And, it will sooner or later.

At my new, state-of-the-art facility near Phoenix, Arizona, I dedicated a large area of the facility to skid control. I have six highly advanced and dedicated skid cars for student instruction: three rear-wheel-drive Ford Mustangs and three front-wheel-drive Ford Taurus SHOs.

Driving in Bad Weather

Adverse weather conditions present even greater hazards and the need for even greater smoothness and concentration. In the rain, a typical turn can be transformed into an instant nightmare if overdone. Your line through a turn in the rain will start a little sooner and slower for a shallow entry.

Your apex area might be twice as long and lower or higher on the road than your normal racing line, because in the rain, off the racing line is where the traction is.

You have to judge the shape and type of turn, and you'd better get it right. The track will become more slippery in places where the rubber has been placed than where there is no rubber. While you have the greatest traction from rubber build-up in the dry, the opposite can happen in the rain. You want to have a slightly higher, more stable, and smoother line. You have to straddle the rubber that has been laid down, sometimes higher or lower because of puddles. Question: Why? Answer: Maximum traction!

Driving in Traffic

Good anticipation comes from experience, from learning to watch the other people you're coming up on and getting familiar with them. You should get to know them personally too, not just on the race-track or driving. Experience is learning to read other people. You need to get to know their personality traits that can help you on the circuit, to learn their moves and see what they do and how they handle themselves in a variety of situations, especially under stress, under attack. You need to

know what their egos will make them do.

The same goes for traffic, passing and drafting. Look far enough ahead to judge and get to know your competition, keep alert, and anticipate. With experience you should be able to take it all in and make the correct decisions.

Each circumstance is different—but learn from watching. Just because the driver in front of you gets the passing flag, don't expect him to pull over and let you by. It completely depends on that driver, so you may get plenty of room or you may have to race him to get past. Just remember, a clean pass is the responsibility of the overtaking driver, not the driver being passed.

That's where experience and how well you've learned to read the competition come in handy. The driver might make it look like you are getting a lot of room, then slam the door on you. An epic battle between Prost

and Senna, for the World Championship in 1989, saw the season title decided in Japan by just such a maneuver. Prost opened the door for his McLaren teammate, Senna, and took him out. Prost was World Champion and Senna Vice Champion. Just keep alert and watch everybody. It's a lot better to profit from someone else's mistake than from your own (Sandro Nannini won the race for Benetton Ford).

Traffic and passing are nothing more than fiberglass mental gymnastics. Everyone is trying to psych out the other guy. The one that doesn't get psyched is the one who will do well.

In drafting: You can pick up a draft at least six or eight car lengths behind the car in front of you. A lot depends on how fast you are running, but generally the closer you get, the easier it is to run faster. You are in what is referred to as his "slipstream."



Driving in bad weather at Brands Hatch in 1965.

This makes both cars run faster than if there was only one car cutting through the air, but there are problems, too.

A good example of drafting can be seen at any NASCAR race, with the leaders usually running nose to tail. They run faster, but the second car, although it gets better fuel economy, can really have a problem with cooling if they run too close too long. The lead car has a problem too, as the second car can easily whip out from behind and gain momentum in the clean air, and easily pass the leader.

In many of the single-seater races now, especially with the highly advanced ground effects, it is very difficult to drive close to the car in front, due to the extreme turbulence created by the ultrahigh down-force that is created. The turbulence can cause both the car in front and the car in the rear to become very unstable, such as in the IRL IndyCars or the CART Champ Cars. Know what your car will do in all conditions.

In traffic, you need to have a plan to get through. You're going to have to make your plans and decisions quick, but once you do,



First lap traffic coming into turn 7 at Riverside. George Fulmer in No. 16, Jerry Grant in No. 8, Don Wester in No. 60, and Bobby Unser in No. 96. Dave Friedman

you're committed, so it had better have been the right decision. After you get by one car, forget about that one and start concentrating on the next . . . how you're going to get by and where. Plan, think, and be quick and decisive. And watch what's happening. Look for weaknesses and strengths—that goes for both the car and the driver. See what corner he is really having trouble with and work on him there. Try different lines yourself to see what you can do at that spot. When he's really messed it up, go for it.

You now know that everything you do in a car must be smooth. When braking or accelerating, it must be eased into and out of. In rain or other adverse conditions, you can multiply that by about five times. When you drive in adverse weather, you must be even more alert, and every little thing that you do must be extra smooth, gentle, and precise. You must be going decidedly slower in the rain or you'll be off the road.

Going Off the Road

When you do go off the road (and you will sooner or later), the most important thing to do is to *turn the wheels straight* in that instant just before you leave the road. If you don't, you may dig a wheel in and might flip over or roll.

I still compete in a lot of vintage racing events, driving very beautiful, very fast, and very expensive old race cars. In a race not too long ago, we were running in a full but mixed field of mid-1960s racers. It was one of the last races of the day and the sun was getting low. About halfway through the race, someone lost an engine on the main straight. Oil was everywhere.

The last corner is a flat-out top gear corner leading on to the straight. Before an oil flag could come out, three cars lost it. One spun down the middle of the track and continued. One spun to the outside and crashed hard against the wall. The third almost saved it. He corrected just right, was scrubbing his speed, and the car had stabilized. He was still heading off the road, but at least front wheels

first and would have had just a drive through the mud.

But the driver didn't straighten his wheels as he left the road, and the poor little TR-3 snapped into a violent roll. The driver was OK but the Triumph was really bent. He did everything right but straighten his wheel as he left the road. Maybe no one ever told him to do that.

The next most important thing to do when you run off the road is *don't hit anything*.

Assuming that you don't have a problem with that, the next most important thing is to either get the car stopped or get back on the road. Let's say that you don't need to stop because all that happened was you apexed too early and you ran out of pavement at the exit, putting two wheels off the road. There is no real problem if the shoulder will support the car and the edge of the road is absolutely even, without a lip. Ease off the throttle smoothly and hold your line. Don't try to steer immediately back onto the pavement, or you could dig in a wheel on the edge of the pavement and spin or roll the car while attempting to come back on the road. Look for a smooth and even bit where the road meets the off-road, and try to get back on there.

Again, as in most situations: *Stay off the brakes!* Hold your line, maintain your traction, and ease smoothly and carefully back onto the road surface. The same thing goes for having all four wheels off course—ease back on where you can safely. If there is a grass surface at the edge of the road, be prepared to quickly correct any oversteer that might follow, and be ready to ease back on the throttle a little if your tires lose traction. But . . . stay off the brakes!

Driving Front-Wheel-Drive Cars

Most cars on the road now are front-wheel drive. For better or for worse, they are less costly to produce so we're stuck with them. The manufacturers have convinced us that they are better, but what they really want is to sell cars, and if it's cheaper to make them, then that's better too.

The above-mentioned procedures will work with almost all cars except front-wheel-drive vehicles. With front-wheel drive, you have a lot more weight over the front wheels, increasing the tire contact patches, but less weight at the rear and possibly less traction at the rear. Front-wheel drive is great to drive in rain and snow.

Cornering techniques, as well as oversteer and understeer characteristics, are slightly different with front-wheel drive. Front-wheel-drive cars have a characteristic called “power understeer” with the front wheels (the ones you have to steer with). It’s an interesting concept.

You brake, enter a corner in the normal way, complete your downshift, and trail-brake into the corner. You must ease off the brake, or the inside rear wheel (probably almost off the ground by now) will lock and make the already light rear end want to swing around even more (remember, this is still oversteer). This puts an even greater load on your outside front wheel. If the rear starts to come around, you must *accelerate to pull yourself out of the corner*. The acceleration transfers the weight again to the rear and increases the rear tire contact patch, and thus the traction.

So far, so good, but if you put in too much throttle to save the back end, you might lose the front. The car might go into power understeer, and the front end will, with acceleration and even steering correction, push to the outside of the corner and that, oddly enough, will be forcing the tires to lose adhesion. What you must do if the front end starts to go is *stay off the brakes!* In this case you have a throttle problem too.

If you come off the throttle all the way, both the front and the rear will lose traction and you’ll be gone! If you stay on the throttle, the front will completely wash out and you’ll be gone! What to do? *Cadence throttle*—come off the throttle quickly, then depress it again just as quickly, on/off, on/off, just like cadence braking. This will get you traction through the turn, a bit jerky, but you’ll make it through the corner.

But don’t try to corner this way in each turn. It’s not the fastest way, and it’ll tear up your car. If you break a CV joint you’ll have to just park it. (If you clip too many curbs, you’ll probably break one.) One more time—do it right and maximize traction. Cadence throttle, for front-wheel drive only. It can get you out of trouble.

The front-wheel drive Ford Contour instructor car.



10 Getting Into Racing

Anyway we go, into the never-never land of buying a race car. Stop! Wait a minute! Is that really what you want? Ask yourself a few questions before you take that big and very expensive step. Big question here. Do you *really* have what it takes? Time? Talent? . . . Determination? And lots of money?

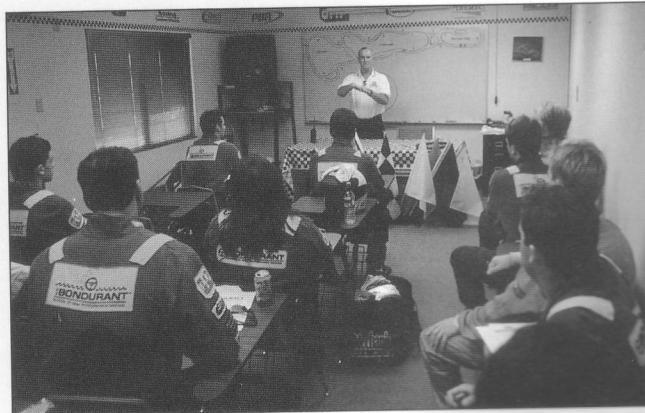
How do you know you are even going to like racing? Have you ever driven a car at its limit? Are you going to panic the first time you get sideways? Good possibility. Let's put it this way: Do you want to spend \$30,000 on a car that's going to scare you to death? Or, maybe driving around by yourself is OK, but you nearly run off the road to get out of the way of someone trying to pass you. Don't like traffic? How do you find out till you try it? And, how do you try it without buying a car? Please read on.

One of the fastest and cheapest ways to learn if you like driving a car fast and to find out if you might make a good race driver is to take the four-day GP Road Racing Course at the Bondurant School of High Performance Driving, 1-800-842-RACE. This first investment can either stop a career before it ever starts, or get it headed in the right direction with a minimum of cost. At this point, don't waste your money on a race car. *Invest in yourself.* You'll have more to show for it.

Today, I still love racing. It's a lot of fun to compete in those vintage cars that I used to race. But, I like to keep current with the latest

technology and driving techniques, so I just finished a full season driving with the Steve Saleen and Tim Allen Ford Mustang Team. After being out of pro racing for more than a few years, I found that it took me four races to dial-in driving "quick" again (over 170 miles per hour and 100-mile-per-hour corners).

Team Saleen fits a driver computer to its Mustang racers, which I have integrated into my school program, too, for the advanced students. This computer tells you exactly the percent of throttle and brake that the driver has on or off at all times. It also records the amount of steering that is fed in, smooth, jerky, abrupt, or precise. It will show exactly where you are on the track, on-line or off-line, all the way around the track.



Instructing the four-day students on vehicle dynamics and the racing line. Rick Scuteri

The computer that Saleen/Allen Racing uses also gives complete mechanical feedback from suspension to fuel/air mixture, as well as constant rpm monitoring, so the car's engineers can see exactly what the car and driver are doing all the time.

Computers are a great asset, but it still all comes down to the driver. The driver has to decide when to apply throttle, when to brake, when to turn in, where to pass or not pass, and how hard to accelerate. A driver can drive extremely well, or he can abuse the car. The computer can tell you what happened, but the burden of performance is still on the driver.

The driver still must always work closely with the crew, spend time with the mechanics,

earn and keep their respect. Remember it is a "team," and everyone must communicate and be honest with that communication. Tell it like it is! Then and only then can you have a winning team.

Today's race cars are a lot more sophisticated, and, as I really learned with Team Saleen, racing is still lots of fun and very exciting, but it still has its disappointments, just the way it did 30 years ago. When you finish well and win, it is a feeling unlike anything else. The only thing that comes close is flying a helicopter well. Your whole body senses and feels everything. It's man and machine blended into one . . . pure excitement.



Winning a vintage car race at Firebird Raceway in a Chevy-powered Devin-modified sports car that was raced in the 1950s.

Racing is *not* like driving fast on the street. Not even close! It doesn't matter how closely you follow the sport or how sure you are that you want to race; until you try it, you'll never really know what it's like. People can tell you what it's like, but until you try it for yourself, you'll never know. You may even surprise yourself and be better than you think.

Planning Your Racing Career— Driving Schools

The Bondurant School furnishes the latest well-prepared SVT Mustang Cobras (2 seaters so your instructor can ride with you, observing and correcting your problems as they happen). Then you drive our latest Formula One-style wing cars. At the end of the 4-day GP course, you will have a race. It's great!

Racing is expensive, there's a lot to learn and it can be dangerous, so get the



Back on the podium again in 1995, driving for Saleen Allen team at Road Atlanta. Shelly Harris



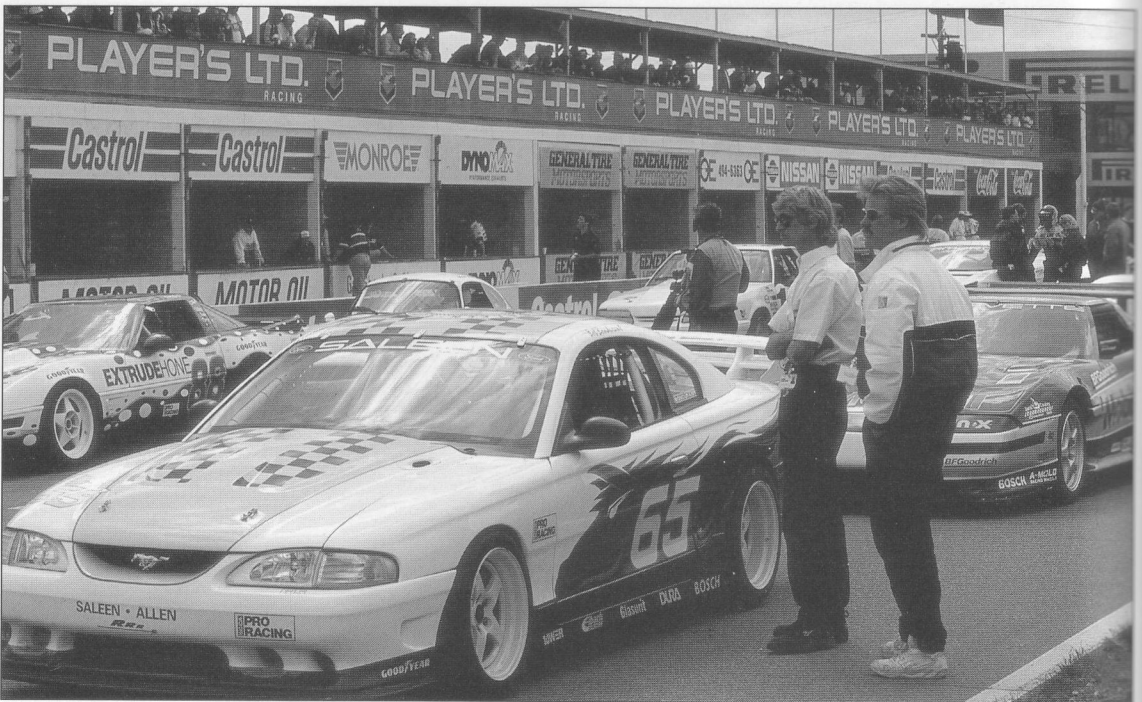
Leading the field at Lime Rock in 1995. Shelly Harris

best training and as much experience as you can before you ever think about buying a car. Attending driving schools is the least expensive way to learn how to drive a race car. It isn't a bad idea to do a couple of schools for the experience. Most have advanced instruction too. And when it comes to getting your license, the Bondurant School now qualifies you for your regional amateur license.

I still recommend doing the SCCA school too, because, first, it is good track time and, second, each region has its way of doing things. Taking their school, too, will give you a real good idea of how they flag their events, how they run their races, and generally what to expect from your competitors. Do the whole school, even though they waive the first weekend for Bondurant graduates. The experience is what you will need. The more track time you can get, the better. For SCCA school, rent a car, don't try to field one of your own. You need to be able to concentrate on what's happening at

school, not what's wrong with the car. Renting a car is great. Pay your money and the car is all ready for you to step into. Find out who prepares the best ones in your region. Cheaper isn't necessarily better. Rent from a preparer whose cars finish.

Most schools will teach you the proper way to do things, on an individual basis, before you have a chance to learn the "traditional way" of doing them wrong. The traditional way, trial and error, can be very costly and not very gratifying. It causes a lot of very potentially talented drivers to give up and fall by the wayside. Sometimes it's money, disappointment in the car they've bought, or just not being able to get around the track properly (which could be the car or the preparation). Many people are lost without really giving themselves a fair chance. Try a school first. Prepare *yourself* before you ever think about buying a race car or converting your street car to a racer; enroll in a school. It's also an ideal way of picking up advice and tips about starting



Final pre-grid activities at Mosport. Shelly Harris



In the advanced courses at the school, we utilize a PI data acquisition system to show proper line technique, throttle position, brake position, rpms, and lap time. Rick Scuteri

racing. All of the instructors have been or are active racers. Pick their brains.

It will take a lot more time and money to reach the same level of driving expertise by the trial-and-error method than by proper school training and instruction. Many trial-and-error drivers *never* reach the proficiency of the school graduate. Any racing school is better than none, but if you are really serious, you might want to try a couple of different schools before you embark on that long and expensive road of race car ownership.

I feel that the Bondurant School offers the most complete and thorough instruction. You want to be sure that you attend a school that will provide you with the firmest foundation possible. The Bondurant School is the only one that starts from a high performance 5-liter Roush race-prepared V-8 Ford Mustang and progresses to single-seater wing Formula Ford race cars. We are the only school to teach all of the basics.

I believe that while learning, students must have an instructor riding with them (as we do at the Bondurant School) to see exactly what mistakes are made and get them corrected immediately. It is also necessary to ride with an instructor to see exactly what he does—not just what he might say. You'll see the proper use of hands on the wheel, good

feet positions on the pedals, heel-and-toe downshifting, trail-braking, and proper seating position. From them you will learn to use your eyes better and look way ahead. It's also important to see the turn properly and what the track ahead is like, especially with other cars on it. The proper use of your eyes in both racing and driving on the road everyday can save your life or keep you from having an accident. Plus, when racing, it can give you the quickest lap times, consistently.

From here, I do recommend that you, providing that you still want to race, try other schools as well. Many of the other schools are geared in the direction of Formula Ford. My school includes that as part of the total program, but by no means limits you to just that (some students just aren't comfortable in single-seaters). The Bondurant School now has a special program that actually puts you in competition with the other students and will qualify you for a full SCCA regional novice license.

Some of the other schools now sponsor racing series. Any of these series provide you with a car (well prepared), and actual racing competition time. Your investment is your time and a minimal amount of money—far less than if you had to buy a car and field it yourself. If, after a few races, you feel that this isn't quite what you wanted, you can just

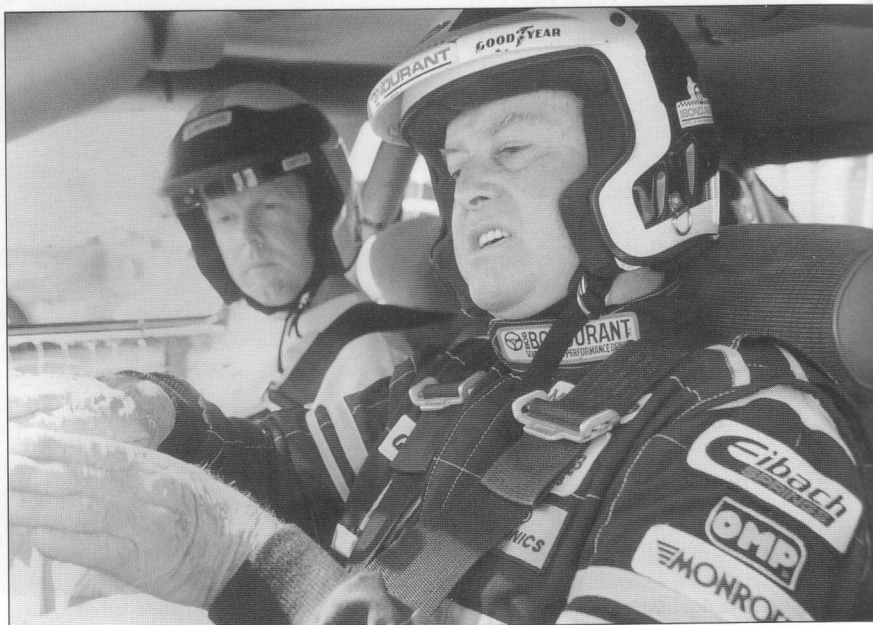
walk away. You won't have the worry of owning and preparing your own car (that probably didn't work right anyway) that you will have to get rid of, probably at a loss.

My school offers the most thorough instruction anywhere, with a ratio of three students to one instructor. Every student has his or her own car to drive throughout the program that is maintained by my own professional staff of mechanics. And, unlike many schools, we have plenty of spare and backup cars, should you have any problems. All of my instructors are personally trained by me, and all are good competitors in their chosen classes of competition.

To learn a technique, you will ride right along with my instructors to see exactly how it is done. Each instructor has his own personal instructor car, a Ford SVT Contour, and will personally demonstrate each and every maneuver to you before you try it yourself.

The instruction and its completeness vary a lot from school to school, but you will get what you pay for. In some cases, a lot more. How much and how well you learn is up to you, the school's basic curriculum, and how good the instructor is.

Here I am instructing a student on the proper line, based on what the computer system showed us. John Blakemore



Any school is better than no school, but some are definitely going to teach you a lot more. It really all comes down to you. If you don't listen or follow instructions, and a lot of time it's easier not to, you are only cheating yourself. Go to a driving school with the attitude that you are going to learn all that the instructors can possibly teach you, and you'll do great!

Choose a quality school, not just a two-day course. It's not a vacation or going around the track in a parade—it's serious business. It's work, it will tire you out, but it can also be very satisfying. It's one of the most self-satisfying, personally rewarding learning experiences you'll ever have. I know, I see it every day!

OK, let's assume that you've gone to a racing school, or better yet, a couple of them, competed in a series and decided that you want to be a road racer, or maybe an oval track racer. Now what?

Getting Licensed

Yes, you might want to buy a car and go from there, but it is really advisable to put

together a whole plan and package, complete with schedule and goals. It's great to set your goals high. After all, it's all up to you and your talent. (Money helps a lot too.) What you need first is a license: SCCA (Sports Car Club of America), or Professional Sports Car Racing Inc. (formerly IMSA), USAC (United States Automobile Club), NASCAR (National Association for Stock Car Auto Racing), or whatever you chose to compete in. What kind of racing do you want to do? If you aspire to be a professional, you'll have to do both road courses and ovals. How much money do you have to spend? Until you've done some racing and won some races, you probably won't find a sponsor unless you own the company. So, guess who's going to foot the bills? Right. *You!* So, let's get the most for your money.

If you own your own company, you can write your racing off for PR, promotion, and advertising purposes if you carry the company name on the car. You can also use

the car as a company morale booster when you do well! Racing is a great vehicle to entertain special clients on a weekend outing.

Just because you don't have a car yet doesn't mean that you can't go to the licensing body's driving school. You might have a friend who will loan you his car, or maybe you can rent one for the weekends of the school (still cheaper than buying). The most popular licensing schools are those of the SCCA. For information on all of the current requirements and fees, you should contact the SCCA directly. They will be able to inform you as to when they are holding their schools and where within your region.

To get a novice license with the SCCA, you must satisfactorily complete two weekends of SCCA driver's school or one private certified competition driving school (such as the Bondurant School). The Bondurant School and a few others qualify you for a full regional license but not all schools do.



Carroll Shelby talking to the Cobra Team in 1965 at Sebring when we won the GT category. Remember it's a team effort and communication is very important to be successful.

Inquire who does and who doesn't. With some, you just get the first weekend of the SCCA school waived. It is really recommended that even though they waive one of the school weekends, take it anyway. It is good inexpensive practice, and it will both give you more track time and help to better familiarize you with their racing procedures. For full and current details, you'd be wise to contact the club. Things change, so keep current.

For a Professional Sports Car Racing Inc. license, you are eligible for a provisional license after satisfactorily completing an approved competition school (like the Bondurant School). Again, contact Professional Sports Car Racing Inc. directly, or any other sanctioning/licensing body for the most current regulations on the racing series in which you are interested in competing.

You'll want to find out all of the rules and classes available in all of the sanctioning groups, so let's get the legwork started. Learn as much as you can about everything. That is, driving, mechanical preparation, and PR. You'll have to sell yourself. I know, I know! You want to get to the good part—buying a car. Hold on. We're just about there. Don't forget, you are learning! So, listen, take a deep breath, and hold on. Here we go!

Time. Take your time. There's not the rush that you think. We've already established that it's better to ease into things than jump into full throttle right away, so why would it be different with buying a race car? It's not. Chances are that you're going to have to wait for a school anyway. (SCCA schools are usually only once a year, just before the season starts, or you could go to the Bondurant School for licensing any time of the year.) Make use of your time to observe. You probably have picked out a class or a series that either fits your pocket-book, your self-image, or both.

Buying a Race Car

Place your priorities where they belong: reliability, affordability, and competitiveness. Use your head, take your time, and be

sure of what you are getting. Only buy what you can afford to run. *Reliability is a must.* You have to be able to concentrate on your driving to do well, so make sure you buy a car that you aren't going to worry about keeping together. Both reliability and affordability are going to be determining factors in what you end up buying, but try to get something that will be competitive as you progress.

Don't forget to add the necessary option to the program too: *common sense!* Forget about, at least for now, the high-priced formulas and the super-fast racers—they are not novice cars and they will *not* help you learn. Buy a lower-horsepower car to start out with then move up the power range as you become more proficient.

A super-fast car is too dangerous for learning. It is usually very unforgiving and very expensive to boot. By super-fast, we mean Atlantic, Indy-Lights, Can-Am, GT1 and 2, and Indy Cars. You get the idea. These cars, for most, are out of the question from the affordability standpoint, but some think they should start at the top if they have the money. FORGET IT!

Start in a smaller, less-powerful car. Find out what you are doing with a car you can handle. You have to learn to set it up for different circuits. Keep it simple. You should have a great deal of respect for a race car, but you shouldn't be afraid of it. Start out with a smaller car in which you can feel comfortable and think you can master, and can explore your limits as well as the car's. Then you will be learning. Field a first-class effort in whatever class you can afford. It's better to have a first-class Showroom Stock car than a bare-boned Atlantic with no spare parts. You can move into faster cars after you master the slower ones.

Maybe after attending a racing school, you will have decided that Formula Ford is the series for you. It is really a great place to start open wheel competition. That's a good choice, especially if you have aspirations of becoming professional. It is an extremely competitive series, and in many regions there are pro race series too. Formula Ford is a very popular series with a lot of talent in

the ranks, so you'll be in some very quick and good company, as well as really learning to race wheel-to-wheel.

Formula Fords are real race cars. They are fast without being ridiculous for the beginner, and they are both sophisticated and reasonably affordable. If you decide to go in that direction, you will learn a lot about driving, racing, and chassis setup. The same can be said for sports racers, except they are full-fendered racing cars that look great, handle great, and have a little more power for better throttle control. And, they have more space to put your sponsors' logos!

Maybe a 50-car field isn't what you had in mind. Maybe the open wheel cars scare you. Maybe racing will scare you no matter what you are driving . . . one more reason to start out with something you can handle. If racing scares you too much, then you probably aren't going to make it past driving school, so you won't be looking for a car to buy. But if racing scares you *just a little*—join the crowd! There are times that anyone is going to be scared—out around the limit of traction, for instance.

If you are going to be successful, you are going to find out about *your* limits, your *car's* limits, and your *tires'* limits. When you do, you will be over your head. You'll slide, you'll spin (maybe even crash), and you'll go right back for more. It'll take "balls." Balls by themselves won't get you any place but in the hospital, but combine that extra bit of daring with smoothness, consistency, and precise control, and you've just discovered that one more bit of necessary character that will make you a successful racing driver.

If you aren't scaring yourself a bit at the limit, then you are probably going too slow and aren't at the limit. By this time you might want to take one of the advanced racing courses, in which you are evaluated on a one-to-one basis and always get you going quicker and with more confidence.

Back to the car. If you have decided that you want to start out in one of the production categories, great! On the SCCA regional level, there can be good competition, and it is relatively inexpensive. Showroom Stock is the least expensive way to start, and

it is good experience. Improved Touring is also a great place to start. One important word on this: If you are considering making your own street car into a race car, *forget it!* It is ridiculously expensive, time-consuming, and probably one of the worst investments you can make at this point in your career. You will put lots more time and money into converting your car than if you buy one that is race-ready.

"Ready-to-race," has a nice ring to it. It really does, if it is indeed ready to race. Unfortunately, most used racing cars aren't ready for much of anything other than restoration. Not all, but a lot of them. We'll forego the horror stories. You'll get to hear enough stories from your racing buddies.

This is why we've been taking the time to observe. You've, hopefully, been going to races, deciding what class you want to run in, and you've been watching and sizing up your future competition. In the class that you have chosen, you have been studying all of the cars, drivers, and teams. By now, you should know which ones are good, fast, and reliable. You have decided to buy one of them.

Now is the time to talk to the owner. Yes, he will sell it at the end of the season. He has qualified it for the regional (or national) run-offs. The car is fast, and it has proven to be reliable. It has been well-driven, and the preparation has been meticulous. He said he will sell you the car as soon as the season's over. But he wants to clean it up first and make sure it is in good order after the last race. Great, you think. *Wrong!*

When the seller gets out of his car at the end of its last race, take delivery on the spot. That is your insurance you are getting all of the goodies you are paying for. You'll have the whole winter break to clean the car, freshen the motor and the other bits that were worn during the last race, but it will all be there, just as it was when he last raced it. If he blew it up or crashed it in his last race, you don't have to buy it, or maybe it will be a lot less money. That's up to you and the seller.

This process of picking out what car to buy is a real problem. Invest six months or



Here at the Bondurant school, we are proudly sponsored by OMP Safety Equipment. Rick Scuteri

so going to a lot of races at different circuits. Talk to the competitors about their cars and about the others they compete against. Racers love to talk. Keep your eyes open and look. Watch how they drive, how they work on their cars, how they repair them, and how clean they keep them. Look for a driver who respects his car, his tools, and the rest of his equipment. Look for the smooth driver who has the proper tools to care for his car—that's the one to buy from.

It's a good idea to take along someone who knows the cars and the classes, or a good racing mechanic to look at a potential car when you get to the point of really serious buying. Go to the owner's workshop and look it all over carefully: the car, the shop, and the tools. If the car doesn't have good paint, interior, a sanitary engine compartment, and good clean wiring, then the car probably is deficient in a lot of other areas too. If the workshop is a mess, poorly lit, and filthy, chances are that the work done on the car is too. Let the buyer beware.

A serious and meticulous owner will have complete records on the car. Every race and testing lap that the car has run should have been recorded, along with modifications, gearing, and speeds. Don't take everything the owner says for fact. Ask for proof. If he is honest, he will have no objections. Ask to see his receipts; they can tell a lot. Take a look at the person selling the car. Would you buy a used car from him? Or better still, would you want him to work on your race car? You'd better come up with the right answer on that one, because he's been working on it for at least the last season. Remember, he is the one who wants to sell it. Why?

Take your time. There are a lot of race cars out there for sale, and if one gets away there will always be another. Don't rush into something that you might regret later (if not immediately). Find the right one.

Safety Equipment

There's one more little detail that you'll have to take care of if you're going to race:

safety equipment. Get the best you can afford; it can save your life. Don't cut corners here—or for that matter anywhere that can affect your safety. The better quality equipment lasts longer, is safer, and offers the best protection. Before you buy anything, see what the other drivers (top drivers) are wearing. Find out what the SCCA and other sanctioning bodies have on their approved lists.

I recommend one-piece driving suits and full-face helmets with Nomex balaclavas, underwear, gloves, socks, and racing shoes. The more protection you can give yourself, the safer you will be. In an enclosed car, the open-faced helmets are still approved, but a full-face Bell helmet is much safer—especially in the case of fire. Again, the more you are protected, the more you can concentrate on driving. Safe is sane. Don't cut corners on safety equipment—buy the best. I use and recommend Bell helmets, OMP driving suits, shoes, and gloves, as well as Simpson restraint systems. And even if a fire system or

fuel cell may not be required in your class, install them! It can save your life and car.

More to think about? Don't worry, this is just the start. Once you get your race car, you'll really have a lot to think about. Have you made any decisions yet? Made a deal to buy a car? Which one? This season's regional E-Production champion after he competes in the regional finale? Picking it up on the spot? Right, you've been paying attention. It sounds like you're really getting into this in a big way. How about what we just discussed? You've already enrolled in a Bondurant four-day competition road course and the Bondurant advanced class with the PI computer-analyzed SVT Mustang Cobra, you ran in SCCA SOLO 1 last summer, and you'll start regional racing this spring. Great. By the time you start next season, you really will be ready. You'll have all winter to prepare and test your car. Very important, testing and practice. Especially with a new car. There are a lot of other things you have to do too, so keep on reading . . .

11 Getting a Sponsor

Let's assume your basic training was a success, you bought a reliable and competitive car and have a season or two behind you with lots of victories and fastest laps. Even a few lap records for your class. All of your friends say, "You should go pro."

If you aspire to be a professional racer, you had better get the idea planted firmly in your head that *it is a serious and expensive business!* If you think it's not, you are seriously mistaken.

The successful professional racer and the successful business person have a lot in common. What does it take to be successful? These attributes apply to both: Well organized. Aggressive. Persistent. Competitive. Confident. Success oriented. Egotistical. Self-centered. Detail conscious. And have a very positive attitude. Just the kind of guy you'd want your sister to marry? Not fantastically flattering, but to the point. Of course, not all successful business people would make successful racers, but these days to be a successful racer you *must* be or learn to become successfully business oriented.

If you are serious about racing as a full-time career, you've just started to learn about what it takes. How you handle yourself off the track can be just as important as how you handle yourself on the track. You must now learn how to be a PR person. You need to be able to handle yourself well with the press, your sponsors, potential sponsors, car owners, crew, track personnel, and everyone else concerned with racing, especially the

fans. Build a good following and give time to your supporters. They will be loyal, and you must be too. You must give the media good interviews and learn how to provide your sponsors the best coverage (diplomatically) in all of your interviews—television, radio, and newspaper!

Perhaps the most important ingredients to your success (besides good driving and lots of money behind you) are good attitude, honesty, and a pleasant personality. Be yourself, and be true to what you believe. You have to live with yourself first, so use integrity and you'll get along better with everyone else, too. A really important thing is to show all of that great enthusiasm that you have. It's good for the media, your sponsors, racing in general, and you personally. Some people hold it in. Don't—let it show! You'll get better coverage if you show it. That's what can make you or break you, that and cooperation.

Don't blame others or make excuses for your problems or mistakes. Tell it like it is, even if it's a bit embarrassing. You'll get a lot more respect, especially with your crew and the media. Also don't become a braggart—remember actions and results in a race car speak louder than words! It is a job, a great job, but still a job, so work at it. There are no free lunches.

As you turn professional, you are going to find that it takes more than desire, more than talent, and more than enthusiasm. Professional or amateur, it takes lots of hard

work and a lot of money too. There aren't many of the "gentleman racers" left who have huge fortunes to spend on racing. Those guys now are mostly in Vintage racing. It is another great segment of the sport, and a fantastic time can be had by all, but not really a place for an up and coming professional. Today most first-class racing efforts are the result of large sponsor contributions and advertising dollars.

There's an old joke about how you can make a small fortune in motor racing: *Start with a large one*. Unfortunately in the current racing market, that is about the size of it. As racing becomes increasingly more expensive each season, the need for a driver to sell himself, his talent, and his racing program to a sponsor—or multiple sponsors—is greater than ever.

You'll want to keep up on what is happening in the business world too. That's the only way you can make realistic proposals to sponsors. Find out what the sponsor's market needs are, and try to fulfill them. Know which companies are having record profits, cash surpluses, opening new markets, or having record losses. Get familiar with *The Wall Street Journal*, *Business Week*, *Entrepreneur*, and the like. You really never know where a sponsor might come from. Some do it for direct marketing of their product or for advertising, others as a shelter from taxes. For others it is simply a means to entertain clients, friends, and employees.

For an independent to run in anything beyond a club-type racing program without any sponsorship, and be competitive, is not too likely. You must have a good understanding of corporate needs, advertising, and business practices, as well as being able to *effectively present* and *communicate* to your sponsor. Just being a good driver doesn't cut it anymore. Sad but true. Major sponsorship is everywhere in professional racing. It is big business. Motor racing is a great advertising medium. Millions are spent on sponsorship. The same financial needs are there for club racing too, only it's *you* who must put up the money for yourself and your car.



Bondurant the businessman. Sponsorship is crucial in racing. To be a successful racer you must also be a smart businessman.

If you find a sponsor, you are the lucky one. Help that person or company in any way you can. Give your sponsor his money's worth. Don't just take the money and ask for more when that runs out. There probably won't be more if you don't work with your sponsor. This goes right up the line all the way to Formula One. It may require personal appearances, talk shows, radio interviews, car shows, whatever. Maybe photos and personal meetings and dinners with your sponsor's clients and friends or other business contacts at a race meet or, whatever, wherever . . . do it.

If you don't have the time or know how to find a sponsor, then hire a good public relations firm or sponsor relations person. But remember, you still have to do your part to keep the sponsor happy. Winning is important for the sponsor, but there are quite a few champions who have a terrible time

Promotion work can be a lot of fun, too! ABK Photographic



keeping sponsors. There are also lots of average drivers who not only have sponsors, but keep their sponsors for a very long time.

The sponsor needs results, true, but they also need a driver who will really work with them to accomplish their marketing goals. You have to train constantly to be good enough to win, but you also have to train just as hard at public relations. Your sponsor will need your good PR every bit as much as your winning. Give your team and your sponsor 110 percent.

Some World Champions are great to work with and really go out of their way to look after the team sponsors. Others couldn't care less. To some, the sponsor is nothing more than a burden that needs to be

around. One recent champion would regularly not show up for the sponsor's functions. The driver took the money but found little time for the sponsor's needs. That sponsor felt slighted and is no longer involved with motor racing. This loss of sponsorship affected more than just that one selfish driver. The "not my problem" attitude affects everyone involved in racing. Sponsors are hard to get, and when a sponsor is lost it is usually not regained . . . ever, by anyone.

Just don't forget that a good, friendly, positive, and cooperative attitude goes a long way. If you find someone who has the faith in you and your talent to sponsor you, give them the help they need in return.

12 Take Some Positive Tips From Me

You've been preparing your mind, your body, and your car, so what's next? Practice! Practice! Practice! My school helped to get you headed in the right direction and gave you a real idea what competition is all about. You bought a good car and now you are learning the limits of both you and your car. That's what practice is all about. You will get better every time out. Remember: Safety, reliability, then performance—in that order. Now that it's time to practice, here are a few bits of information to help you on your way.

Practicing for Perfection

First, there is no such thing as too much practice. Unfortunately, when you're talking about practice, you are also talking about a lot of time and money. Practice doesn't mean just driving around the track. That's what a lot of people do, but that's not what I'm talking about. The *quality* of time spent practicing is perhaps more important than the amount of time spent. Make each lap count. Really concentrate and feel exactly what your car is doing.

Most tracks are available to groups or individuals to rent, but it's expensive, so spend your time frugally. Don't pay your practice fee and sit there and work on your car all day long, hardly turning a wheel. You can do that in your garage. Work on your car in your garage and have everything ready to drive when you arrive at the track. Don't waste your time and your

money. Arrive at the track with your car well prepared and ready to race, or practice, just as if it were a race weekend!

Even before you think about going to a track to practice, have in mind what you want to accomplish. Do you want to improve a basic or special technique? Work on your car's handling? See how a new part works or doesn't work? Know what you want to do. Every lap costs you money. Even if nothing breaks, it will cost you in car and tire wear. So, make sure you are going to get your money's worth.

Preparation is the key to both successful practice and successful racing. Don't forget your checklist to make sure everything has been done. Your car must be meticulously prepared and be as safe as theoretically possible to enable you to get the most out of your practice, testing, qualifying, or racing. Don't make excuses for yourself about why you can't do something. Just do it, or don't run.

Warm Up Yourself and Your Car

There is actually one little step past preparation that will really make a difference as to how you and your car perform: Warm up! *Warm-up is an absolute necessity.* An athlete, say a runner, wouldn't consider starting a race cold. He'd injure himself, strain something, or just wouldn't perform up to what he could if all of his muscles were warm and ready to go.

The same thing applies to a car, on the street or on the track. Warm-up is imperative.

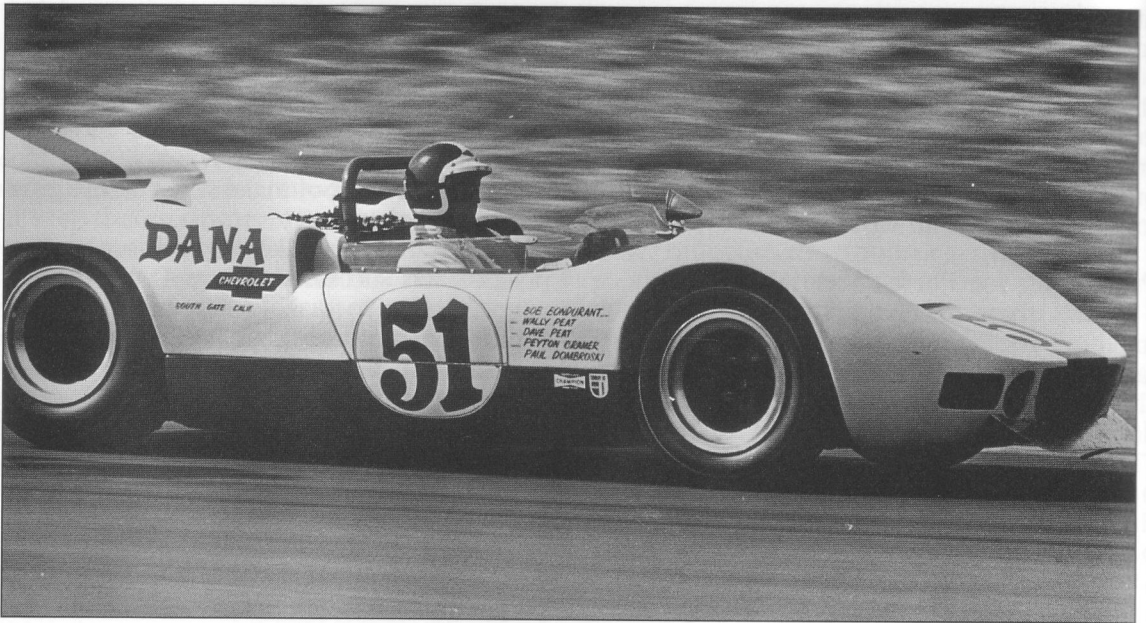
By this I don't mean let the car idle for a few minutes and then take off hard. By warm-up I mean a complete warm-up. Think of it like this: In the morning when you first wake up you might be a little slow and sluggish till you have your shower and your exercise or your morning coffee. It just takes a few minutes to get yourself going before you're functioning up to par.

Your car has to wake up gradually, too. There are parts that take a little more time than others to get ready. The engine is usually the first thing to warm up. But then what? You probably haven't even thought about it. Now's the time.

Warm the engine at a medium idle before you do anything else. This will give you a lot more time to think, relax, and plan before you get under way. When the

water temperature moves into the operating range, you're ready to start out. Don't forget, right now the only thing that's warmed up is the engine, so take it easy. The wheel bearings, transmission, differential oil, and the gears are all still cold. In Formula One, they warm up the gearbox with the car jacked up and in gear, running, to help bring everything up to temperature. They heat the tires to bring them to a proper operating temperature too. Probably the thing that most people forget is the tires. If they are not up to working temperature, you're going to fly right off the road from lack of grip.

Take it easy on the track, make sure everything is warm and ready to go, especially your tires. Give it a couple laps at a slow and safe speed before you put it to the



Testing and seat time are very important.

floor. On the street, give your car a few miles to get everything warm. Getting all of the parts warmed up will really minimize the wear and dramatically increase the life of your car. You'll have far fewer failures, and it will perform a lot better for a lot longer. For peak performance, both you and your car need that extra little bit of easy warm-up. Be gentle with it. Just give yourself that extra few minutes for preparation, and it'll maximize your potential. In the long run, everything will work better and longer. Don't forget, on the racetrack or on the street, high-performance driving is knowing what you and your car are doing all the time.

Be sure that the running gear, shock absorbers, and tires are warmed up too. The tires are, for safety reasons, the most important things to have at working temperature. If they are not warm enough before you really get into it, there is little adhesion . . . and it's into the weeds! If you remember the 1992 Indy 500, the weather was cold, and the tires had a problem in heating up. The pole sitter spun out on the pace lap and there were numerous crashes, almost one after each caution. Almost every time they restarted, the tires were cold from following the pace car, and someone else would spin or crash. On a pace lap, remember to scrub your tires in, and I mean a lot, before you ever get within sight of the starter's flag. Warm those tires up for the whole pace lap.

A lot depends on the car you are driving. A formula car will take longer to warm up than a sports car or sedan, simply because it weighs so much less. Also, the harder the tire compound, the slower it is to warm up. If the temperature is really cold or the track damp, it will take even longer to bring your tires up to optimum operating temperature. It might take a couple of laps—so don't rush it.

Choosing High-Performance Tires

What about tires . . . all the manufacturers claim theirs are the best, so what are you going to choose? If you are asking about a street car, showroom stocker, or a racer that must use stock treaded tires, you've got a lot to choose from. Read the reports in

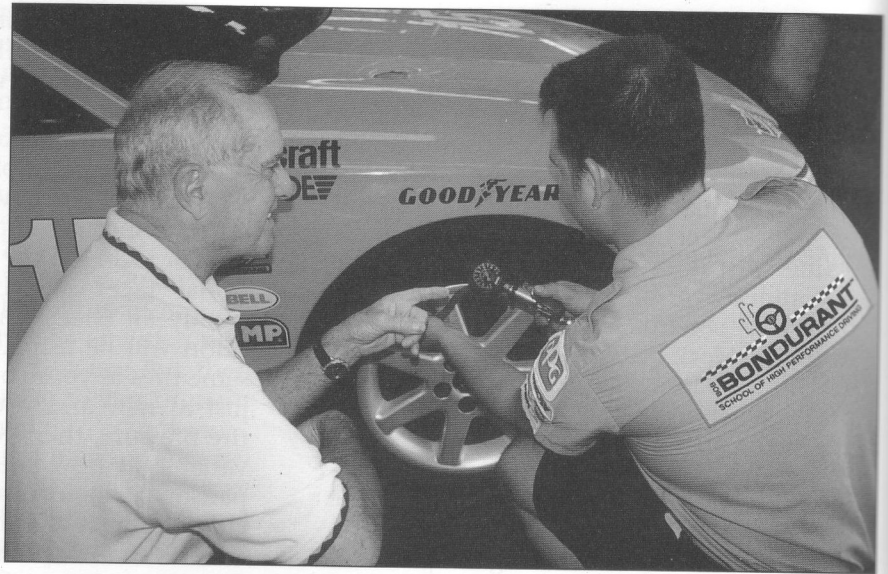
Road & Track, Car and Driver, Motor Trend, Autoweek, and the like. Also, talk to different people with the same kind of car. Try to drive several cars to find out what the different tires work like. Your dilemma then becomes a process of elimination. In some series you don't have a choice, as there is just one spec tire approved for that series.

For racing in the U.S., the novice or national racer is probably best off with Goodyear. That's what most of the competition will be using. If you're running the same tires as your competition and they are just as new and you're running the same tire pressure, then you've just eliminated a variable in how your car handles in comparison to the competition. The more variables you can eliminate, the quicker you'll be able to set up and dial in your car. For the proper rates of inflation, check with your tire representative at the event—one more reason to choose Goodyear.

For the street, tire choices are numerous. As I said, do your homework, spend time on research. What kind of tread? What kind of tire? The technology of tire development is constantly changing, and constantly getting better. There will always be better, stickier tires, for the street and for the track. Keep on top of it by reading, listening, and researching and, if possible, testing. Tire wear and tire life are a definite consideration if you are on a very limited budget. The latest up-to-date new tires are usually the best and the quickest. I use Goodyears on all of my cars because they are the best.

Tire consumption at the Bondurant School is always a major financial consideration, as it is with any racer. Goodyear Eagle high-performance racing and F-1 GT tires give our students maximum performance, adhesion, and safety with a minimum of tire wear. They really perform extremely well for all of our needs.

As for racing with street F-1 GT tires, I recommend having the treads shaved off by your tire distributor to increase their adhesion, as well as their life, under racing conditions. Some are being manufactured now, already shaved, just for racing.



Never overlook the importance of tire pressure. Rick Scuteri

Tire Temperatures and Inflation Rates

Tire temperatures should be monitored every time you come into the pits. It will give you a definite clue as to what your car is or isn't doing. Your tire rep will be able to tell you how and where to check the temps and what they mean. The temperature will vary from the center to the edges of the tire, depending on how you have your car set up. It can also tell you what part of the tire is working and what part isn't, due to your suspension set.

The inflation rates and types of compound to use on a given day are other bits of information you want to talk over with your tire company technical engineer. They will be as much help as possible, since it's to their advantage to see you do well. That's what they are there for and part of what you paid for when you bought those expensive skins. The same goes for wet weather tires. Talk to your tech rep and use the information that is available to you.

For all forms of driving, tire pressures are really important. Keep your tires properly inflated. I drive my high-performance cars fast and hard, so I push my tire pressures up a bit above the manufacturer's recommended pressures. At my school I run all

of the cars at 40 psi all the way around. It's a real safety factor and I get better traction.

When street tires (on most street wheels) are run at or below normal inflation rates, the tire bead can break under hard cornering, or the tire casing can roll over and come off the rim or lose air rapidly. If it comes off while you're really pushing it hard in a corner, the wheel rim edge will dig into the pavement and you could be in for a really big accident, maybe even a roll-over. At my school, I use special Bondurant/American Racing wheels designed just for our SVT Mustang Cobras.

Like the rest of your car, keep your tires in top condition and properly inflated. They are your only contact with the road surface! If you have treaded tires, make sure that you have enough tread.

Be sure they are in proper balance too, on the street or the race track. Not only will a good balancing prolong their life, but it will reduce high-speed vibrations. Properly balanced tires reduce the chance of hot spots, overheating, and blistering, which can prevent a blow-out.

Shock Absorbers and Antisway Bars

In addition to your tires, you must concern yourself with your shock absorbers and

antisway bars. On my school cars I use stiffer Eibach springs and larger-diameter sway bars especially tuned to my cars, as well as Monroe adjustable shocks. There are many kinds of shocks, springs, and antisway bars available on the market, so it's time for you to determine just which are the best for you.

One of the fastest and most efficient ways to determine the setup is to contact a competition suspension specialist. They can give you the best setup for the kind of driving that you want to do with your particular car. If you want it for the street, it should be a little softer ride than for a full-race setup. You don't want it so stiff that you rattle your brains. Each kind of driving has different handling requirements. Setting up your car for the street is far different from setting up for a slalom, autocross, rally, or improved touring race setup. Each requires a different kind of suspension setting and geometry, so you'd be best off to contact a suspension specialist to design one for your car, your driving style, and your specific needs.

Setting an Engine Redline

Back to the track. Once you've decided on the specific areas you want to work on and properly warmed up your car and your tires, you should pick a predetermined engine redline and stick to it. (You've just eliminated another variable in setting up your car.) This should remain constant so you can gauge improvement accordingly. Run fast enough to find out what the car will do and spot the changes, but be sure to shift at the red-line so that it won't damage your engine.

Forget about your speedometer; it's not important. What is important is how many revs you are turning. That should be your concern, not your top speed. Some racers disconnect the speedometer so that they won't be preoccupied with it.

Of all your instruments, your tachometer is one of the most important and should be checked two or three times a lap. The seasoned racer becomes accustomed to listening to the engine sound and reads that



Shock and spring configuration on the Bondurant Formula Ford. Rick Scuteri

as accurately as the tach. But, until you can do that perfectly, check your tach. Who knows, you might be short shifting by 500 or 1,000 rpm.

Be sure to check all of your instruments a few times each lap, when it is safe and you can relax your concentration momentarily. It's best to pick a couple spots on a longish straightaway to give them a quick glance. That quick glance at your oil pressure and oil temperature and water temperature gauges will let you know if you have problems on the way. They can save you lots of money, so use them!

Testing and Practice

While testing and practicing, don't spend too many laps on the track without a break, or you'll find yourself making the same mistakes time after time. Eight or 10 laps are usually enough to run at one time. Then, come in and figure out what you've been doing right or wrong. Get out of the car and really think about it. Isolate what you did right and what you did wrong; find ways to improve when you go out again. Isolate where you could be smoother, faster, more consistent. Did you hit your apex areas right? How about your downshifts? Are you trailing your brake properly and long

enough? Is your chassis set properly through the corners? Are you braking late enough or hard enough? Did you really blow a couple of corners?

Your perspective really changes once you've stepped out of the car. Once back in the car, before you go out again, close your eyes and imagine every corner, every straightaway, just the way it really is. Picture a perfect lap, and then get out there and do it.

During each lap in practice, think how and where you can go quicker. Check the tach as you exit the corners to see if you're really quicker, or if it just felt as if you were. Remember, smooth is quick, so be as smooth as you can. If you make a mistake, correct it as best you can, smoothly, then put it aside till you've finished that session. When you are behind the wheel, think about where you are going, not where you have been.

One word about practicing braking. Most novice drivers don't realize how deep they can brake into a corner driving a race car. This is something that you must learn. The best way to practice this is to find a hard 90-degree corner or a hairpin with a lot of run-off room, where a spin won't be dangerous. Each time you approach the

Goodyear tire test, January 1965 at Daytona in a Cobra 289.



corner, try braking a little later and a little later until you reach the point where you start to lock up your brakes because you are about to overshoot your turn-in point. You now know how deep you can go before you have to brake.

When you practice your braking, don't forget the basics: Lightly double-pump, then squeeze on your brake pedal so you can feel what your brakes are doing, finish your major braking, and continue trail-braking into the first third of the corner, slowly easing off to keep weight on your front tires in order to maintain the chassis set, then ease on the throttle. It's simple, once you know how deep you can go into a turn before breaking. You should be able to figure out just about any corner without looping it if you know how much distance it takes to brake from what speed.

For racing, you now have to practice left-foot braking, because most drivers, who are intent on making a living need to do both road racing and oval track racing. Once you get the technique down, it works great in racing. For street driving, I still use right-foot braking. That way I'll never get myself into an emergency with my left foot and lock up the brakes. If you have ABS, you are lucky either way.

Don't forget to try to use alternate lines on some corners, just to see what will happen if you are forced to use them under racing conditions. No matter what it is that you are working at to improve or test, be sure to do it completely and methodically with your full concentration. You really must concentrate fully 100 percent of the time. You'll increase your confidence as well as your ability. Your marked progress and quicker and quicker lap times will definitely help you to build enthusiasm and self-assurance.

If you have some friends or family who can give you a hand on your test days and at the races, they can help you make better use of your time by videotaping you and section timing, like at the entry and exit of a difficult corner to see how you progress. Another option is to mount a small video camera on your roll bar during your race or

practice. This really helps when you review what you did and where and why. Just as pro football players review their game tapes, a video system will give you the benefit of being able to see, on the spot, the replay of what you are doing right and what you are doing wrong. From reviewing these tapes you can immediately begin working on the problems.

Having a friend time you through specific corners or sections as you experiment with different braking points, variations in your racing lines and changes in your car can be very useful too. Even though you may have the same tach reading at the exit of the corner, one line might be slightly quicker than another, and you might carry more speed down the following straight. With section timing, this can be readily seen.

If possible, tape and time your competition (those faster, not slower than you) in the same sections you do yourself, then compare. It will help you become more competitive with them by seeing what they do right, wrong, or just differently. Especially watch how they make passes on other cars. This is one area that makes some drivers nervous, as it is up to the overtaking driver to make a clean pass. Watch how the best do it, and it will help you, too. *The better you know your competition, the better you will do against them.*

Another thing, please try not to be just a dry weather driver. If it is raining, go for it anyway. Lots of drivers pack it up and leave for home at the sign of the first rain. Practice is practice! Road races are also run in the rain, so you'd better practice in the rain, too. Get used to it, if you really want to become a good driver. It doesn't mean you have to like it, just get good at it. Besides, driving in the wet is a fantastic way to learn more. You really have to be smoother and gentler, concentrate harder, and be even more precise at controlling your car in wet conditions.

In the wet, you are going a lot slower and you can really experience less traction and faster responses from your car. You reach the limit of adhesion much faster, and you force yourself to improve your concentration and reaction speed. The wet forces

you to be a much smoother driver, so take advantage of the rain, and practice. You'll be amazed how much you can learn. You'll end up being quicker in the dry from it, too.

As far as practice goes, practice all the time. Every time you are behind the wheel—on the street or track—practice something. As I said before, use your head, be careful, don't jeopardize anyone else, and take it easy on the street. Driving on the street is a good place to practice smoothness, concentration, and heel-and-toe downshifting, provided you have a stick shift. You can also practice other basic techniques you'll need on the racetrack—but you don't have to go fast to practice. If you practice and perfect them on the street, when you're on the track, you can concen-

trate on the other aspects of racing, like testing and learning to go quicker.

Testing is practice, true. But, although you're combining all the basics you learned from practice, you're also now starting to develop your car. Once you've got yourself dialed in, now is the time for your car.

Follow these Rules

Rule Number 1:

This one's the most important—only change one thing at a time!

Rule Number 2:

Record each change made and its effect and result.

Rule Number 3:

Time every lap—always: practicing, testing, and racing.



Practice and shakedown during a GT40 test session at Daytona.

Rule Number 4:

Keep a record of times and changes for each circuit you run.

All of this should save you time and make your testing more productive. Try to be able to test at a session apart from a race meet. You'll have more time and be more efficient. Then, when you come to race qualifying, you'll do much better.

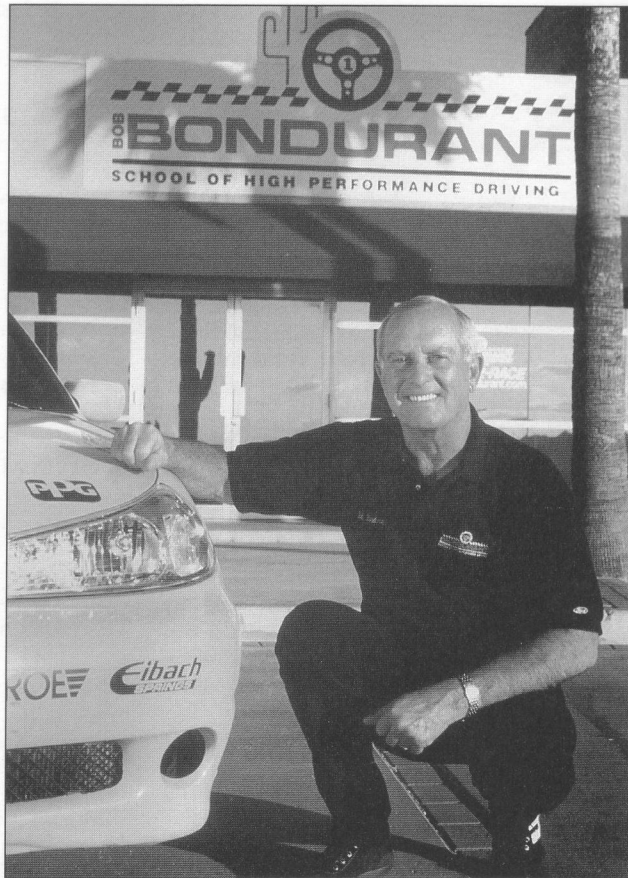
A word about Rule Number 1: If you have a handling problem, take each change as a separate thing. It may be your tire pressure, your shock absorber setting, or your antiroll bar adjustment. Just change one thing at a time. Find out if the change makes it better or worse before you make another change. Record each change and its effect before you move on to the next change, and work that one out. It's a process of elimination. Do it orderly, for the best results. If you change three or four adjustments at once, you won't know which one made it better or worse. Maybe your problem isn't mechanical. Maybe it's you and what you are doing. Some problems are really solved simply. Use your head and run about 8 or 10 laps, then get out of the car and think about what you've been doing. Really analyze.

A Corvette driver I knew was having trouble with his brakes one race meet. It was an important national race, and he was under pressure to do well. But he wasn't thinking. He reported to his crew that his brakes were pulling hard to the right at the end of two long and fast straightaways. His crew spent hours trying to find the brake problem and couldn't find anything wrong, but kept trying to correct the problem. It wasn't the brakes . . . it was him. He was pushing so hard on the brakes to slow the big 'Vette that he was accidentally pulling up on the steering wheel for leverage. The car wasn't pulling right under braking; it was being *steered* to the right without him realizing it. Use your head; analyze what you are doing, and you'll do just fine.

Whatever your racing choice, it takes a lot of time behind the wheel to perfect it.

Give a lot of thought to the different kinds of racing available to you. They're all good practice. Go-karts, midgets, sprint cars, trucks, stockers—all of them will give you experience, and that's what is necessary when you're starting out. Most of the current Formula One drivers started out in go-karts. It's fast and competitive, and, like motorcycles, it teaches you to get used to having competitors very close around you. Whatever you can drive on a track is better than not racing at all. Practice with them the same as you would in a real race. Do 8 or 10 laps, then get out and think about it. When you do your next 8 or 10 laps a few minutes later, you'll always be quicker.

Well, you're just about on your own now. I hope you listened and think about



See you at the races! Rick Scuteri

what you're doing. Take your time and do it right. Practice, practice, practice to perfect it, and read, read, read. Read everything you can about *driving, racing, car preparation, and the rules*. Read the business section of the paper as well as the classified ads, in addition to the auto and racing publications. Everything has clues. Learn to read and interpret them. Give yourself a broad base of knowledge, and you'll have a lot more information and experience to draw from.

In our final section on sources, you'll get a full list of recommended reading, schools, and publications, as well as some companies that can provide you with good information on what they are doing for racing and what they can do for you.

I hope you get along well in your quest for racing. Remember: Put yourself on a rigorous training program; lay out a promotional and sponsorship package; run your racing program like a business (it is); give yourself a plan for the racing goals you want to achieve; practice any chance you can.

Put together all that talent that you have and use it to the fullest. It's not going to be easy, but it is great when you achieve your goals. Work out a long-term and a short-term plan to get you headed in the right direction. All the very best of luck to you, and keep in touch. See you at the races!

Sources

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Bob Bondurant School of
High Performance Driving
P. O. Box 51980
Phoenix, AZ 85076
Telephone: (800) 842-RACE(7223)
<http://www.bondurant.com>

Buck Baker School
1613 Runnymede Lane
Charlotte, NC 28211
Telephone: (800) 529-BUCK

Skip Barber Racing School
29 Brook Street
Lakeville, CT 06039
Telephone: (800) 221-1131
<http://www.skipbarber.com>

Car Guys, Inc.
P.O. Box 21275
Roanoke, VA 24018

Derek Daly Driving Academy
7000 N. Las Vegas Blvd.
Las Vegas, NV 89115
Telephone: (800) Go-Derek
<http://www.derekdaly.com>

Frank Hawley's Racing Schools
P.O. Box 484
La Verne, CA 91750
Telephone: (800) 901-7223

Danny McKeever's Fast Lane
Racing School
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Richard Petty Driving Experience
6022 Victory Lane
Harrisburg, NC 28075
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Bertil Roos Indystyle Racing
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Telephone: (800) RACE-NOW
<http://www.racenow.com>

Jim Russell Racing Drivers School
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Jim Russell Racing School
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Russell Racing School
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<http://www.russellracing.com>

Tracktime, Inc.
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Car and Driver
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Spectators Association)
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Los Angeles, CA 90046

Go Racing
S & B Racing Team
1920 S. Archibald St., Suite L
Ontario, CA 91761

Grassroots Motorsports
425 Parque Drive
Ormond Beach, FL 32174
Telephone: (904) 673-4148

*Indy Car and Championship
Racing Magazine*
P.O. Box 408
Waukesha, WI 53187
Telephone: (414) 896-9203

Kart Racer
7950 Deering Ave.
Canoga Park, CA 91304-5063

Motoracing
Kelly Communications
P.O. Box 1203
Pleasanton, CA 94566-0120

Motor Sport
Standard House
Bonhill Street
London EZCA 4DA
England

Motor Trend/Hot Rod
110 Fifth Ave.
New York, NY 10011
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Mustang Illustrated
774 S. Placentia Ave.
Placentia, CA 92870
Telephone: (714) 572-6881

Mustang Monthly
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Lakeland, FL 33811
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National Kart News
51535 Bittersweet Rd.
Granger, IL 46530

National Speed Sport News
6509 Hudspeth Rd.
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Harrisburg, NC 28075
Telephone: (704) 455-2531

On Track
128 S. Tyron St., Suite 2275
Charlotte, NC 28202
Telephone: (704) 371-3966

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Canada
Telephone: (416) 818-7223

Racer
1371 E. Warner Ave., Suite E
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Road & Track
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SportsCar
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Sanctioning Bodies
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Racing Teams)*
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Indy Car Racing League
NASCAR
(National Association for Stock
Car Auto Racing)
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Professional Sports Car Racing Inc.
(Formerly IMSA)
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Bridgeport, CT 06605
Telephone: (203) 336-2116

SCCA
(Sports Car Club of America)
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6750 South Emporia
Englewood, CO 80112
Telephone: (303) 770-1044

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P. O. Box 2
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