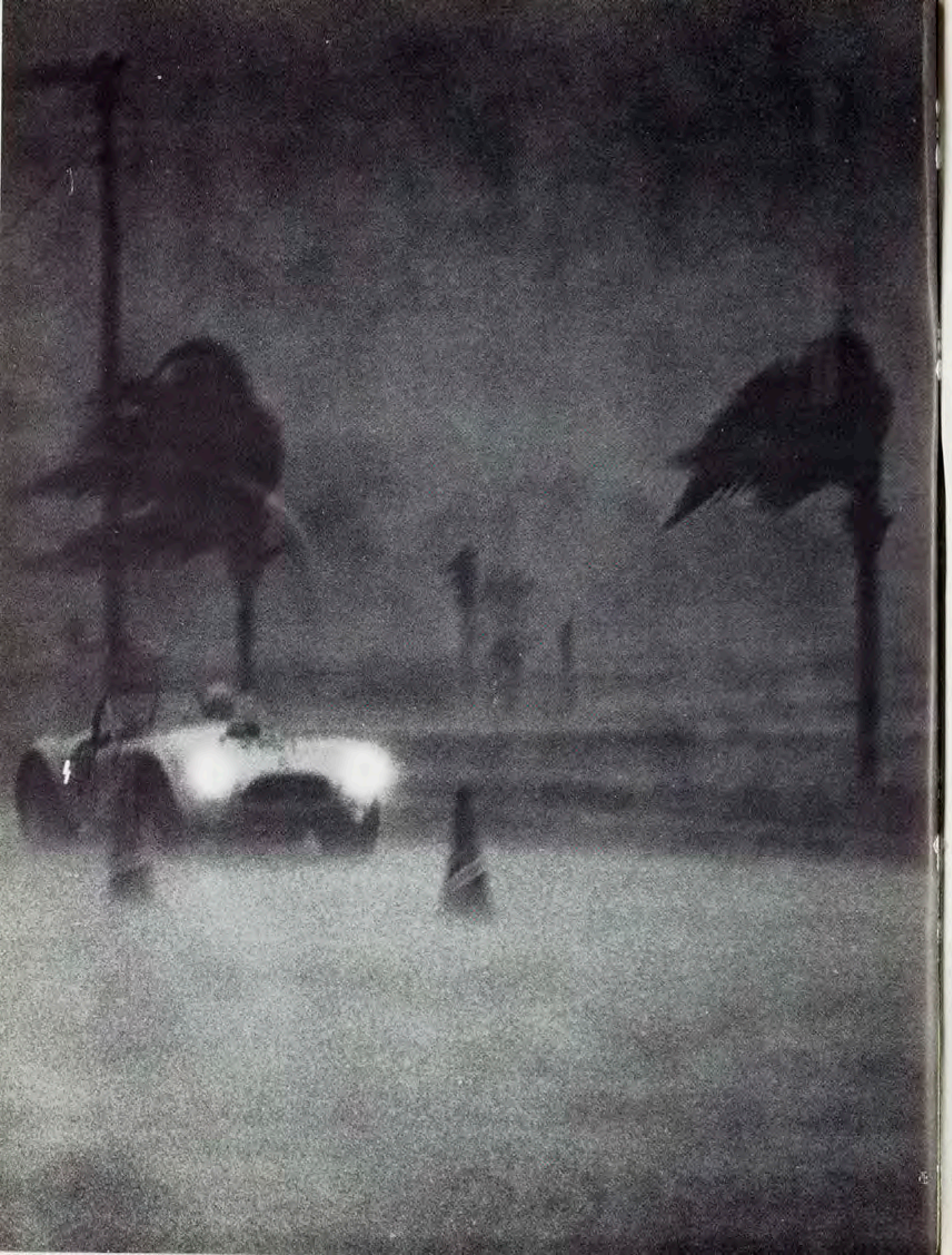
CORVETTE NEWS

Vol. 8
No. 4

FOR CORVETTE ENTHUSIASTS



VOLUME 8
NUMBER 4

CORVETTE NEWS

396-mill Corvette shows off its new bonnet and side feathers

New look along with new power! When the new 425-hp Turbo-Jet 396 engine is ordered in a 1965 Corvette, a significant change in the hood appearance occurs. As these photos show, a bubble-like rise with louvers at each side blends into the raised spear design common to all Sting Ray hoods. These louvers are for real, too, allowing extra ventilation for the engine compartment.

In these photos, the new extra-cost side-mounted exhaust system also is shown. Available for all '65 Corvettes as factory-installed equipment, this system features chambered pipes to eliminate the regular mufflers. The anodized aluminum grille-like guard running the length of the rocker panel is designed to prevent accidental contact with the hot exhaust pipes. Exhaust outlets are located just forward of the rear wheels. Because of its somewhat higher noise level over regular exhaust systems, this new side-mounted system is not generally recommended for regular in-city use.

rookies rally at andiamo

What do magazine editors do on rainy days? They think up new ideas like "Let's pick out two staff members who have never been on a rally and enter them in one." (We fooled the editors. Our driver started in one rally six years ago but has yet to find the finish line.)

The next rally in our vicinity happened to be the 4th annual Andiamo, a Sports Car Club of America Central Division event sponsored by the Northwest Ohio Region. As we were to discover, an SCCA Divisional is hardly the ideal spot for a couple of novices. Cars from eight states were entered. Drivers and navigators included some of the most experienced and talented in the nation. But with an innocence born of ignorance, we took on the assignment.

We decided to take a minimum of gear: a clipboard and paper; several sharp pencils; stop watch; and a borrowed Stevens Rally Indicator. For the uninitiated, this latter device is a sort of circular slide rule designed to convert time factors into distance and vice versa, while correcting for odometer error. To our dismay, there was no wheel or table to correct for human error.

The Andiamo was scheduled for Sunday, March 14, with registration set for 6 p.m. the night before. We arrived in Toledo about an hour early and checked into the motel which served as rally headquarters. Upon registering, we were assigned a car number—55—and received a packet of materials including an identification sticker and number sign for the windshield. Along with the rest of the materials was an innocent looking set of mimeographed sheets labeled "General Instructions." These turned out to be straightforward and honest—and about as easy to follow as the set of directions that come with put-it-together-yourself toys.

Immediately after the registration, the cars were assembled on the motel parking lot for a brief but thorough technical inspection. Our Corvette Sting Ray passed with flying colors for our only top score of the entire event.

A good dinner and a pleasant social mixer lulled us into a sense of belonging. We chatted amiably with a number of entrants. Nice ordinary looking folks. Surely we could expect to compete on fairly even terms.

Since our starting time was set for 8:55 Sunday morning, it seemed prudent to retire early. Just enough time for a reading of the general instructions. This pre-bed ceremony brought on several nightmares. The seven simple course instructions seemed to work against each other. For example, Rule No. 2 specifically said do not follow it whenever it infringed on Rule No. 1. However, Rule No. 4 took precedence over Rule No. 2 and promised never to conflict with Rule No. 1. Oh, well, another run-through in the morning ought to make things clearer.

Next morning, a quick reading of the Generals, a hasty breakfast and off to the parking lot for the rally start. A set of instructions was thrust in our hands at 8:54:30, and at 8:55:00 we were off with a wave from the starter. Little did we know that this was to be the last time we would be on schedule for the rest of the day.

The first six instructions covered a 10.7-mile tire warmup. Most of this distance was on the Detroit-Toledo freeway and we arrived nearly a full minute earlier than the allotted 11 minutes. Next came the odometer check. This 23.13-mile jaunt was crucial. We needed an accurate reading to feed into our Rally Indicator to correct for odometer error. Naturally, we got lost. Not badly lost. Just enough to take us off course and completely foul up our odometer check. The Rally Indicator was then tossed into the back of the car, along with a few epithets. We had no choice but to let calculations and careful timing go by the boards and concentrate on looking for road signs.

Shortly after the odometer check, we reached our first checkpoint. Arriving more than 10 minutes late, we were glad to settle for the maximum penalty score of 300 points. It was about that time we started to hit some unpaved roads. Unfortunately, the weather had played havoc with the rally route. A severe snowstorm the previous weekend had left most of the dirt roads rutted and, in many spots, ankle-deep in mud. It was here that the Corvette really showed its

stuff. Riding comfort was superb by sports car standards and the car stayed under control through the worst road conditions. Despite bad roads and our inexperience, we hit the next checkpoint less than two minutes behind schedule. The following stretch was accomplished without mishap in just one minute and five seconds more than the allotted time. And this without keeping a running check on our time. About then we decided we were getting the hang of things.

Instruction No. 27 seemed simple enough—turn left after sign reading in part "Seven Maples." As it turned out, the sign was a fair-sized nameplate over a large barn set back from the road about a hundred feet or so. We managed to miss it and found ourselves on a dead-end trail. Doubling back, we somehow missed the sign again. By then, traffic was getting a bit heavy. There were a half dozen other rally cars going back and forth in every direction. A couple of small boys came running out of a farmhouse on the road and told us that most of the cars had turned onto a road they pointed to.

Now, we had been forewarned that small boys are somewhat less than reliable for rally directions. It seems that after the first few cars go by, they catch on to things and start sending cars off in different directions. In fact they take great delight in getting rallyists lost. We came to regret our lack of faith in human nature. The third time past the barn, we saw the sign and turned down the road pointed to by the youngsters. By the time we reached the next checkpoint, the 300-point maximum penalty was again gratefully accepted.

On the next leg, we traveled nothing but unpaved roads. By then, snow flurries made the going rougher, and we had difficulty maintaining an average speed of 43 mph over the twisting trails. But we were pleased to find ourselves staying on course. Even when a landmark listed as "Bethel Church" turned out to be not a church but the name of a street. A bit over three minutes late at the next checkpoint.

Word was given us at Checkpoint No. 5 to switch to an emergency route. The road between Instruction No. 45 and 46 was blocked by heavy snow drifts left over from an earlier storm. We managed to find our way over the alternate route without problem—but got lost trying to get back on the regular course. This threw us so far behind schedule that by the time we got back on the track, the next two checkpoints were closed when we reached them. This meant we were more than a half hour late and received a 600-point penalty for missing each of the two checkpoints.

Our embarassment was more than matched by a team of fellow entrants. They turned down one dirt road to find a farmer with his car parked perpendicular to the road. When the driver and navigator got out of the car to see what was the matter, the farmer launched a tirade about all the wild sports car drivers that were careening down this road. He refused to budge and made it clear that the local police had been called and were on the way. Having been delayed for several minutes already, the driver decided to try to make it around the farmer's car. With great dexterity, he got by the blockade, avoiding a snowbank and a deep ditch. Accelerating quickly to make up for lost time, the duo took only seconds to arrive at a dead end. Oops, wrong road! Color their faces red as they came back down the same road and had to go around the friendly farmer once again.

By now it was lunchtime. The instructions allowed us an hour and a quarter to eat and steered us to a pleasant restaurant in Chelsea, Michigan. Fearing that subsequent checkpoints might be closed if we dawdled too long, we gulped down a couple of cheeseburgers and were on our way. Soon we came to Checkpoint No. 8 where we received an automatic 300 points for having missed the preceding checkpoint.

Roads were good on the next stretch. The snow flurries had changed into a drizzling rain and we were running under foul-weather speeds. To everyone's amazement — including our own —we hit the next checkpoint just eight seconds off schedule. A moment of pride for us, despite the fact that ten other teams got better scores on this particular leg.

Instruction No. 74 ended with the innocuous phrase, "becomes unpaved." It turned out to be the understatement of the year. For the next three legs of the rally, we encountered some of the muddiest roads in Michigan. All along the way, we could hear our Corvette's Positraction cutting in and out. Our biggest fear was that the windshield wiper motor would burn out from overwork, shoving the goo out of our line of vision. It held up, however, and our windshield washers helped to thin the mud. Our penalties for the three stretches were 125, 96 and 300.

On turning to the last of the five pages of instructions, we were startled to find at the top of the page our first direction based on elapsed time. To be precise, it read, "Left — 6 hrs., 07 min., 43 sec. elapsed rally time from the start." We hadn't been paying too much attention to our time, were way behind schedule and had accumulated far more mileage than called for. A frantic search of the back of the car turned up the Rally Indicator. One hasty calculation plus some arithmetic gave us an odometer reading for the driver to use as a turning point. Surprisingly enough, the figure was less than a tenth of a mile off and there were no other roads in that stretch to mislead us. We were, however, less than confident we had made the correct turn. Our eyes searched for the sign that was to be our next landmark. On we drove for miles, feeling less sure by the minute. The illusion was heightened as we passed several rally cars speeding in the opposite direction. We couldn't help but get excited when we spotted the sought-after sign about twenty miles past the point where we had turned. And directly after the sign was the last control.

The half-hour drive back to the motel gave us time to relax and wonder how well we stacked up against the experts. Most of the scores were posted when we arrived. As soon as we turned in our own score sheet we looked over the charts to see how the others did. First thing we noticed was that the Rally Committee saw fit to throw out the sixth leg. The detour had fouled things up thoroughly and there was no place to make up lost time. We were happy to shed our 600 points for that leg.

With smug satisfaction, we discovered that seven of the original starters did not finish. And two cars that did finish piled up even more points than we had. So we weren't dead last. But finishing in 52nd place among 64 cars hardly could be considered a victory.

The winners were Ruth and Don Nixon of Michigan City, Indiana. Making the circuit in a Porsche, they accumulated a mere 47 points for the twelve legs. It's still hard to belive anyone could cover that rugged route averaging less than four seconds off at each checkpoint.

Close behind with 49 points were Scott Harvey and Robert E. Mollman in a Barracuda. Third place went to Lee Hendrick and Phillip Henderson who gathered a total of 53 points in their Comet.

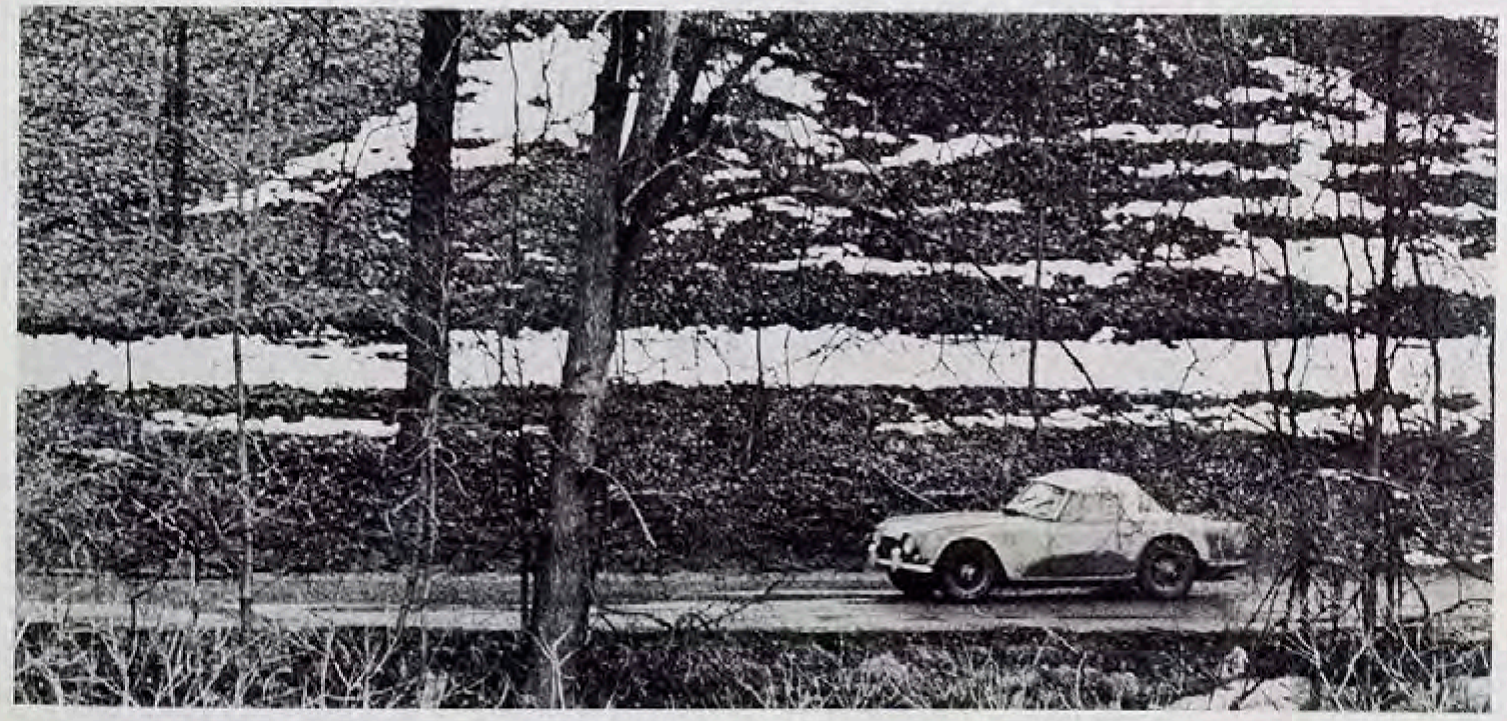
Naturally, we couldn't help but form some definite conclusions during our very first rally.

So here they are:

1. Enter rallies—don't be afraid of the competition. No one could be more outclassed than we were in the Andiamo. Yet, we weren't laughed at. In fact, a number of people commended us on our showing. If possible, though, enter a few local rallies before taking on a divisional or national event.

2. Start with a minimum of equipment. Sure, that expensive gear can be a tremendous help, but if you're not familiar with your equipment it can work against you, causing you to miss turns while you fiddle with various devices.

3. Enjoy yourself—rallying is fun. Later on, when you become more adept, you'll undoubtedly get more competitive. Never lose sight, however, that you're there to have a good time. Try it once and see what we mean.



About

JAMES T. CROW

who writes

"About The Sport"

James T. Crow, who writes the "About The Sport" column for Road & Track and serves as executive editor, defines his duties as "gathering data on, and writing road tests of, new cars; keeping up with what's going on in competition events; covering some of the major sports car races in the U.S.; preparing free lance copy to fit our format; and trying to keep Henry Manney's sentences down to one page each."

James Crow's career as a sports car writer goes back to when "covering" racing events really meant "discovering" the places, people and cars that represented the avant garde of the sport. Today, as more people are participating and many more are aware of sports car activities, opinions overflow on every controversy. Amid the hollering to be heard stand a few individuals whose calm voices and logical messages make the most sense. Some are drivers, some promoters, car builders, officials . . . and some are journalists like Jim Crow. Those who read him regularly find a soapbox to stand on.

One of the first things Jim told us was "I'm not really an engineering type. In writing about the sport, I've always been more interested in the drama of the people than in the machines." This was borne out in a recent issue of *Road & Track* when Crow reminded his readers of an article he had written years ago in a parody of *Competition Press* called "Compost Press." He satirically wrote that SCCA's policy pronouncement about next year's code would be, "Any engine modification is allowable, provided displacement is unchanged; replica aluminum or fiberglass bodies may be used; suspension systems can be modified in any way. 'We're trying to save racing for the little guy,' says a club official." Jim's current comment about that old take-off: "Truer than we knew. Truer than we knew."

Lest we be accused of dawdling in the pits, let's get back to more about Mr. Crow. According to the specs, he is six feet three and 205 pounds. He was born December 6, 1922, in Vincennes, Indiana; now lives in Balboa, California, with his wife Joyce, who is also a Hoosier from South Bend.

By his own admission, and in most serious tones, he has always wanted to be a writer. This feeling first manifested itself in a smeary hand-written neighborhood newspaper he put out in the sixth grade. Through English Lit courses in high school and college he fueled this interest. Rather sheepishly, he told us, "I stayed away from journalism courses because I was interested in fiction writing, not in becoming a reporter. I've tried occasional fiction pieces since then. Published a few, nothing I'd want my mother to read, and written much more that hasn't been published, which I also wouldn't want my mother to read."

He started college at the University of Wisconsin and finished after he returned from WW II, European edition. Even though his MOS was listed as truckdriver, laborer, auxiliary power unit operator or section leader . . . he usually was writing reports and such and ended up preparing the history of the 837th QM Gasoline Supply Company. "Perhaps you've read it," he said dryly.

After Wisconsin, he transferred to the University of California at Berkeley for two semesters of graduate studies and then worked for a couple of aerospace companies where he wrote reports, specs and technical papers that added to the greater glory of some laboratory. It was about this time he got his start in sports car writing, so we asked him to tell us about the turning point in his writing career.

"Funny you should ask," he said, anticipating the question since the beginning of the interview. "Actually, I think the first thing I wrote in this field was the menu for a California Sports Car Club banquet. This was about 1956 and one of my fellow workers at Lockheed turned out to be the brother of Mary Hauser, the Cal Club secretary.

"One afternoon Mary was struggling with a menu in the club office, so I wrote it for her. Shortly after, she asked if I'd like to put together the Cal Club section that was then appearing in the old *Sports Car Journal*. This section, called 'CSCC Notes,' led to other stuff for the *Journal* so that when it went under, Dick Sherwin and I did 'CSCC Notes' in a separate package. I remember, too, that it was *Sports Car Journal* that first paid me money for a sports car story.

"Anyway, I continued on as editor of 'CSCC Notes' until the end of 1960. I've got a soft spot for that publication because it was much more than a run-of-the-mill club newsletter. I recall a research item based on the relationship between driver experience and involvement in accidents and the first serious specs on rollbars for sports cars."

In 1960, feeling he had been too close to sports cars for too long and looking for a change of pace, Jim went to editing *Karting World* which he described as a non-serious delight at that time . . . even though the karting position was ridiculous. From there, he went to *Competition Press* where he came into his own and excelled at encouraging young talent, seeking out promising writers, agitating for progress and turning over clay-footed idols. Jim interrupted our applause to say that he did everything except have a financially successful publication.

His association with *Competition Press* brought him in touch with several writers whom he still reads and appreciates. Names he mentioned were Brock Yates " . . . who did really excellent stuff for CP"; John Jerome " . . . whose copy in the old *Sports Car Digest* is still worth reading"; and Donna Mae Mims: "She continues to write to me and it makes me feel much younger than I am."

Reflecting on some of the people around the sport that he doesn't like, Jim included "freeloaders, bad writers, lazy writers and almost all professional photographers. I don't like promoters who are willing to take everything they can get from the sport but don't put anything in. And I am especially intolerant of press relations people who don't know their jobs, the people or the cars they're trying to publicize."

Memorable occasions? Well, Jim reflected and came up with these: "I saw Moss win the last World Championship race held for the 2.5-liter Formula. I saw Innes Ireland post Team Lotus's first victory in a grande epreuve at Watkins Glen in 1961. I've been to Sebring, to Indianapolis . . . even to Willow Springs (an obscure little course in the desert) . . . but I've never seen a race that gave me as big a thrill as the Phoenix, Arizona, race where the Scarab sports car appeared for the first time. That was spring, 1956, and Lance Reventlow was too young for an SCCA license and therefore could not drive. Bruce Kessler tried it in practice. Then Richie Ginther, in less than half a dozen laps, put it well under the times Kessler had made and well under the lap record. It was history in the making sort of thing, y'know."

Top Left: Pencil poised, Crow waits for a "how I won" statement from F-Vee winner Lew Kerr at the '64 Riverside Road Race of Champions.
Top Right: When you cover Cal Club races in the Dodger Stadium parking lot, you take your own place to park.
Bottom: One last, long, pensive look records an event, a face, a certain car and stores the memory for future copy.

We asked Jim how he saw himself. He grinned, gazed . . . took a deep breath and said, "I get great satisfaction out of doing a good piece of work . . . in doing a 'professional' job on a difficult subject. There are challenges in writing articles against deadlines that give me real joy. I think I am basically an orderly person. For instance, I don't mind a messy desk, but I'm embarrassed by losing something amid the mess.

"I also like to get up early and seem to do my best work in the morning. Afternoons I try to reserve for doing routine, mechanical, non-creative things. My hobbies are reading, which I do continuously and insatiably, taking pictures of bridges and dams, the psychology of which I don't care to know, exploring real ghost towns and the California desert."

When we asked Crow if he owned a sports car, he answered, "I don't know. Is an Austin-Cooper a sports car?" We pulled our leg from his grip as he went on. "I owned a 1953 Singer SM 1500-D, a 1952 MG-TD and was associated with an MG Special, which was owned by some other unfortunate. Bob Pattison and I campaigned my Singer for a season, then Bob, Russ Randolph and I ran the MG Special for a season. This was even less satisfactory as it seldom ran long enough for anybody to get any practice in it.

"However, we kept track of our expenses on the Special and at the end of a year found that each of us had spent about $5 a week on the car even though we broke several things, including a block, during the year. And $5 a week is pretty cheap to support a hobby, eh?"

Jim's regular readers will recognize this item from *Road & Track* when he was commenting on the Times GP held at Riverside and the performance of the Lotus 30. "Frankly, I was disappointed in it even though Jimmy [Clark] was fifth fastest in practice. If it hadn't been the fabulous Lotus 30 designed by the fabulous Colin Chapman, I would have said it handled like a pig. And another 30, which arrived for Mike Spence to drive, gave off such a strong odor of pork that Mike couldn't even get it into the race."

That's the kind of familiarity James T. Crow brings to sports car reporting along with his insight and devotion to the best interest of the sport. He appears to be one of those lucky guys who gets paid for doing what he would do anyway.

bumps & grinds—a chronicle of Corvette

camshafts

In the argot of automotive enthusiasts, a camshaft's performance characteristics are generally referred to as its "grind," while the cams that actually do the work are naturally "bumps." Perhaps one of the more common departure points for Corvette engine discussion is the kind of camshaft installed; to the knowledgeable, the cam is a source of much conversation. This article hopes to bring some light out of the darkness, explode some popular myths and explore the insight behind camshaft design.

December, 1956. Daytona's sand beach and a new era

On a windswept, deserted stretch of beach just outside the populated verge of Daytona Beach, Florida, a lone Corvette was prepared for a record run attempt. The driver, Chevrolet's Zora Arkus-Duntov, climbed into the car, started its engine and awaited the NASCAR timing official's "ready" sign. When it came, the Corvette bellowed loud out of its straight-through exhaust, dug into the tightly packed sand and sped off. Some several hundred yards down the beach, a covey of sanderlings skittered back and forth with the waves. The birds flew off abruptly when the Corvette boomed through the five-mile slightly curving beach run. It flashed through the measured mile, slowed down, turned around and made a return run through the measured mile. Hardly had the Corvette cleared the traps, and even before the exhaust died away, a NASCAR official announced to the tense and jubilant crew that the Corvette had set a new American production sports car record with a two-way average of 150.583 mph. Just to prove that the performance wasn't a fluke, the crew repeated the performance several weeks later during Daytona's then popular Speed Weeks on the tightly packed sand.

With this run, a new era was begun: that of truly high-output American-made production engines. The Corvette unit was a 265-cubic-inch V8 with two four-barrel carburetors, high-compression cylinder heads and a new camshaft. It was this camshaft that made the difference in horsepower. Its design gained a sizeable reputation as the "Duntov" cam. Its efficiency helped Corvette gain five straight SCCA BP and one AP championships; for all of its exotica, it still can be purchased from a Chevrolet dealer for less than $35.00, and cars so equipped can be driven to and from the supermarket.

The camshaft and its effect on performance

Although engines vary in many respects, the most significant difference (in the manner in which they deliver their power output) is largely determined by the camshaft. Essentially, once a designer has selected a lift diagram and has related it to piston motion, the character of the engine is fixed by determining the range of engine speed at which the engine will deliver its best power. A camshaft which enables an engine to deliver best output at all operational speeds has not yet been invented; and all camshafts do favor one speed range to the detriment of another.

The camshaft describes the manner in which the valve is to open and close. Valve motion itself is affected by opposing forces. The cam moves the valve away from its seat and a spring wants to move the valve toward the seat. A typical valve motion diagram for a mechanical cam is shown on the next page.

EDITOR'S NOTE: In this article on camshafts, some of the technical discussion and personal experiences were gathered from the collected remarks of Zora Arkus-Duntov.

Typical lift sequence is shown in the numbered drawings. Comparison of valve acceleration, velocity and lift curves is shown below. All are drawn to correlate with valve motion diagram.

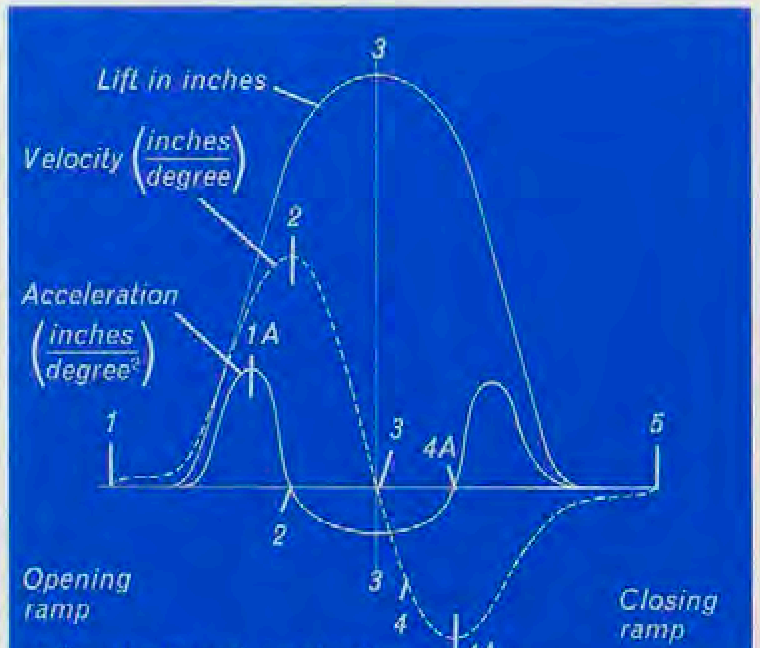
1. As cam engages the lifter, takes up valve lash and moves the valve off its seat, acceleration, velocity and lift curves all show an upward movement. The valve is being accelerated at an increasing rate; valve continues its movement at increasing velocity. At 1A, valve acceleration has reached its maximum. Valve velocity continues to increase. Acceleration begins to taper off.

2. At this point on the cam, the valve has reached its maximum velocity. It now will be slowed down by the valve spring as it nears the full-open position. Note that at exactly the maximum velocity point, valve acceleration has dropped to zero. Now the spring will reduce the valve's velocity at the acceleration prescribed by the cam profile. This acceleration is opposite to acceleration supplied previously by the cam and therefore called negative.

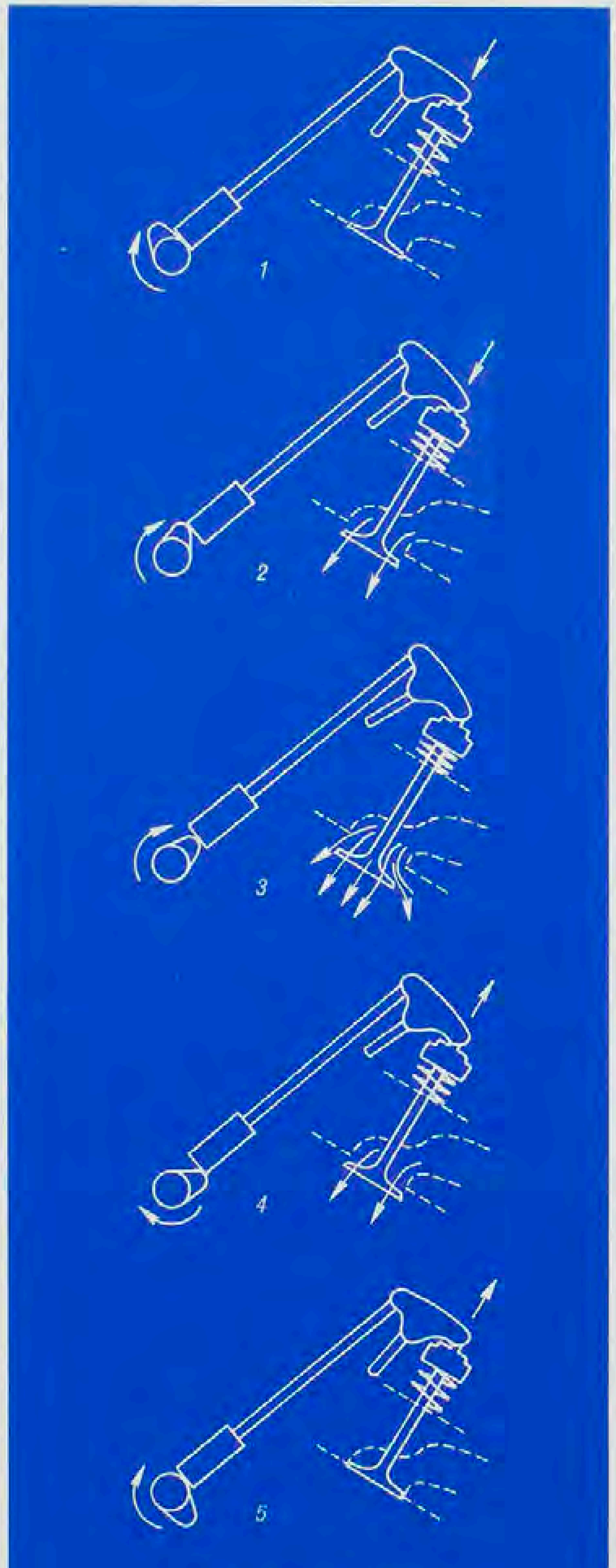
3. At full-open position, valve velocity is zero. It is completely stopped in its opening sequence. Also, the valve spring is now compressed and is exerting its maximum negative force.

4. As cam high point passes by lifter, valve spring exerts its force to close valve back against seat. Valve closing velocity is building up, though now in a negative sense, since all force is being exerted by the spring, not the cam. At 4A, the valve has been accelerated to its maximum velocity by the spring. Now the valve has reached its maximum negative velocity, again at the same point where valve acceleration is zero. The camshaft, in effect, operates as a brake against the valve spring. Valve velocity is lessening.

5. Cam has rotated so that lifter is on closing ramp and the valve seats in the cylinder head at ramp velocity. Valve lifter is on clearance ramp and lash is being re-introduced into system. Valve lift is again at zero; its velocity is zero and acceleration is likewise at zero. Valve is now ready for next full cycle of opening and closing. Exhaust valve follows the same cycle, except that piston expels spent gasses when valve is open.



Lift, velocity and acceleration comparison relating to valve motion diagram



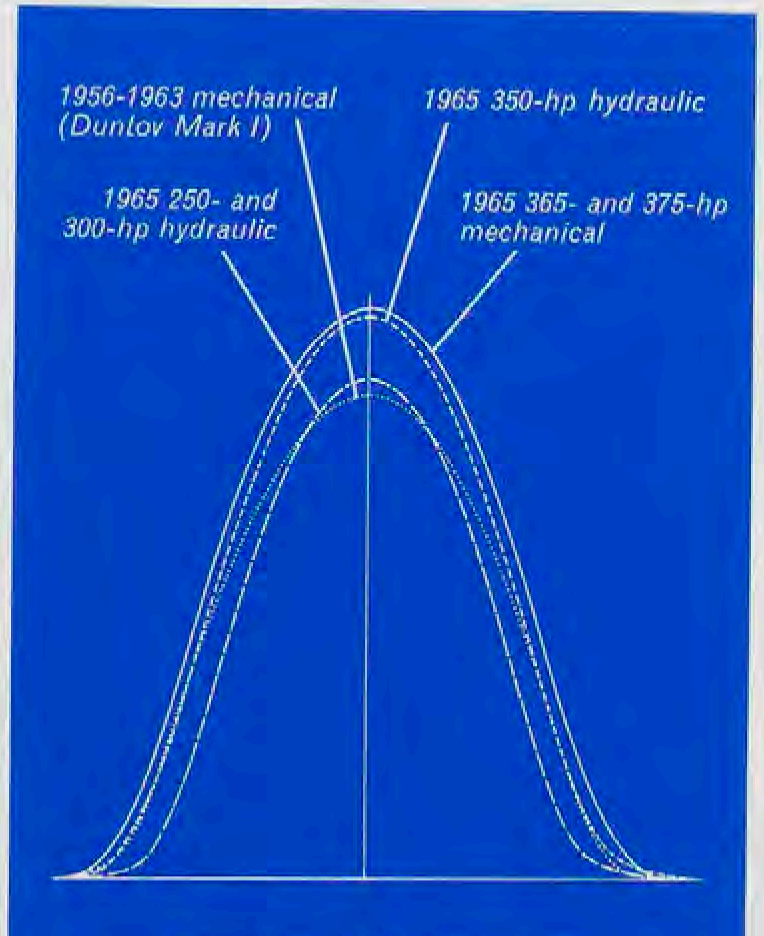
Valve motion diagram

Chevrolet Corvette Engine Group Engineer Denny Davis pointed out, "We would like to accelerate the valve open at an infinite rate, hold it open for the desired time and then close it at an infinite rate. However, the faster we attempt to open and close the valve, the greater the loads imposed on the valve train and the greater the spring load requirements are to maintain the motion prescribed by the cam contour."

Mr. Davis also pointed out that this same increase in forces and spring requirements occurs with increasing engine speed. This is because the total valve lift remains constant and has a fixed relationship to crankshaft and piston motion regardless of speed. As engine speed increases, the time available to effect complete motion diminishes. Since the same valve motion has been achieved in less time, it is evident that greater accelerating forces must be applied. For this reason, in designing a high-speed camshaft such as Corvette mechanical camshafts, the designer allocates the greatest possible time for the valve operating cycle and particularly that part of the cycle which is controlled by the valve spring.

This is done by extending the valve opening and closing motion over a greater angular travel of the crankshaft than would be done for a lower speed camshaft.

Example—Compare the width of the lift curves shown for the Duntov Mark I and the 250- 300-hp hydraulic cams below. The Duntov unit lifts slightly less and takes more time to do so than the 250- 300-hp cam as shown in the lift profiles. This allows the maximum values of both the positive and particularly negative acceleration to be reduced while still achieving the desired valve lift.



Comparison of valve lift patterns

Camshaft timing diagram relates valve action to crankshaft motion

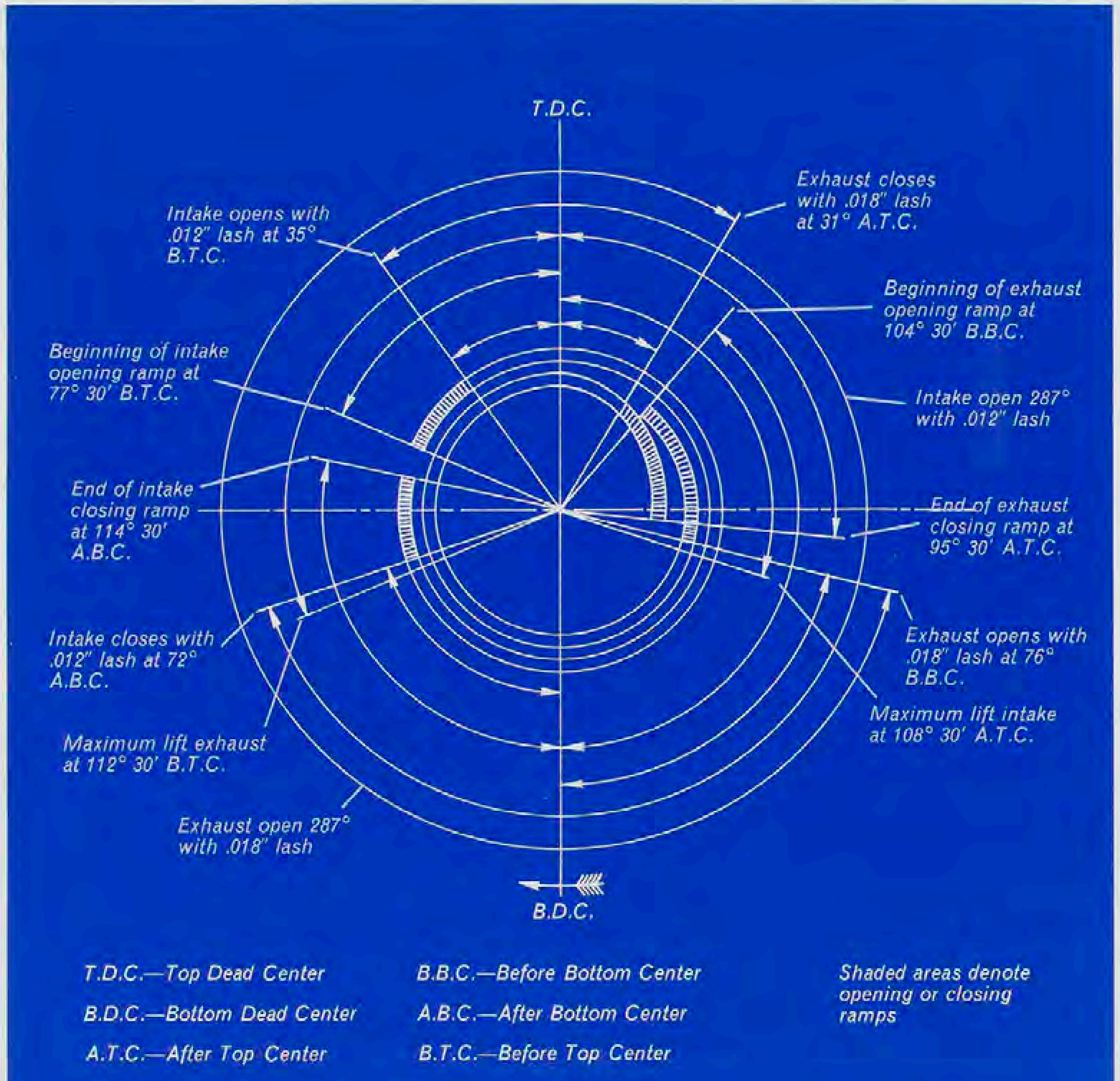
Take a peek at the circular diagram on page 18. At the upper left of the diagram, around 11:00 o'clock, note the caption, "Intake opens with .012" lash." Follow the line around the circle to about the 8:00 o'clock position to the caption, "Intake closes with .012" lash at 72° A.B.C." The part of a circle shown, 287°, is the duration in crankshaft degrees that the intake valve is moved off its seat in the cylinder head, moved to the fully open position, and allowed to close. An additional piece of information pertains to the intake valve cycle. Looking back at the legend, "Intake opens with .012" . . . " the next caption to the left says, "Beginning of intake opening ramp at 77° 30' B.T.C." The valve chart shows the action of the original Duntov camshaft which used a mechanical lifter valve system. With a mechanical lifter, some device is necessary to take up clearance allowed for expansion of the valve system components. Ramps take up the clearance and provide cushions for opening and closing the valve. With hydraulic lifters, oil maintains zero valve system clearance, eliminating the need for the clearance portion of the ramps. However, a small cushioning ramp is usually maintained.

In total, the intake valve lifter contacts the starting ramp at 77° 30' before Top Dead Center (the condition when the piston is approaching its highest point of travel in the cylinder, abbreviated "T.D.C."), begins the lift sequence at 35° before T.D.C. and remains open for 287° of rotation. The intake valve closes at 72° After Bottom Center (again, the position of the piston past the lowest point of travel in the cylinder, abbreviated "A.B.C.") and runs smoothly onto the closing ramp 78° 30' A.B.C. It finally finishes the closing ramp at 114° 30' A.B.C. If you trace the exhaust valve diagram, you will note a similar sequence, only at a different relative position on the degree chart. Astute observers, adding up all of the degree indications, will come up with nearly 720° of indication. But bear in mind that the chart shows valve opening in terms of crankshaft degrees, not camshaft degrees. It is necessary to relate valve opening and closing in terms of what the piston does, and since the camshaft moves at one-half engine speed, it turns 180° every time the crankshaft makes one complete revolution. To complete one cam revolution, the crank turns twice, or 720°.

Looking once more at the chart, note that the intake opens at 35° before T.D.C. and the exhaust closes at 31° after T.D.C. This means that for 66° of crankshaft travel, both intake and exhaust valves are partially open. The exhaust hasn't quite closed and the intake is just opening. This overlap, as it is called, is what causes the "hoppity" idle characteristics with Corvette special performance camshafts.

Both the Duntov and the 250- 300-hp camshafts use the same valve spring, yet the 250- 300-hp cam is redlined at 5300 rpm while the Duntov cam was redlined at 6500 rpm. The reason for this difference is because the lower acceleration requirements of the Duntov cam impose less demand on the spring.

Regardless of the cam profile, however, there will be a speed at which the available spring force will be inadequate. Then the valve operating system, and with it the engine, will cease to function properly. This occurrence is termed valve float, and the engine speed at which it occurs, limiting speed.



VALVE TIMING CHART FOR CORVETTE SPECIAL PERFORMANCE CAMSHAFT USED FROM 1956 THROUGH 1963 (Duntov Mark I) Part No. 3736098

The limiting speed, and with this the operational range of the engine, can be raised by reducing valve system weight, using stronger springs or a cam profile which has less valve spring demand.

Since the weight of the valve system components is usually fixed, this leaves only the latter two methods of increasing speed potential open to the designer. Increasing the valve spring load would appear to be the easiest means. Unfortunately, the higher spring loads would also be imposed on the cam at low speeds when they are not required and can cause excessive contact stresses between the cams and lifters leading to possible failure. For this reason, Corvette high-performance engines still use relatively low spring loads and, as pointed out previously, high speeds are achieved mainly by increasing cam duration.

For aid in the spring area, Corvette engines utilize a flat spring within the regular valve spring. This flat spring is called a damper and its purpose is to reduce valve spring surge. Surge is a condition in which the spring vibrates at its natural frequency causing a reduction in available spring load.

The damper is an interference fit within the valve spring providing a friction load between the spring coils and the damper coils which acts to dampen the spring oscillations.

Operations include valves, distributor and fuel pump

If you'll take a moment to glance back at the camshaft picture on the opening page of this article, you'll notice one eccentric at the extreme left end. It drives the fuel pump through a push rod. Because the forces imposed on the fuel pump are less than those on valve system, and the motion described is different, no lifter is needed.

At the other end of the camshaft is a spiral gear which drives both the distributor and oil pump. The gear teeth on both the camshaft and the distributor shaft are designed for exact mesh to maintain ignition timing.

The oil pump is driven through the slotted distributor shaft. It requires no maintenance whatever, and, like the other components hooked up to the cam, runs at one-half engine speeds.

How cam designs are tested

In the Chevrolet facilities, camshaft experimental designs are run on test units in the dynamometer room to determine horsepower and torque characteristics with respect to engine speed.

To see what is actually going on at the valve spring, various techniques are used. High-speed motion pictures of the valve spring are taken and the resulting film is run at normal projector speed, allowing a slow-motion study of valve spring action. Variations of this technique are used to study valve motion, but all are very time consuming and sample only one cycle of valve opening and closing. A new device has changed that, however. Called the Optron, this little piece of electronic marvelousness shines a special light on the valve spring cap, converts the reflected beam into an electronic signal and feeds the signal to the face of an oscilloscope, thus giving an instantaneous valve lift picture.

The trace of the scope can also be photographed for future study. According to Chevrolet engineers, the Optron makes camshaft testing more accurate and easier to conduct.

Two pairs and a spare, plus one

In the five Turbo-Fire 327 V8 engines offered during 1965, camshaft design plays a significant part in determining their outputs. One pair, the 250- and 300-hp units, uses the same camshaft and hydraulic lifters. Another pair, the 365- and 375-hp V8s, uses a special performance camshaft and mechanical lifters. In between is the 350-hp V8 with a performance slanted cam profile but with the convenience of hydraulic valve lifters. The new 425-hp Turbo-Jet 396 V8 has an entirely different camshaft specifically tailored to it.

It's interesting to compare valve specifications to see how the camshaft designs differ. Beginning with the 250- and 300-hp engines, the intake valve opens at 32° 30′ B.T.C. (Before Top Center), closes 87° 30′ A.B.C. Exhaust opens at 74° 30′ B.B.C. (Before Bottom Center), closes at 45° 30′ A.T.C. (After Top Center). Duration for both intake and exhaust is 300° and overlap is a relatively mild 78°. The 350-hp Turbo-Fire 327 has this timing: Intake valve opens 54° B.T.C., closes 108° A.B.C.; exhaust opens 102° B.B.C., closes 60° A.T.C. Duration for both is increased to 342° along with the overlap which is increased to 114°. The 365- and 375-hp V8s have this timing: Intake opens 60° 50′ B.T.C., closes at 105° 23′ A.B.C.; exhaust opens 108° 50′ B.B.C., closes 57° 23′ A.T.C. Duration for intake and exhaust is 346° 13′, and overlap is even greater at 118° 13′.

Valve timing for the 425-hp Turbo-Jet 396 looks to be somewhat less than 327 highest output engines. But with the larger displacement and other engine differences covered in **Corvette News**, Volume 8, No. 3, the horsepower output is considerable. Intake valves open at 54° B.T.C., close at 102° A.B.C. Exhausts open at 102° B.B.C., close at 54° A.T.C. Duration for both is 336° and the overlap is 108°. No matter how you look at these times, the effect is very much on the high-performance side of things.

As Chevrolet engineers are careful to point out, the valve timing always represents something of a compromise. The 250- and 300-hp engines favor torque at lower engine speed. The 365-hp, 375-hp and 425-hp engines are compromised in favor of blistering performance at high engine rpm. The idling speed, somewhat higher and a little less smooth, is the result of cam timing. Above 3,000 rpm, these really high-output engines smooth out and develop acceleration that can be described in only one word: fierce. The 350-hp engine represents a design that fits neatly between the other types. It's also interesting to note that of Corvette's six engines offered throughout the 1965 model year, four of them develop more than one horsepower per cubic inch, and one of them (the 350-hp) does it with hydraulic lifters. Generally, the more-than-one-horsepower-per-cubic-inch-goal has required mechanical lifters, since hydraulic versions pumped up at high engine speeds and caused valve float. The new 350-hp Turbo-Fire 327 V8 engine can be operated up to 6,000 rpm without lifter pump-up.

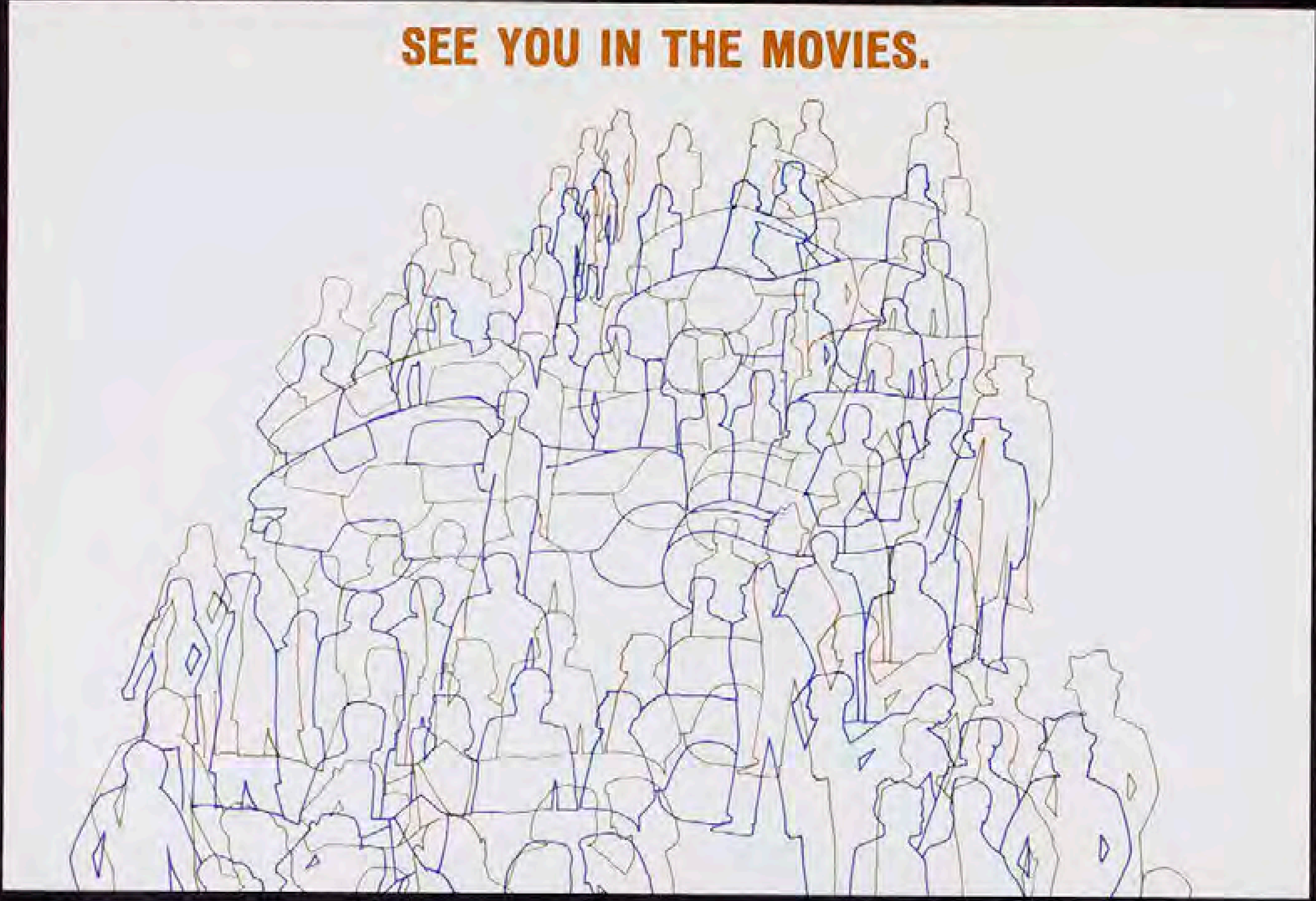
Why changing cams is sometimes like mixing apples and oranges.

Finally, Chevrolet engineers point out that camshafts are designed to match engine equipment—in terms of cylinder head design, carburetion (or fuel injection) and displacement. Changing one without the other can lead to some unusual—and possibly unhappy—circumstances. All Corvette engines have been selected for very definite performance characteristics for just about every type of enthusiast.

For example, the 365- 375-hp camshaft was developed for use with the 327 engine incorporating the larger inlet and exhaust valves now used in Corvette high-performance engines. Installing this camshaft in an earlier model Corvette not having the displacement or valve size necessary to fully utilize the valve timing will result in a reduction in low-speed city traffic performance with any power gains in a speed range so high that they can rarely be used.

Did you attend the Great Canyon or Virginia Reel Rally?

SEE YOU IN THE MOVIES.



When was a sports car rally registration like a Hollywood casting call? When the rally was the Great Canyon or Virginia Reel run in May 1965. What caused car owners to recruit promising and talented navigators with the lure: "Stick with me and I'll get you in the movies"?

The answer is very simple. Chevrolet Motor Division contracted to have a new professionally produced motion picture made about automobile rallying. This 25-minute sound and color film covered two of the biggest rallies held in the U.S.

The rallies selected were in different parts of the country so audiences enjoyed the fun of rallying in distinctive settings. They were both sanctioned by the Sports Car Club of America and specifically chosen because they represent the best rallying effort in the U.S.

Coverage of the rallying included the social side . . . the fun of getting together with friends to talk about cars and to share good food. Considerable footage in the film is devoted to the precision of rallying, too, showing the skills and equipment needed to win. Viewers will go through the pre-rally inspection along with entrants and see how rally inspections are more rigid than most state safety checks. All this plus the sounds of rallying and the sights along the way.

The Great Canyon Rally, held in Arizona on May 7, 8 and 9, featured the arid and beautiful background of the Southwest as well as the rally itself. The Virginia Reel Rally, run May 13, 14 and 15, contrasted with the Great Canyon by taking viewers on a route through the lush, green Smoky Mountain region of Virginia.

As a feature of the rallies—and the film—Chevrolet awarded trophies to the best-placed Corvette and Corvair entries in each of the rallies. The trophies were established in recognition of the fact that more Chevrolet products entered SCCA-sanctioned rallies in 1964 than any other marque. Indications are that this trend will continue, and the trophies, plus the movie, are intended to encourage such participation.

Of course, the film will be available to Corvette Clubs as soon as copies can be made for general distribution. Watch later issues of *Corvette News* for more information on the film's availability.

SEBRING SIXTY-FIVE

LOTSA CONTRAST

At least two aspects of this year's Sebring International 12-Hour Grand Prix of Endurance were at opposite poles at different times: the weather and the speeds.

In the jam-packed Corvette Corral the temperature rose to almost 95 degrees at noontime. Shirts were doffed for cooling off and sunburning. Cold drinks were gulped. Conjectures were bandied about concerning temperatures on the course. On-course thermometer readings were actually estimated at 130 degrees, leading Delmo Johnson, Corvette Grand Sport driver, to exaggerate, "I know it's about 400 degrees in that dog-gone car."

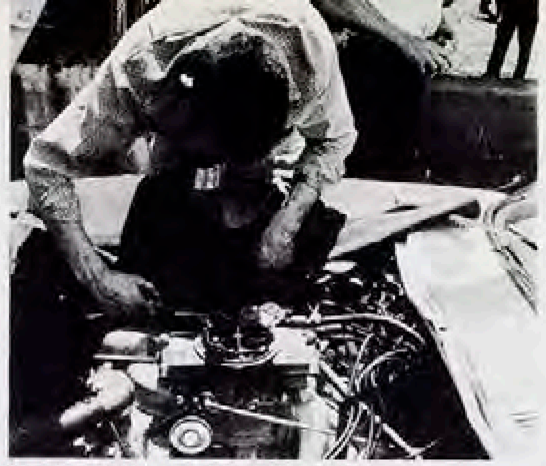
Hot time in the ol' Corvette Corral.

The inferno gave way to the deluge about 5:30 p.m. For approximately an hour, drivers, crews, officials, spectators, etc., were treated to a first class tropical rainstorm, complete with high winds, Martini-size raindrops and minor floods. The temperature dropped as the water levels rose. Beyond the Webster turn, the race resembled the Gold Cup event; roostertails bloomed 15 feet high as big ones and little ones negotiated a pond at least 18 inches deep covering the course.

The early warmth didn't hinder the lap speeds, however. The No. 3 Chaparral whined around the 5.2-mile route clocking the fastest competition lap ever run at Sebring: 2 minutes, 59 seconds. That beat a Ferrari's year-old record time by some 7 seconds.

Then, the rains came and lead-foot Pedro Rodriguez managed to tour the track in a resounding 11 minutes, 4 seconds in a prototype Ferrari.

Roostertail blossoms as a Corvette negotiates the "pond."



Tending to the new Corvette engine.

SEBRING / SIXTY-FIVE

LOTSA CORVETTE POWER

Say, the Yanks finally done it again, taking the Sebring 12-Hour race with U.S.-made power after a 12-year reign of foreign machinery. And Corvette-powered cars were right in there, winning, placing and showing all the way.

The Prototype Class Grand Sports.

Early word around the Sebring pits pointed to the No. 1 Corvette Grand Sport power plant as a fine new engine. The early prognosticators were right. This engine began as a basic 396-cubic-incher with a generous bore of 4.094 inches and a 3.76-inch stroke. (Check Vol. 8, No. 3 for an itemized description.) Then, it was enlarged a bit—to 427 cu. inches. With a big single 4-barrel carb, the resultant engine belched fire, rumbled most ominously and roared down Sebring's back straight at better than 180 mph. Held to a race-finishing 5500 rpm's most of the time, the No. 1 Grand Sport turned very respectable 3:13 laps. The drivers and crew attending the new engine had a relatively short time in which to prepare it. In fact, the engine was delivered in a 396 Sting Ray only a week before the race. After transference to the Grand Sport and traveling time, there were just two days of testing and running before the race. Carburetion problems were never totally solved; lean carburetion caused overheating in the initial hours of the event. But surely, this new engine will be something to reckon with in future outings.

The No. 2 Corvette Grand Sport, while not as spectacular as No. 1, ran steady and true all day with a 377-cu.-in. Corvette engine (a bored out 327) studded with Weber carbs. This one turned 3:20 laps with no apparent difficulty. Both of the Grand Sports are lightweight 'Vettes, of course, due to the thin-skinned fiber glass body and specially designed chassis.

The Grand Touring Class Sting Rays.

There's a story behind the fine-churning engine in the No. 5 Sting Ray. George Robertson, perennial Sebring visitor, brought down a nicely set-up car only to have the engine blow in practice. The car was trailered to Red Vogt in nearby Daytona Beach, Fla., and within 36 hours a new engine was installed and the car returned in time for the race. According to the No. 5 Sting Ray pit crew, the engine was constructed out of a handbasket with components to make up the stock 327 Corvette gathered from all over the Daytona area. The finished product was no hybrid, however, and turned in regular 3:40 laps.

The No. 6 Sting Ray was also powered by a well-prepared 327-cu.-in. Fuel Injection Corvette engine. But, after touring the course in practice sessions in times of 3:33, the car ran afoul of wheel troubles early in the race.

The Prototype Class Grifos.

Pre-Sebring publicity was rather ecstatic about the new Italian Grifos, reading like this: "Sleek, powerful and streamlined is the word for two of the newest type high-speed auto racing cars . . . Bertone designed, all aluminum bodied and weighing in at under 1,900 lbs., the car under the hands of unheralded drivers won many races in European road races this past season." Both Grifos, No. 8 and No. 9, were fitted out with highly modified 327-cu.-in. Corvette mills, rated at 465 hp, with the usual ample stock of Weber carburetors. And both marques turned in good qualifying lap times in the 3-minute, 20-second range.

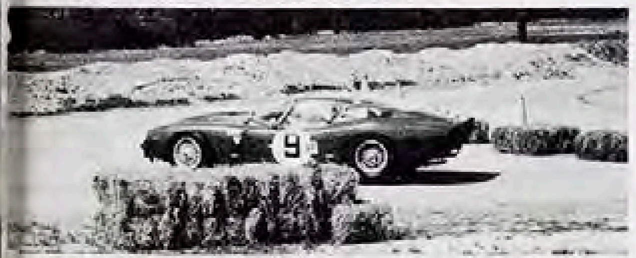
The Sports Car Class Chaparrals.

A pre-race couplet could be heard all over the Sebring circuit: "Sure, they're fast . . . but will they last?" Well, they lasted and lasted and outlasted, in a tribute to painstaking race preparation on the part of the Chaparral drivers and crewmen. Each Chaparral, No. 3 and No. 4, was powered with a rear-mounted 327-cu.-in. Corvette engine with 4 Weber carbs. The transmissions, of course, were the revolutionary and much-publicized automatics that allow exceptional acceleration coming out of tight turns and corners. These all-out racing machines were extremely light in weight and had an exceptionally high power-to-weight ratio. Their shark-nosed fronts and blunt behinds made them the most distinctive cars in the race . . . the latter characteristic being the most familiar one to other race participants.

No. 2 Corvette Grand Sport skimming the waves on the pit straight.

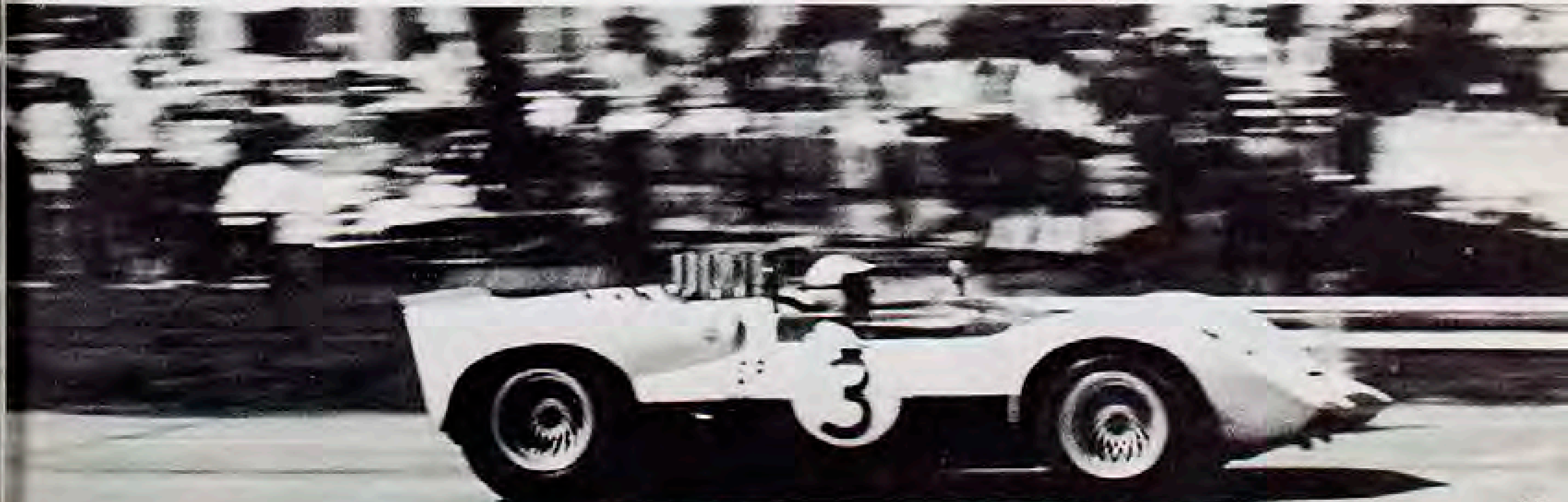
No. 5 Corvette Sting Ray through the Esses.

No. 9 Grifo loses it among the haybales.



No. 1 Corvette Grand Sport at nearly full bore.

No. 3 Chaparral strokes along enjoying a seven lap lead.



In a long, hard pull such as the Sebring 12-hour, there is bound to be a goodly amount of finger-crossing reliance on the whims of the Good Lady of Fortune. While luck is certainly no substitute for race preparedness and good driving, you must have some to run hard all the way and still finish. Naturally, both varieties of fortune visited the Corvette-powered entries at this year's Sebring.

Where Lady Luck smiled.

Take the No. 3 Chaparral which was given a beautiful winning ride by Texans Jim Hall and Hap Sharp. Before the race, people said the brakes wouldn't make it. But Jim Hall replied that the brakes were heavy-duty caliper-disc 12-inch jobs that should stand the hard usage put upon them by the automatic transmission. (Like, obviously, you can't use the gearbox to brake down; it's all on the binders.) Hall was right . . . and lucky, too. Car No. 3 ran first almost the entire race. And the drivers even took out after the "mechanical rabbit" (No. 23 Lotus-Ford), sent out to wear them down, and turned the tables by shaving off the hare. And the hard rain didn't last long enough to let the heavier cars overtake the Chaparral's long lead. And nothing else broke.

Careful, intelligent car preparation was the reason for the fine race turned in by the No. 2 Corvette Grand Sport. The car performed well and within its limits. George Wintersteen showed himself as an excellent pilot. So did his co-drivers Peter Goetz and Ed Diehl. But, it was fortunate that Ed Diehl was on hand. Goetz, originally the only co-driver listed for No. 2, nearly suffered heat prostration in the early stages of the race and had to be relieved by Diehl. After 12 hours, the No. 2 Grand Sport finished 14th overall and second in the Prototype class—a strong, well-deserved placement.

Talk about happiness . . . it was epitomized in the post-race smile on George Robertson's face. As mentioned earlier, the No. 5 Sting Ray received its new powerplant on the morning of the race. Untried and unqualified, Robertson and co-driver Dick Boo entered No. 5 into the fray. And in the words of Dick Boo, "It ran like a striped ape all day long." Other unforeseen mechanical troubles brought on some extra pit time, but George Robertson said happily, "I won!" Meaning that he was satisfied with his 33rd overall position, overjoyed that he had finally finished a Sebring race after trying for five frustrating years, and elated with his first-place class 15 GT trophy.

Delmo Johnson / Dave Morgan

SEBRING / SIXTY-FIVE

LOTSA LUCK (and prep)

Ron Hissom / Bruce Jennings

Don Yenko / John Bushell

Where Lady Luck frowned.

All the worst of it went to the new Grifos. On the first turn of the first lap, driver Rainville lost control of No. 9 and ended up nestled against a snow fence hurriedly vacated by spectators. Later, in the rain, Rainville struck the Mercedes-Benz bridge and split the No. 9 Grifo in half. Nevertheless, No. 9 (Rainville and Mike Gammino) had completed the required two-thirds of the race (an international rule) and was placed 39th overall and fourth in Prototype class. The No. 8 Grifo lost its brakes and whacked a VW bus, retiring for the day without placing.

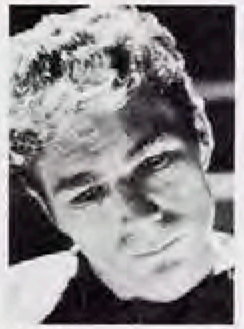
With Delmo Johnson at the wheel, the No. 1 Grand Sport broke first from the Le Mans start and led through the early turns of lap one. But Johnson was forced into a pit stop on lap one because a fouled-out plug left only seven cylinders functioning. Then the throttle linkage let go and Johnson exhibited great ingenuity. Out on the course, he opened the hood, grabbed the damaged throttle linkage, reached into the cockpit for the switch, got the car in gear and ran alongside No. 1 to the pits over a mile away . . . with hood ajar to operate the throttle and steering through the side window. Next, the gearbox broke and was replaced. Then, the second gearbox broke and was replaced with the first one which had been repaired. Total time out of the race for repairs: about two and a half hours. The No. 1 Corvette Grand Sport eventually placed 36th overall and third in Prototype class with drivers Delmo Johnson, Dave Morgan and Ed Sevadvian.

The No. 6 Corvette Sting Ray, driven by Don Yenko and John Bushell, had its share of bad fortune when a rear wheel broke loose, damaging the brake drum and hub carrier. It looked to be too much of a repair job in the pits and the car was reluctantly withdrawn.

Chaparral No. 4 suffered rather lengthy pit stops for electrical system repairs after running with the leaders at the beginning. Drivers Bruce Jennings and Ron Hissom finished No. 4 in 22nd place overall and third in the Sports Car class.

Frenzied action in the No. 4 Chaparral pits.

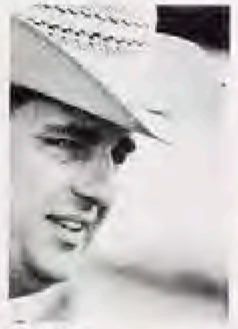
Hap Sharp



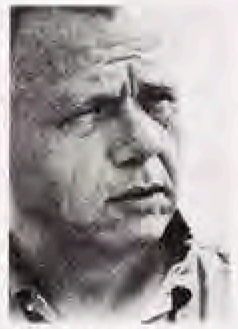
Jim Hall

Peter Goetz

Ed Diehl

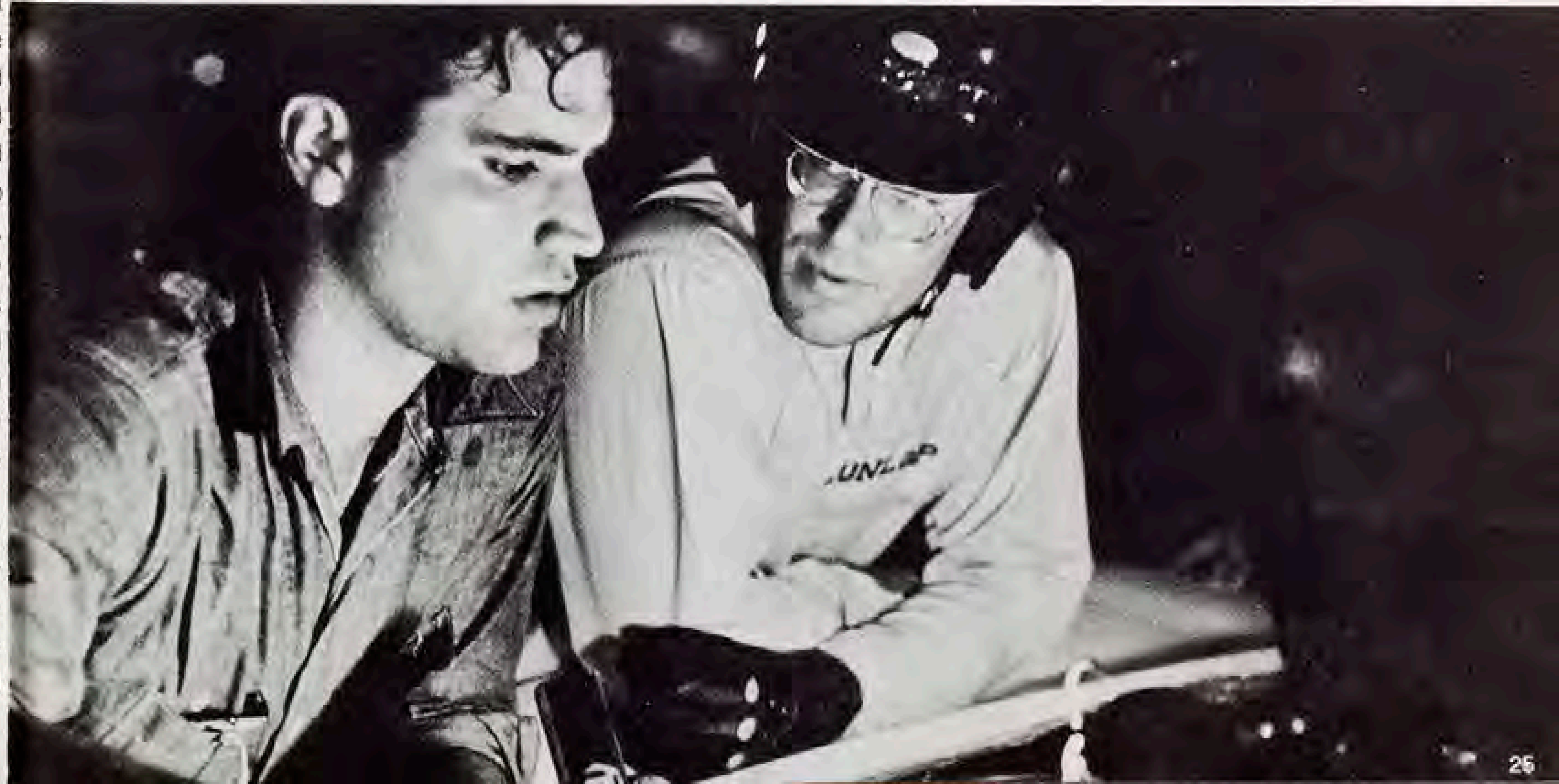


Dick Boo

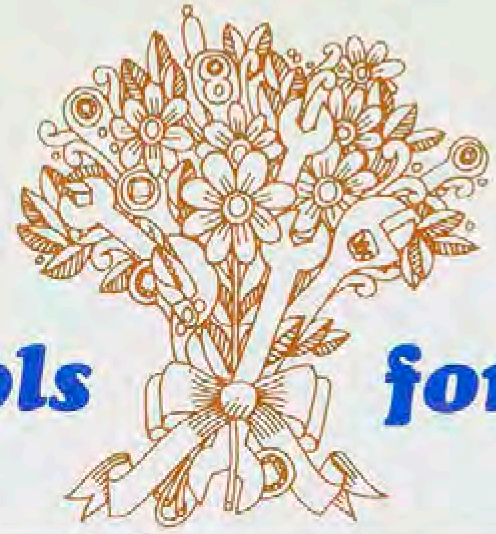


Geo. Robertson

Ed Sevadvian



A "whaddya think" session in the pits between George Wintersteen and mechanic



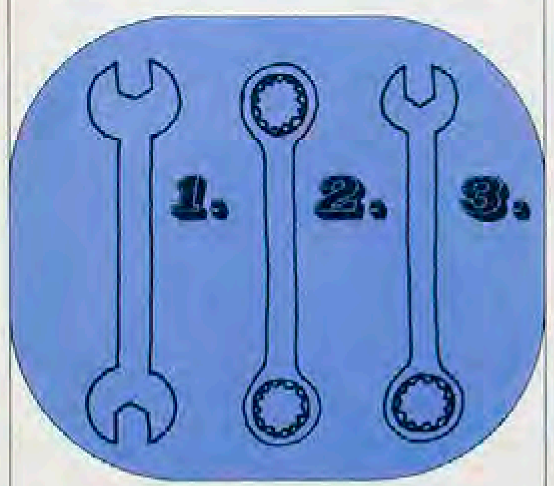
basic tools for basic jobs

Once the snow stops blowing and cold winds stop whistling, the springtime urge to "clean up, paint up, fix up" usually overtakes many Corvette owners. In the process, they often decide to tighten every nut and bolt in sight and perform preventive maintenance and other "spring-tune" operations. Most of these minor tasks can be performed with a few well-selected tools carried in a neatly arranged, old (but clean) sock.

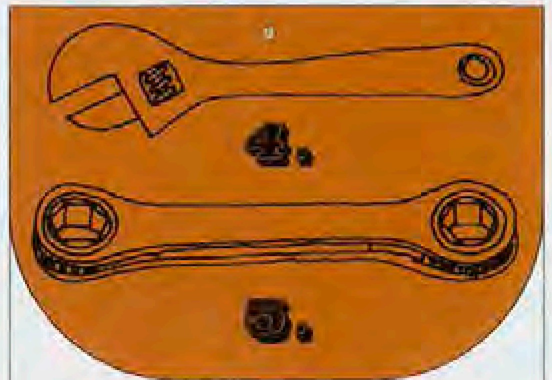
Purchasing tools one at a time as the need arises is a popular way to accumulate necessary items. This system has a good deal of merit because it will seldom result in useless tools, and it's certainly the easiest on the pocketbook. Of course, tools can be bought in sets for less than the total cost of individual items, but sets often include sizes that are seldom, if ever, needed.

For those owners who haven't a goodly supply of basic tools, the following descriptions and recommendations should be of help. Automotive tools and sizes directly applicable to Corvette are highlighted.

wrenches

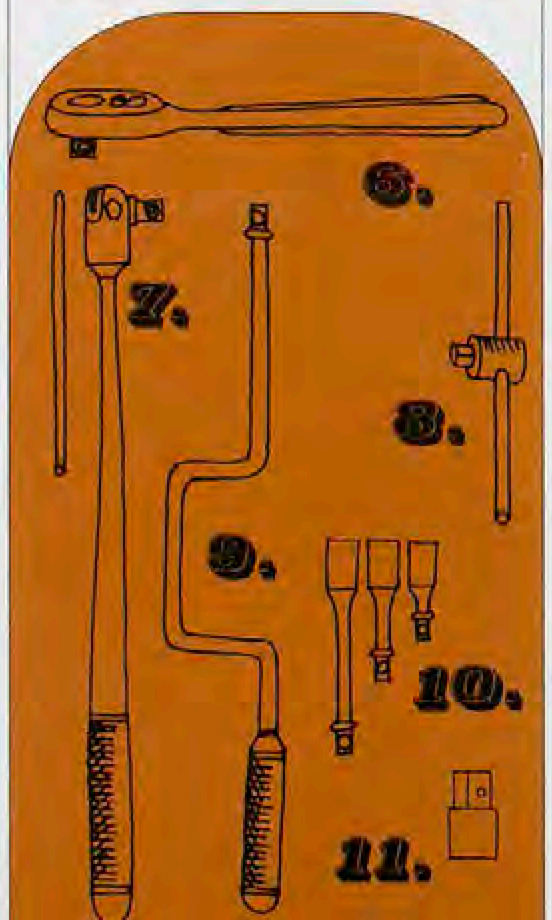


About the most common automotive tool is the end wrench available in open-end (illustration #1) and box-end (#2) designs—with different size openings at each end. The combination wrench (#3) has open and box ends of the same size opening. Most useful sizes would be in the ⅜" to ¾" range to fit on the majority of Corvette bolt-head sizes. These three types of wrenches have certain limitations, however, especially where nuts or bolts are recessed or otherwise hard to reach.



In place of a number of open-end wrenches, one good adjustable-end wrench (#4) may be just as handy. Other than its slightly bulkier design, it offers the advantage of wide jaws for a good grip on brass or other soft-metal nuts and fittings. A box-ratchet (#5) offers convenience in those confined spots that have little clearance.

socket wrenches

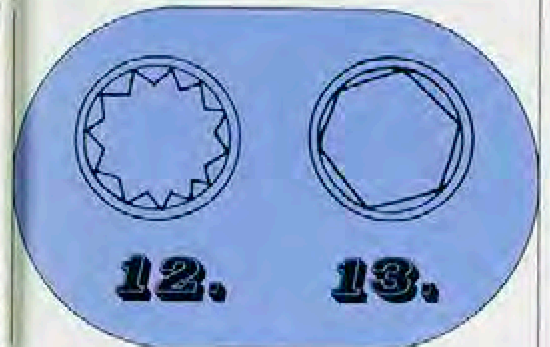


Socket wrenches are the next type of common automotive tools. These, because of the various handles available, are about the most versatile of all. Sockets come in ¼"-, ⅜"-, ½"-, and ¾"-drive sizes. (The drive designation refers to the width or thickness of the stub attached to the handle.) For Corvette work, ⅜" and ½" sizes are the most popular. For the occasional heavier duty work, a ½"-drive flex handle (#7) can be used with selected sockets for loosening or final tightening, with the ⅜"-drive doing all the rest. Adapters (#11) are available for converting ⅜"- to ½"-drive or vice versa.

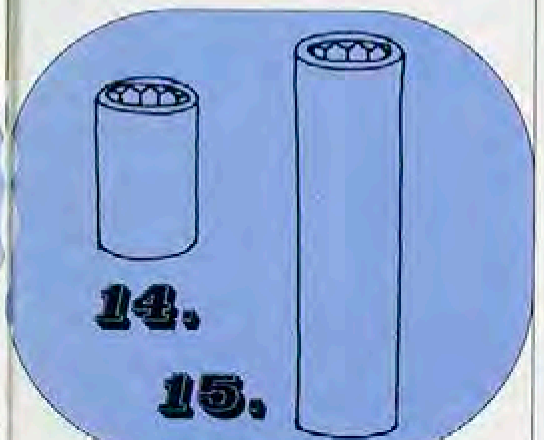
A reversible ratchet handle (#6) is by far the most practical for use with any socket set, but the less-expensive flex handle (#7) with its 180° swivel drive stub can be used in most places. With the sliding bar that can be inserted into the handle, the need for an extension (#10) is often eliminated. By turning the handle at right angles to the nut, a great deal of force can be applied. This flex handle can also be used like a screwdriver by swiveling the end to make it parallel to the handle. A T-handle (#8) may be preferred by some, but it seldom offers the versatility or strength of the flex handle in tight places. The speed handle (#9) does just what its name implies.

sockets

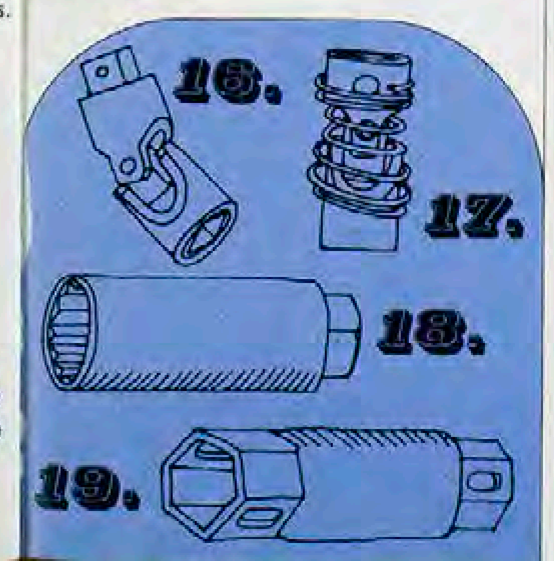
Individual sockets are of three opening types with a 12-point (#12) the most practical because it fits both square nuts and hex nuts. A 6-point socket (#13) is best where a nut is worn, rounded or badly rusted. It does, however, have a thicker wall, making it difficult to use in very tight spots.

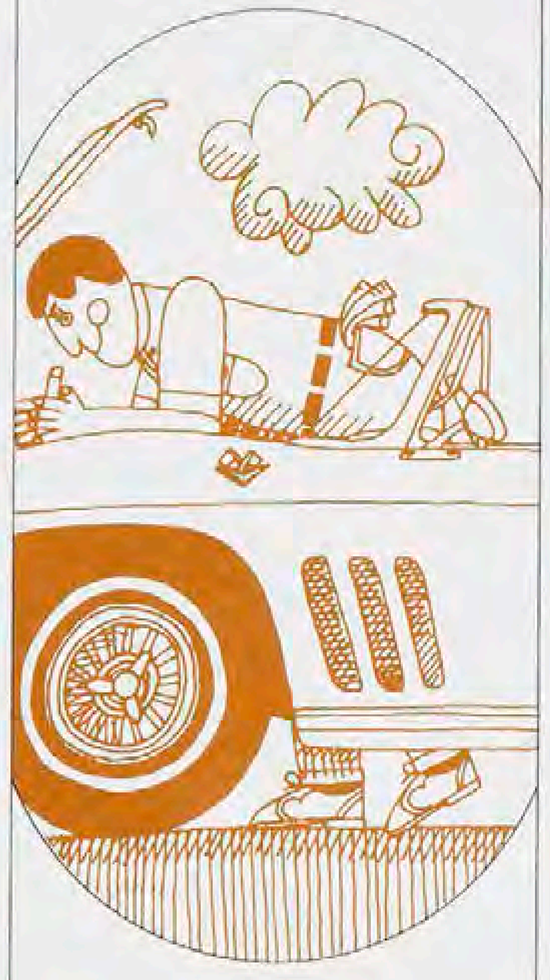


Further sophistication in the socket wrench sets would include a complete set of regular sockets (#14) and deep sockets (#15). One deep socket that is almost indispensable would be a 13/16" spark plug type with a sponge rubber insert (#18) to hold the plug and protect the porcelain. Without such a socket, an inexpensive stamped-metal spark plug wrench (#19) can be used.

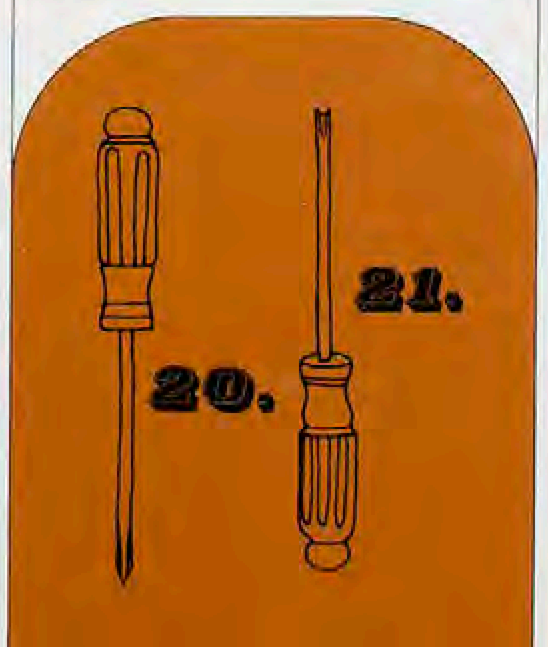


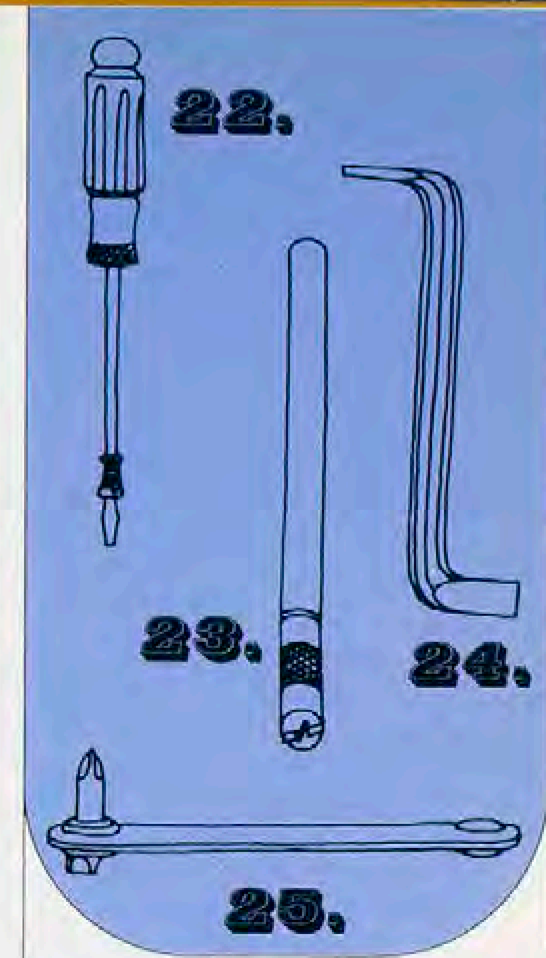
Also included in a more sophisticated set would be a universal joint (#16) and possibly a universal (flex) socket (#17). A plain universal is usually available in ⅜"- or ½"-drive size, while the flex sockets are available in ⅜"-drive. Greater versatility of the flex sockets can be attained by installing a light coil spring (spring from a wheel brake cylinder) around the tool (#17). This keeps the socket lined up for installing on a nut from a remote position.



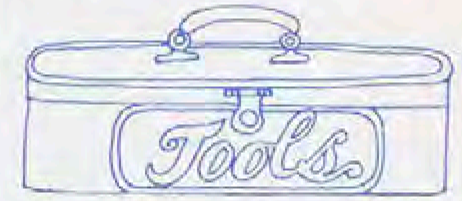


screwdrivers



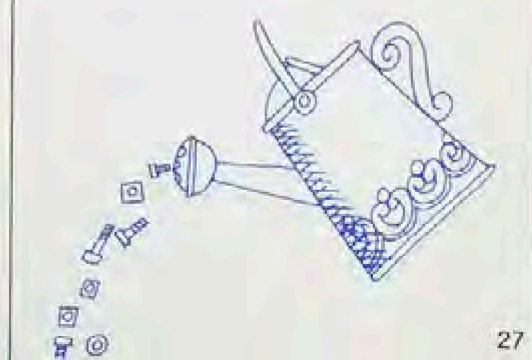


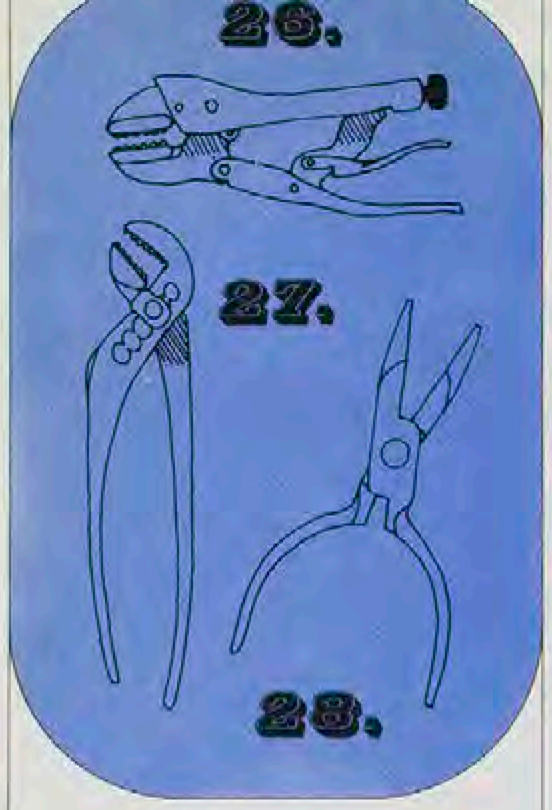
Many basic types of screwdrivers are shown. The holding screwdriver (#23) has a novel interlocking arrangement that grips inside the slot.



pliers

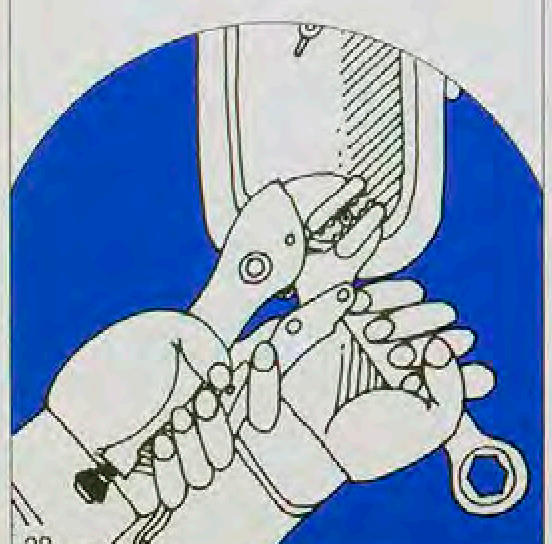
Pliers, too, come in a wide variety of shapes. Many are for specific purposes, but—as most Corvette owners know—never as a substitute for a wrench. This rule may be violated in rare instances where a "third hand" is needed or a nut or bolt is so battered it defies gripping by any other means. Under these conditions, locking pliers (#26—shown on next page) are helpful. Locking pliers, or adjustable angle-jawed pliers (#27), have parallel jaws that grip flat sides of nuts squarely and open very wide. Pliers may also be used to remove spring-wire hose clamps. Needle-nose pliers (#28) are good for installing or removing small springs or clips; for retrieving small parts in hard-to-reach places.





There are many tools that obviously could be covered in detail, such as socket-head (Allen-type, hex-head) wrenches, chisels, hammers, hacksaws, files, screw extractors and wire cutters. Normally, any person confronted with a job requiring these items would certainly know their use in that particular job. Seldom are these tools required in minor work. Another point. These same tools could hardly be considered as automotive tools, but rather as general tools in any home workshop. Also, major work requires the kind of special tools, instrumentation and skilled know-how found in a Chevrolet dealership service department. A discussion of some special tools and equipment will be featured in a future issue of Corvette News.

In the following charts, approximate costs of individual tools and basic sets of tools described earlier are shown. Also shown are some specific operations and the size or type of tools needed for what would be considered minor adjustment or maintenance work.



approximate tool costs

In the chart below, approximate costs of individual tools and tool sets are given. The wide range of prices of individual tools and sets is due to wide variations in quality, length or special construction features. Special economy- or sale-priced tools may cost considerably less; special-purpose tools of these basic designs may run considerably higher.

Most quality tools, with the exception of screwdrivers and ratchet-box wrenches, are usually sold with a lifetime or free-replacement guarantee. Therefore, when tool-shopping and where tools appear the same and have the same (by reputable manufacturer or retailer) guarantee, the lowest priced item would normally be the best buy.

Tool illustration and number	Approximate price range of individual items ($)	Approximate price range of sets ($)	Additional information
1. Open-end wrench	0.50–1.50	2.50– 5.00	6- and 12-point; 3/8" to 1" opening
2. Box-end wrench	0.70–4.00	3.00– 9.00	
3. Combination wrench	0.60–3.00	2.75– 7.00	
4. Adjustable-end wrench	1.75–4.00	5.00–11.00	6" to 12" overall lengths
5. Ratchet-box wrench	1.25–3.50	5.00–10.00	3/8" to 1" openings available
6. Reversible ratchet handle	4.00–8.00	Price of "starter" sets including assortment of handles, sockets and extensions: 3/8"—15.00, 1/2"—20.00	
7. Flex handle (Includes removable slide bar)	1.75–3.75		
8. Sliding T-handle	1.00–2.50		
9. Speed handle	1.75–3.50		
10. Extension (Available in several lengths) 11. Adapter (3/8" to 1/2" or vice versa)	1.00–2.00	Complete sets, including 3/8", 1/2" sets, plus assortment of end wrenches and other automotive tools start at approx. $50.00	
14. Regular socket (Illus. #12 & 13 show types)	0.40–1.00		
15. Deep socket (Illus. #12 & 13 show types)	0.65–1.75		
16. Universal joint	1.50–2.50		3/8"- or 1/2"-drive
17. Universal (flex) socket	1.50–2.50		Usually 3/8"-drive; 3/8" to 3/4" opening only
18. Spark plug socket	1.15–2.00		With rubber insert; 13/16" opening, 3/8"- or 1/2"-drive
19. Stamped spark plug wrench	0.25–0.50		
20. Cross-head (Phillips) screwdriver (Available in No. 1-, 2- or 3-point size) 21. Clutch-head screwdriver			Screwdriver prices too numerous to classify. Available in stubby, regular and extra-long handle or shank designs.
22. Holding screwdriver (Spring-clip type)	1.25–2.50		
23. Holding screwdriver (Slot-holding type)	1.50–2.50		
24. Offset screwdriver (Regular or cross-head type)	0.35–0.75		
25. Offset ratchet screwdriver (Regular or cross-head type)	0.75–1.75		
26. Locking pliers	1.50–3.50		Available in a wide variety of sizes.
27. Angle-jawed pliers	1.50–4.50		Available in a wide variety of sizes.
28. Needle-nose pliers	1.50–2.50		Available in 2 or 3 sizes.

suggested sets of tools and approximate costs

As a possible suggestion for keeping initial tool costs down, an attempt has been made to show here minimum combinations of tools for the greatest variety of jobs.

Minimum Set—approximate cost less than $10.00	Medium-size screwdrivers (regular and cross-head). Medium-size pliers: 3/8"-7/16", 1/2"-9/16", 5/8"-11/16" open-end or combination wrenches in this size range. 6- or 8-inch adjustable wrench. Stamped spark plug wrench (regular plug socket wrench with flex or ratchet handle could be subsitituted).
Basic Set #1—additional cost over minimum set approximately $15.00	Same tools as minimum set. Add box-end wrenches in the same sizes and 3/8"-drive sockets with appropriate flex or ratchet handle and extension(s).
Basic Set #2—additional cost over set #1 approximately $5.00 to $10.00	Same tools as set #1. Add ratchet handle if not added previously. Include larger size box and open-end wrenches.
Basic Set #3—additional cost over set #2 approximately $5.00 to $10.00	Same tools as set #2. Add 1/2"-drive handle (preferably flex or ratchet handle) and selected 1/2"-drive sockets in 5/8" to 1" opening sizes. Also add 3/8" to 1/2" adapter.
Basic Set #4—additional cost over set #3 approximately $10.00 to $15.00	Same tools as set #3. Add 1/2" reversible ratchet if not added earlier. Also include universal joint, plus deep sockets with a 1/2" to 3/4" opening range. Possibly add 3/8"-drive universal (flex) sockets.
Basic Set #5—additional cost over set #4 approximately $8.00	Same tools as set #4. Add complete 1/4"-drive set and 3/8"-or 1/2"-drive speed handles if not added earlier.

typical tool requirements for basic preventive maintenance or minor repair

The chart below shows tools that might be needed for specific operations on a Corvette. These recommendations are general in nature. By checking down the list, you can determine the sizes and types of tools most often used.

Operation	Recommended Tool and Typical Opening Size			
	Open-end or combination wrench	Box-end or combination wrench	Socket size (handle or drive size optional)	Miscellaneous hand tool requirements and notes
Minor carburetor adjustment				Regular, stubby or offset screwdriver
Tighten carburetor fittings	3/8", 7/16", 1/2", 9/16"			Adjustable wrench could be used
Tighten carburetor base and cover	1/2"			Regular or cross-head screwdriver
Set timing	9/16"			
Adjust or replace points; replace condenser	9/16"			Holding screwdriver
Clean or replace spark plugs			13/16" plug type	
Check compression			13/16" plug type	
Check fuel filter	1/2", 9/16"			Adjustable wrench could be used
Remove rocker cover			3/8" or 7/16" (on some models)	Cross-head screwdriver
Adjust tappets—Mechanical type			5/8"	
—Hydraulic type			5/8"	
Tighten exhaust manifold bolts			9/16"	Extension & universal possibly needed
Tighten intake manifold bolts	9/16"			
Tighten cylinder head bolts			11/16"	
Replace cooling system hoses				Pliers for clamps
Replace cooling system thermostat	9/16"			
Tighten or remove fuel pump	7/16", 1/2"			Possibly pliers for fuel line hose clamps
Adjust fan belt tension	1/2", 9/16"			
Clean or replace battery	1/2", 9/16"			Pliers for cable clamps
Tighten or remove generator or Delcotron unit	1/2", 9/16"			Pliers for battery cable clamps
Tighten or remove starter	3/8", 7/16", 1/2", 9/16"			Long extension and universals possibly needed
Tighten or remove shock absorbers	1/2", 9/16", 3/4"			Adjustable wrench
Repack or replace driveshaft universal joints	1/2"			5/8" or similar size socket needed for driving out journal
Adjust clutch	9/16"			Pliers for cotter pin; 3/4" open-end on '56-'57
Bleed brake lines	3/8" or 7/16"			Adjustable wrench for master cylinder on some
Check brake fluid				Adjustable wrench for master cylinder on some

THE SYMBOL SHOWN ABOVE IS USED THROUGHOUT THE CORVETTE CLUB DIRECTORY TO DESIGNATE CLUBS BELONGING TO THE NATIONAL COUNCIL.

NATIONAL COUNCIL OF CORVETTE CLUBS, INC.

OFFICERS • 1964-1965

ARTHUR F. MILLER, PRESIDENT
311 SOUTH WISNER
JACKSON, MICHIGAN
PHONE—AREA 517-782-1592

DONALD H. CRISS
VICE PRESIDENT
3690 GREENGATE DRIVE
TOLEDO, OHIO
PHONE—AREA 419-385-6548

TOM KOETS
VICE PRESIDENT
1019 COBB AVE.
KALAMAZOO, MICHIGAN
PHONE—AREA 616-FI-27179

SPARKY KALLUNKI
VICE PRESIDENT
9350 MEMORIAL
DETROIT, MICHIGAN
PHONE—AREA 313-838-6844

EILEEN TIMKO, SECRETARY
4365 NORTHFIELD ROAD
WARRENSVILLE, OHIO
(HAVE NO PHONE NUMBER)

TERRY TETZLAFF, TREASURER
4030 YORK ROAD
SOUTH BEND 14, INDIANA
PHONE—AREA 219-291-3045

BOARD OF GOVERNORS

KEN ADAMS—CORVETTE CLUB OF ONTARIO
THOMAS G. JURICIC—CHICAGO CORVETTE CLUB
MARLIN MUNSON—MIDWEST CORVETTES
CHARLES EPPERSON—MICHIANA CORVETTE CLUB, INC
DON HOSKINS—CORVETTE CLUB OF IOWA
JAMES N. FRITZE—CREOLE CORVETTE CLUB
WAYNE DAHLSTROM—CORVETTE CLUB OF BALTIMORE
GIL ROYCRAFT—CORVETTE CLUB OF MICHIGAN
DARWIN THOMAS—CAPITAL CITY CORVETTE CLUB
DAVE FITZJOHN—KALAMAZOO CORVETTE CLUB
STUART ROBERTS—CORVETTE CLUB OF BATTLE CREEK
DICK O'DELL—CORVETTE CLUB OF KANSAS CITY
ALAN MILLNER—SO. ST. LOUIS CORVETTES, INC
JACK SHELTON—CORNHUSKER CORVETTE CLUB
JIM PHILLIPS—CORVETTE CLUB OF LAS VEGAS
WILLIAM PENN—THE JERSEY CORVETTE CLUB
JOHN PALLADINO—EMPIRE CORVETTES
FRED KIRSCH—TIRETOWN CORVETTE CLUB
LARRY ROY—QUEEN CITY CORVETTE CLUB
DENNIS SPACONE—CORVETTE-CLEVELAND, INC
JAMES MURPHY—CENTRAL OHIO CORVETTE CLUB
DON CRISS—CORVETTES, INC.
CURTIS PERSON—CORVETTE CLUB OF TENNESSEE
DR. R. A. GREINER—CORVETTES LIMITED, MADISON
JOHN HAZEWINKEL—GRAND VALLEY CORVETTE CLUB
TERRY McHENRY—CAMINO CORVETTES
HOWARD FETTEROLF—SCHUYLKILL VALLEY CORVETTE CLUB
ROBERT O. HARRISON, JR.—MASTERS CORVETTE CLUB
HARRY GREEN—SAN JACINTO CORVETTE CLUB
ALAN HAAS—BUCKEYE CORVETTES, INC.
KENNETH J. KINDERMAN—GREATER DAYTON CORVETTE CLUB
TOM ECKERT—CORVETTE CLUB OF ST. LOUIS
BUD JOHNSON—HEART OF DIXIE CORVETTE ASSOCIATION
VINCE VLASIC—SAGINAW VALLEY CORVETTE ASSOCIATION

ALABAMA

Heart of Dixie Corvette Association
Juris Skujins, Chairman
P.O. Box 3178
Huntsville, Alabama

ARIZONA

Corvette Club of Tucson
Art K. Tom, President
1604 East 10th Street
Tucson, Arizona

CALIFORNIA

Coureur D'Corvette
Richard MacDonald
11428 206th Street
Lakewood, California

Corvettes Limited
Don Platzer, President
5328 North Rosemead Boulevard
San Gabriel, California

Corvette Owners Club of North Hollywood
Linda Dietz, Corres. Secretary
15208½ Magnolia Boulevard
Sherman Oaks, California 91403

Northern California Corvette Association
Jerry Vercelli, President
3020 East 18th Street, Apt. 20
Oakland, California

Corvette Owners Club of San Diego
Gary Crowley, President
16743 Antonio Drive
San Diego, California 92128

Corvette Super Sports
Tom Mazzola, Corres. Secretary
P.O. Box 592
La Habra, California 90631

Corvettes of Monterey
Richard Schultz, President
P.O. Box 1114
Salinas, California

Southwestern Corvette Association
Jim Cash, President
1223 Muirlands Vista Way
La Jolla, California

Corvettes of Bakersfield
Myron F. Overton, President
1808 Alameda Avenue
Bakersfield, California

Camino Corvettes
Harvey Schiff, President
433 Mary Avenue, #25
Sunnyvale, California

Cal Coast Corvettes
Gene Axsom, President
P.O. Box 1012
Santa Maria, California

Corvette Owners Club of Sacramento
Larry Armes, President
222 Finley Street
Auburn, California

San Bernardino Corvette Association
Pauline J. Castelluccio, Secretary
3568 Crowell Street
Riverside, California

Coast Vette-Airs
F. P. "Rick" Cordero, Jr., President
c/o Howard Cuyler Chevrolet, Inc.
675 Cristobal
Pacifica, California

Pomona Valley Corvette Association
Peter Groth, President
5646 North Willard Avenue
San Gabriel, California

East Bay Corvette Association
Jay D. Murphey, President
37 Kerr Avenue
Berkeley, California

Checkmates Corvette Club
Art Cunningham, President
1415 Hauser
Los Angeles, California 90019

Marina Del Rey Corvette Club
Joel Woolf, Club Representative
c/o Owen Keown Chevrolet Co.
3233 Washington Boulevard
Venice, California

Courtesy Corvettes of San Jose
John Whitted, President
16686 Chirco Drive
Los Gatos, California 95030

Clippinger Corvair-Corvette Club of San Gabriel Valley, Inc.
Mrs. Marjorie E. Gibbons, Secretary
316 East Greystone Avenue
Monrovia, California 91016

Corvette Club of Pasadena
Judith A. Sherrard, Secretary-Treasurer
2917 Foss Avenue
Arcadia, California 91006

Corvettes of Southern California
Terry Fiskin, President
2211 East Anaheim
Wilmington, California

COLORADO

Corvette Club of Colorado
Julius R. Buerger, President
2960 South Ivanhoe Street
Denver, Colorado 80222

The Corvette Club of Colorado Springs
Donald L. Green, President
c/o Daniels Motors, Inc.
105 North Weber
Colorado Springs, Colorado

Denver Corvette Association
Don Smith, President
1463 Newton Street
Denver, Colorado 80204

CONNECTICUT

Western Connecticut Corvette Club
David M. Cote, President
P.O. Box 579
Waterbury, Connecticut

Corvettes Limited of Connecticut
Norman Schaefer, President
East Litchfield Road
Litchfield, Connecticut

Connecticut Yankee Corvettes
John T. O'Connor, President
259 Elaine Terrace
New Haven, Connecticut

DISTRICT OF COLUMBIA

Corvette Club of America
Mrs. Ruth Shenton, Corres. Secretary
Box 3846
Washington, D.C. 20014

FLORIDA

Corvette Club of Central Florida
Vince Gimondo, President
1613 Bordeaux Drive
Leesburg, Florida

Orlando Corvette Club
Stewart H. Crawford, President
2316 Hoffner Avenue
Orlando, Florida

Corvette Club of Miami, Inc.
Norman P. Pascarella, President
2050 North Miami Avenue
Miami, Florida

The Corvette Club of South Florida
Joel Brandwein, President
1900 North East 186th Drive
North Miami Beach, Florida

GEORGIA

Masters Corvette Club
Robert O. Harrison, Jr., President
909 Fairwood Avenue
North Augusta, South Carolina

IDAHO

Treasure Valley Corvette Club
Kent Moehlmann, President
206 20th Avenue South
Nampa, Idaho

ILLINOIS

Chain-O-Lakes Corvette Club
Dick Kerr, President
7610 Woodland Terrace
Gurnee, Illinois

Chicago Corvette Club, Inc.
Thomas G. Juricic, President
731 Sibley Boulevard, Apt. B
Calumet City, Illinois

Midwest Corvettes
John Drexler, President
Mrs. Ruth Lowrence, Secretary
4224 18th Avenue
Rock Island, Illinois

Corvette Club of Joliet, Inc.
Forrest L. McAllister, President
Middletree Road,
Sugar Creek Woods
Joliet, Illinois

Sting-Rays
Miss Judy Kruzsels, President
1523 North Cleveland Avenue
Chicago, Illinois 60610

Piasa Corvettes, Inc.
Edward May, Secretary
4710 D'Adrian Drive
Godfrey, Illinois

Twin-City Corvette Club
John Sparbel, President
109 East Olive Street
Bloomington, Illinois

Iliscon Vettes Club
Ted Oseid, President
c/o Lou Bachrodt Chevrolet
2000 Christina Street
Rockford, Illinois

Corvettes of Peoria
Jack Kaveney, President
3913 North Sterling Avenue
Peoria, Illinois 61614

Northern Illinois Corvette Club
James R. Ryley, President
c/o Fourth Street Motor Sales, Inc.
204 North Fourth Street
DeKalb, Illinois 60115

Windy City Corvettes, Inc.
Norbert Klosowski, President
4916 West Grace Street
Chicago, Illinois 60641

INDIANA

The Amberly Castle Corvette Club
Ron L. Clift, President
7014 Rockville Road
Indianapolis, Indiana

Lafayette Corvette Club
Richard Darnaby, President
234 Littleton
West Lafayette, Indiana

Indie Corvettes
Peter C. Mountz, President
412 East King
Garrett, Indiana 46738

IOWA

Regal Vettes
John Fromm, President
R #4
Mason City, Iowa 50401

Corvette Club of Iowa
Phil Slinker, Jr., President
709 Clegg Road
West Des Moines, Iowa

Cedar Rapids Corvette Club, Inc.
Patrick L. Kelly, Vice President
2057 Washington Avenue
South East
Cedar Rapids, Iowa 52403

KANSAS

Corvette Club of Kansas
A. J. Robinson, President
9723 West Ninth
Wichita, Kansas

Corvette Club of Kansas City
Dale W. Martin, Secretary
Box 1262
Richards-Gebaur AFB, Missouri

Tornado Alley Corvette Club
J. L. Painter, President
2601 Burnett Road
Topeka, Kansas 66614

KENTUCKY

Kentuckiana Corvette Club
Richard Gorantlo, President
5330 Westhall
Louisville, Kentucky

Northern Kentucky Corvette Club
James G. Schworer, President
1919 Russell Street
Covington, Kentucky

LOUISIANA

Creole Corvette Club
Loy B. Moore, President
221 Traffic Street
Bossier City, Louisiana

Crescent City Corvette Club, Inc.
Maumus F. Claverie, Jr., Secretary-Treasurer
1624 National Bank of Commerce Bldg.
New Orleans, Louisiana 70112

Sportsters Corvette Club
Jimmy James, President
5181 Underwood Street
Baton Rouge, Louisiana

MAINE

Corvettes Limited
Doreen M. McCafferty, President
P.O. Box 163
Mattawamkeag, Maine

Kennebec Valley Corvette Club
James Leavitt, President
210 Central Street
Gardiner, Maine

MARYLAND

Corvette Club of Baltimore, Inc.
John Grove, President
1204 Elmridge Avenue
Baltimore, Maryland 21229

MASSACHUSETTS

Corvettes of Central Massachusetts
Don Levine, President
9 Kelley Square
Worcester, Massachusetts

Corvettes of Massachusetts
John Bushell, President
3 Amherst Road
Beverly, Massachusetts

MICHIGAN

Corvette Club of Michigan, Inc.
Ralph Henning, President
17292 Ward
Detroit, Michigan 48227

Capital City Corvette Club, Inc.
James F. Hoppin, President
P.O. Box 146
Lansing, Michigan 48901

Kalamazoo Corvette Club
Robert M. McAllan, President
P.O. Box 852
Kalamazoo, Michigan

Corvette Club of Battle Creek, Inc.
Max Root, President
P.O. Box 1097
Battle Creek, Michigan

Grand Valley Corvette Club
Don Hall, President
670 Byers, North East
Grand Rapids, Michigan 49505

Michiana Corvette Club
Charles Pratt, President
1444 Bond Street Road
Niles, Michigan

Saginaw Valley Corvette Association
Naomi Maloney, Secretary
502 West Main Street
Midland, Michigan

MINNESOTA

Corvettes of Minnesota
Jim Whelan, President
525 Wildwood Avenue
White Bear Lake, Minnesota 55110

MISSISSIPPI

Vertigo Vettes
Richard Gospard, President
1405 Broad Street
Columbia, Mississippi

Rebel Vettes Corvette Club
Mrs. Jacquelyn W. Farris, Secretary
1015 Devonshire Drive
Jackson, Mississippi

MISSOURI

South St. Louis Corvettes, Inc.
Paul D. Callahan, Secretary
9924 Foxglove
Affton, Missouri 63123

Corvette Club of St. Louis
Carol Kappel, Secretary
7522A Park Towne South
St. Louis, Missouri 63136

NEBRASKA

Cornhusker Corvette Club
Dale P. Nelson, Secretary
1360 South 75th Street, Apt. 4
Omaha, Nebraska

NEVADA

Corvette Club of Las Vegas
Leroy Wickham, President
Dimensional Fibreglass Enterprises
2306 Losee Road
Las Vegas, Nevada

NEW HAMPSHIRE

Granite State Corvette Club
Daniel W. Fitzgerald, President
13 Randall Street
Manchester, New Hampshire

NEW JERSEY

Corvette Sports Car Club
Henry Steinman, Membership Chairman
1051 Woodland Avenue
Plainfield, New Jersey 07060

The Jersey Corvette Club
David L. Weil, President
254 Joralemon Street
Belleville, New Jersey 07109

Surf Corvette Club
Jack Hansen, President
Box 1252
Point Pleasant Beach, New Jersey

Corvette Club of South Jersey
Les Osti, President
P.O. Box 501
Millville, New Jersey 08332

NEW YORK

Thundervettes Sports Car Club of America, Inc.
Lester Bauman, President
43 Bridle Avenue
Hicksville, Long Island, New York

Long Island Corvette Owners' Association (LICOA)
Warren H. Shiber, President
306 West Merrick Road
Merrick, Long Island, New York

Northeastern Corvette Owners' Club
Joseph E. Nichols, President
Nichols Notch—P. O. Box 245
North Creek, New York

The Rochester Corvette Club
Ron Nichols, President
22 Brookview Road
Rochester, New York 14624

Western New York Corvette Club
Mrs. Susan Allen, Membership Chairman
4795 Genesee Street
Buffalo, New York 14225

Northshore Corvette Club
Leland Gaylor, President
90 Southview Drive
Port Jefferson, New York

The Ja-Vette Club
Patrick M. Pacitti, President
401 Charles Street
Jamestown, New York

Corvette Club of Syracuse
George H. Whitbeck, President
108 Ambergate Road
DeWitt, New York 13214

Westchester Corvette Association
Robert Barry, President
P.O. Box 88, Parkchester Station
Bronx, New York 10462

The Gentlemen Vets of East Meadow
Ronald R. Ramis, President
808 Wenwood Drive
East Meadow, Long Island, New York

Empire Corvettes
John Palladino, President
80-57 160th Street
Jamaica, New York 11432

Corvette Club of North America
Jerry Puchkoff, President
745 Troy Avenue
Brooklyn, New York

Mid-Hudson Corvair-Corvette Assoc.
Douglas L. Bard, President
c/o Bard Chevrolet
453 Broadway
Newburgh, New York

NORTH CAROLINA

Corvette Club of North Carolina
Sandy Mitchell, President
P.O. Box 8106
Charlotte, North Carolina 28208

OHIO

Tiretown Corvette Club
Dick Starts, President
P.O. Box 331
Cuyahoga Falls, Ohio

Buckeye Corvette, Inc.
Ralph Motz, President
13088 Mogadore Avenue, North West
Uniontown, Ohio

Queen City Corvette Club, Inc.
Larry Roy, President
2218 North Bend Road
Cincinnati, Ohio 45239

Corvette-Cleveland, Inc.
Stanley Kronen, President
3904 West 162nd Street
Cleveland, Ohio 44111

Central Ohio Corvette Club
David B. Selby, President
1984 Northwest Boulevard
Columbus, Ohio 43212

Corvettes, Inc.
Tom McGuire, President
3627 Burton Avenue
Toledo, Ohio 43612

Mahoning Valley Corvettes
Donald N. Sutvak, President
227 Kenilworth North East
Warren, Ohio 44483

Wooster Vettes
Harold Geiser, President
R. D. #1, Township Road 221
Orrville, Ohio 44667

Hamilton Corvettes
Boyd Furginson, Jr., President
170 Gregory Lane
Hamilton, Ohio

The Greater Dayton Corvette Club, Inc.
Kenneth J. Kinderman, President
275 Valley View Drive
Dayton, Ohio 45405

Fort Findlay Corvette Club
James Runkle, President
2801 South Main Street
Findlay, Ohio

OKLAHOMA

Oklahoma Corvette Club, Inc.
Mrs. Mary Kay Leslie, Secretary
122 South West 6th Street
Oklahoma City, Oklahoma 73125

Tulsa Corvette Club
Burch K. Farnsworth, President
215 South Fulton
Tulsa, Oklahoma 74112

OREGON

Capital Corvette Club, Inc.
Glenn Neuharth, President
357 Kestrel, North
Salem, Oregon

PENNSYLVANIA

Corvette Club of Delaware Valley
Norm Lieberman, President
1354 Wells Street
Philadelphia, Pennsylvania 19119

Schuylkill Valley Corvette Club
Howard Fetterolf, President
314 Hobart Street
Gordon, Pennsylvania

Corvette Club of Western Pennsylvania
G. Richard Gray, Jr., Publicity Director
323 Grant Avenue
Pittsburgh, Pennsylvania 15209

Delaware Valley "Vets"
James A. Good, Secretary & Treasurer
676 Rennard Street
Somerton
Philadelphia, Pennsylvania 19116

Checkpoint Corvette Club
Albert J. Loquasto, Jr.
3676 Mountain View Avenue
Easton, Pennsylvania

Fox Chase Vets
Dennis F. McCarthy, President
716 Disston Street
Philadelphia, Pennsylvania 19111

Lancaster Corvettes Limited
Martin A. Kuoss, President
127 Main Street
Landisville, Pennsylvania 17538

Skyline Drive Corvettes
John W. Angstadt, President
Box 191
Oley, Pennsylvania 19547

TENNESSEE

Corvette Club of Tennessee
Curtis Person, Jr.
Curtis Person Chevrolet Co.
Millington, Tennessee

East Tennessee Corvette Club
John Waggoner, President
600 Inskip Drive, North West
Knoxville, Tennessee

TEXAS

Corvette Club of Texas
Kenneth A. Bradley, President
9964 Greenfield Drive
Dallas, Texas 75238

San Jacinto Corvette Club
James Ellis, President
6702 Biggs, Apt. #7
Houston, Texas

Corvette Club of Dallas, Inc.
Gary Vandergriff, President
c/o Mohr Chevrolet
999 North Central Expressway
Dallas 4, Texas

The Lubbock Corvette Club
Steve Sell, President
c/o Jackie's Automotive
2014 Fourth Street
Lubbock, Texas

VIRGINIA

Corvette Club of Richmond
James P. Scott, Corres. Secretary
P.O. Box 6313
Richmond, Virginia 23230

Tidewater Corvette Club
David W. Boling, Jr., President
c/o Colonial Chevrolet Corp.
Bough Street & Olney Road
Norfolk, Virginia 23510

Mason-Dixon Vettes
Robert W. T. Saville, President
R.F.D. No. 1
Ridgeley, West Virginia 26753

WASHINGTON

Pacific Northwest Corvette Association
George W. Mitchell, President
26025 108th Avenue, South East
Kent, Washington 98031

Corvette Marque Club of Seattle
Ed Baker, President
514 East 10th
Olympia, Washington 98502

WISCONSIN

Wisconsin Corvette Club, Inc.
La Nor Diego, Secretary & Treasurer
P.O. Box 1115
Milwaukee, Wisconsin 53201

Indianhead Corvette Club of Wisconsin
Dick Bergh, Secretary
P.O. Box 447
Eau Claire, Wisconsin

corvettes d'elegance
Russell Townsend, Jr., President
3419 West Wisconsin Avenue
Milwaukee, Wisconsin 53208

Corvettes Limited, Madison
David A. Pearson, Secretary
608 East Washington Avenue
Madison, Wisconsin 53703

Corvette Specialists of La Crosse
Hal G. Scheir, President
208 South 21st Place
La Crosse, Wisconsin

CANADA

Corvette Club of Ontario
Ken Adams, President
P.O. Box 1065
Adelaide Station
Toronto 1, Ontario, Canada

Corvette Automobile Club (Quebec), Inc.
Peter Cullen, Secretary
61 Rosemount Boulevard
Westmount, Montreal, P.Q.