
# The Chaparrals from Texas

## *Chevrolet Power in a Fiberglass Chassis*

BY RON WAKEFIELD

After the most smashingly successful season anyone can remember in the SCCA-supervised Modified Sports Car class of road racing, Jim Hall and Hap Sharp are ready to do battle in the more strenuous and exacting league of FIA Sports-Prototype racing in Europe. In brief, this means their Chevrolet-powered, plastic-framed, fluid-transmission Chaparrals are moving from a series of shorter (sprint) races of 100-200 miles on relatively smooth courses and comparatively little restriction on car design or powerplant, to the longer, more tortuous FIA events in which there are very definite restrictions on such things as overall height, car weight in relation to engine displacement, headlight placement, luggage capacity and door width—among other things.

However, before looking at the new Chaparral coupes that, along with Ford prototypes in the same class, will be seeking to put the U.S. on the international road racing map, the technical history of the Chapparal and the people behind it must be examined.



Jim Hall's first Chaparral—which he now calls the Chaparral 1—appeared in mid 1961 and was among the last front-engined sports racing cars to be at all competitive. It was Chevrolet-powered, had an 88-in. wheelbase and weighed about 1600 lb. By the time Hall brought it to the stage of reliability, it already was being roundly eclipsed by the upcoming breed of rear- (or actually midship-) engined cars that were concentrating weight over the rear wheels for superior traction and more responsive handling. Thus it was that Hall, who already had earned laurels driving various European cars in domestic events, decided to design and build a new rear-engined car and really get serious about the racing business.

Hall, a young man from Dallas with a family fortune behind him, was joined by Hap Sharp, another Texan with money in his pockets (from his oil drilling business) and an intense interest in racing. Both competent drivers, they combined the resources of an idea man (Sharp) and a graduate engineer (Hall) with their driving sensitivities and came up with the Chaparral 2, a thoroughly up-to-date car at the time of its inception and a highly original car in the area of its chassis construction.

The most striking feature of the Chaparral 2 (first seen in 1963) was a chassis made up of box sections of fiberglass, bonded together. This chassis consists of torque boxes running down each side, connected by bulkheads at each end of the cockpit and extending at the rear to the suspension attachment points. Because the stiffness of a torque box is proportional to its cross-sectional area, Hall and Andy Green (of Pfaff-Trend, Fort Worth) designed sections of maximum size, with the result that the frame projects out to form the lower half of the body sides and extends outboard to become the boundaries of the foot wells and the engine compartment. Demanding targets were set for the design: The chassis could weigh a maximum of 150 lb, and have to have a torsional rigidity, axle-to-axle, of at least 3000 lb.-ft./deg. The final design, which obviously called for an unfettered approach, met these objectives. It went on to prove some other virtues when the same frame that had been crashed severely at the Canadian Mosport course in September, 1963, was repaired and used in the car that won the 1964 Sebring 12-hour race.

As development of the Chaparral 2 went on, Hall tried, for the 2C version that appeared in early 1965, an aluminum version of the same frame design, saving a few more pounds. But at this writing Hall is not convinced that aluminum is superior overall and has returned to the fiberglass-reinforced plastic (FRP) for the chassis of the coupes designed for European competition.

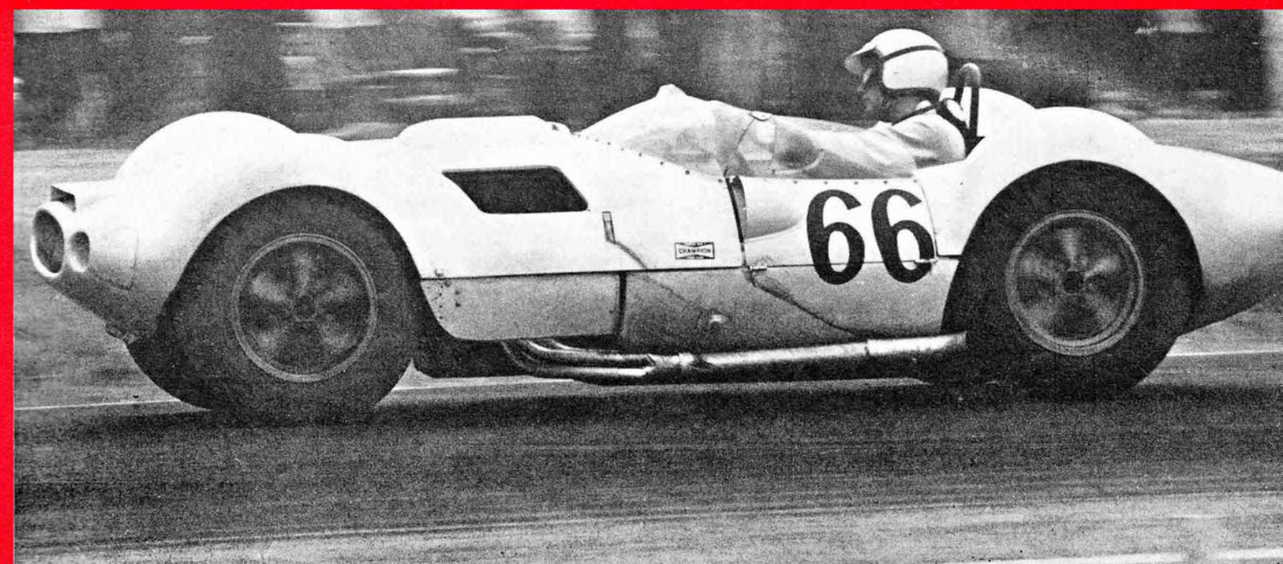
With an unusual frame for its basic platform, the Chaparral 2 is otherwise conventional in concept, as sports racing cars go. The 327-cu. in. aluminum-block Chevrolet engine is positioned just behind the driver and in the original version delivered power through a Colotti gearbox. Front/rear weight distribution is 38/62%. Rear wheels are suspended in the Lotus manner, with unequal-length lateral control arms and trailing arms. Front suspension also is Lotus-like and, in fact, there are many Lotus parts in both front and rear suspensions. The front system uses unequal-length arms, as do virtually all cars of this type. The Chaparral 2 is on a 90-in. wheelbase and weighs approximately 1600 lb., about the same as Chaparral 1. But, there was all the difference in the world between the 2 and the 1 when it came to handling and delivering power to the ground, so Hall and Sharp knew they were on the right trail.

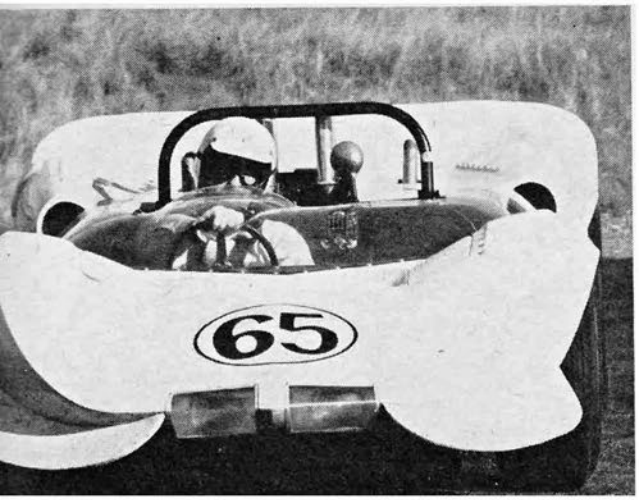
With any racing car, the big compromise—once the design has been settled upon—is between speed and durability. Lightness means speed and durability can mean weight. It therefore becomes a matter of making the car as fast as possible without sacrificing the necessary reliability. Components must be designed for maximum strength and longevity without making them unnecessarily heavy. This is development engineering and this is where Hall's technical background aided the Chaparral cause. Over the months of experience with the 2, detail changes were made to such components as wheels, hubs and steering knuckles. The engine, always a relatively mild (as racing engines go) version of the 327 Chevrolet, was developed more for durability than for maximum power output, though, at the same time, power has continued to increase.

Hence Chaparral 2 became absolutely reliable and the expected winner in the closed races of 1965. There were faster cars most of the time and it wasn't unusual for Chaparrals to be second and third for the first few laps. But it was highly unusual for one of the Chaparrals not to be first on the last lap.

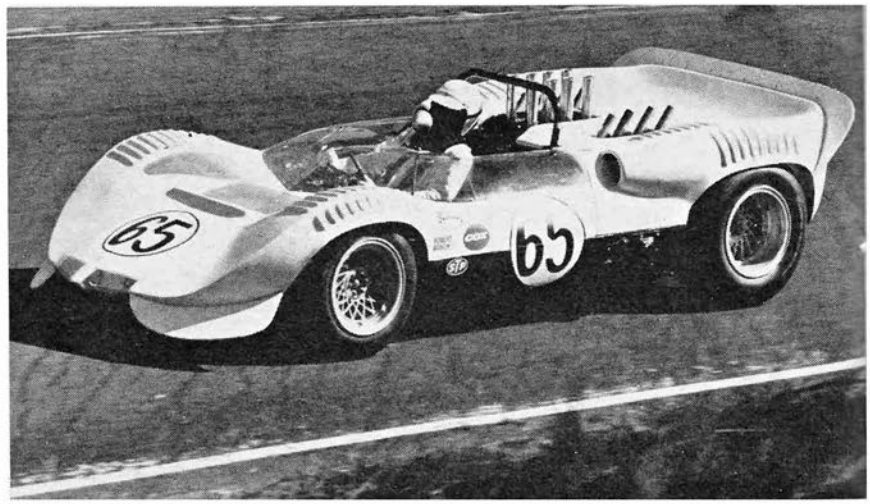
Somewhere in the quest for reliability, it occurred to Hall and Sharp that the manually-shifted gearbox—fast becoming the Achilles Heel of the high-torque American engine on the road circuits—might be replaced with something more dependable. They looked to automatic transmissions for the answer and came up with a simple torque-converter, 2-speed planetary gearbox. With the help of General Motors, this fluid transmis- ▶

THE CHAPARRAL 1 was among the last front-engined sports racing cars to offer competition to rear-engined machines. The car, which appeared in 1961, weighed 1600 lb., displayed an 88-in. wheelbase and was Chevrolet powered. The trend was started.



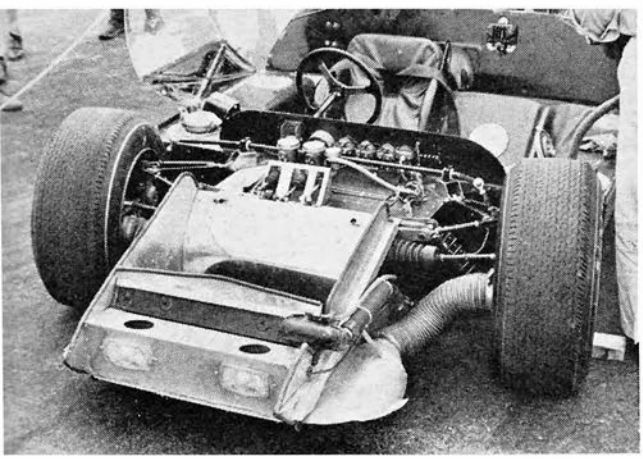



CHARLES MITCHELL PHOTOS



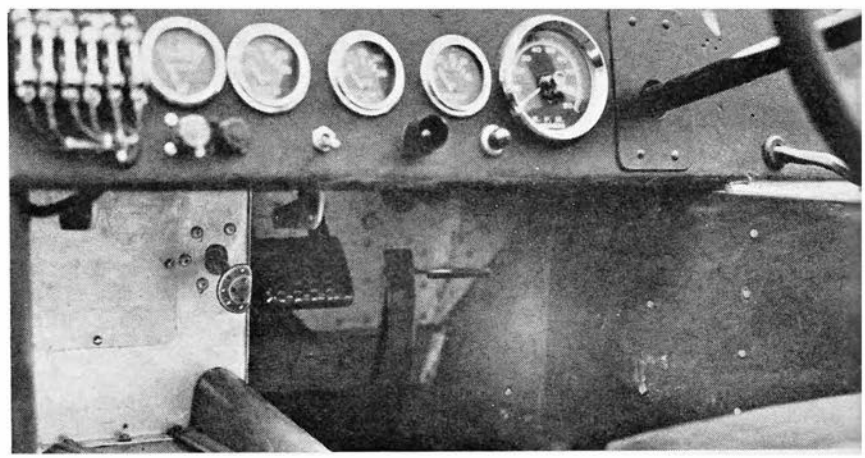

**SECOND GENERATION** Chaparral cars, first seen in 1963, featured fiberglass box-section chassis designed to weigh a maximum of 150 lb., yet provide phenomenal axle-to-axle torsional rigidity at a minimum 3000 lb.-ft./deg.

**DUCTING** channels cooling air to slanted radiator, disc brakes in Chaparral 2.



CAMERON A. WARREN PHOTOS

**LEFT PEDAL** actuates the spoiler airfoil at the rear of Chaparral 2 to vary rear loading for course conditions.



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sion (in the past termed "automatic," but really manually shifted) has been brought to a fine edge of reliability. Though the arrangement does not allow the last lb.-ft. of torque from the engine to be utilized at every moment, it does permit improved driver concentration in cornering. This, according to Hall, contributes to durability in other drivetrain components by making less frequent and less severe the on-and-off shock loads of power application. This transmission also is a reason the engine has been kept on the mild side. With only two gears and a converter, high engine speeds cannot be employed, as with a 4- or 5-speed box. A safe prediction is that a greater number of fluid transmissions will be seen in racing cars. Ford is working hard to get its entry into competition this year.

As Hall engineered in more durability and weight increased, the Chaparrals became faster. As they did, aerodynamic problems were encountered. Having their own test track at their Midland, Tex., plant, an unusual asset in the racing world, Hall and Sharp were able to do their sorting out at home. They found that with the original body, the front end lifted alarmingly at 120 mph. The immediate solution was a "snowplow" under the front end to create a downward aerodynamic force to counteract lift. However, design of a completely new front end was started. New noses were installed early in 1964 and produced speeds of 150 mph. As speed continued to increase, small tabs appeared at the outboard edges of the front end. Then the tabs grew larger and remained the same through the 2C roadster.

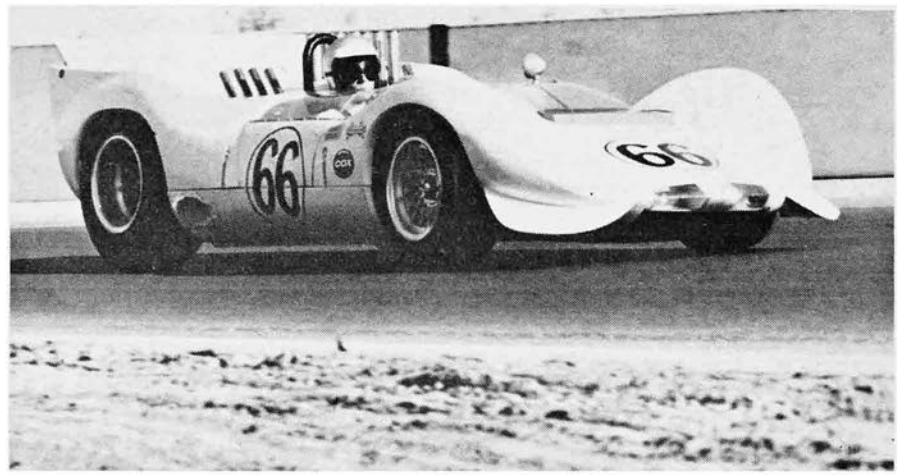
Each front end refinement seemed to bring out the worst in the rear end. As speeds increased, rear spoilers had become accepted, necessary evils on cars of this type. The Texans, however, discovered spoilers don't have to be in action at all times. Because the Chaparral driver's left foot is free, Hall and Sharp decided to hook the spoiler to a pedal. That they did and this device caused at least as much stir as the transmission when it was discovered by other drivers and racing enthusiasts. Wild stories went into print on how the spoiler was actuated.

THE MOVABLE spoiler has been a considerable asset. The normal fixed unit brings increased frontal area and drag as it produces the desired downward force at the rear, and definitely reduces top speed. It is through the fast corners that rear end stabilization is required and this is when the Chaparral driver brings up the spoiler. Hall and Sharp also have been seen to use their spoilers during braking—for obvious reasons. Pressure on the left foot pedal actuates a small ram cylinder which raises the spoiler airfoil. The slipstream puts it back down. In the down position, the spoiler airfoil isn't horizontal, but is inclined slightly upward to the rear to offer a degree of downward force.

The movable spoiler appeared as part of an extensive revision to the basic Chaparral 2. First seen at the Kent circuit in Washington State in October, 1965, this version had an entirely new rear section, reduced overall width and height, and a weight saving attributed to the aluminum frame. This returned car weight to 1655 lb., not far from what it had been in the original car. However, there were no conceptual changes and the 2C is very much a part of the Chaparral 2 lineage. Many people had been expecting a radical new car incorporating, perhaps, 4-wheel drive. The movable spoiler also was installed on one of the older 2s, while one retained the fixed spoiler and the other was set aside for rebuilding after a crash.

The 2C chassis was modified dimensionally where necessary to conform to FIA specifications, for the idea of the European campaign already was firm in the minds of Hall and Sharp. By this time, too, many refinements in suspension geometry had been accomplished with the result that the cars were able to corner at an impressive 1.2 G. Rear suspension had been modified on all cars to produce more anti-squat and anti-lift, and the front had been changed for more anti-dive.

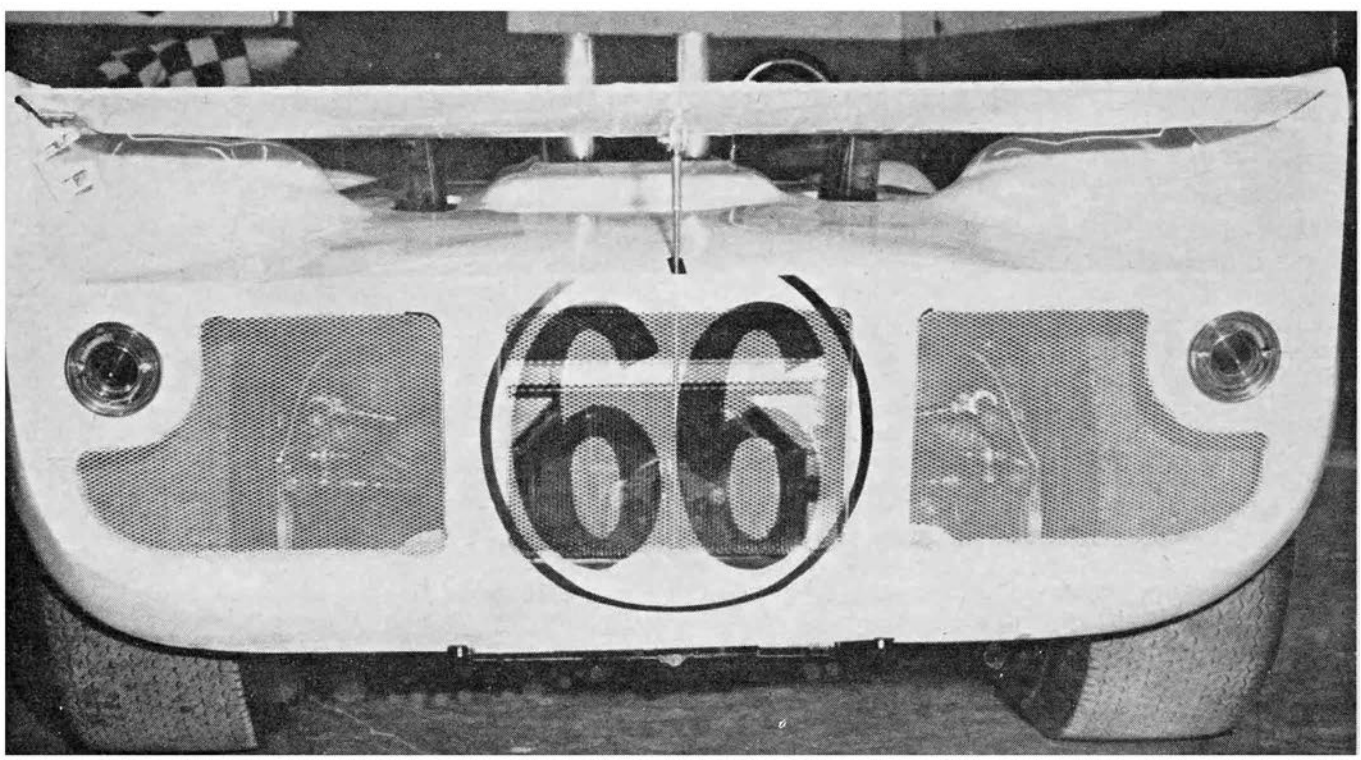
The evolutionary process had been gradual, but, if the 2C is compared to the original 2, it is difficult to realize they are the same car, from external appearance. Another, often ignored, aspect of Chaparral evolution is that practical brains in charge of the project have given due importance to matters of service, adjustment and repair. The result is that many operations which must be performed frequently on the cars (such as fine-adjustment of suspension geometry or balancing the brakes) can be carried out in a few minutes, where hours may be required on some other ▶

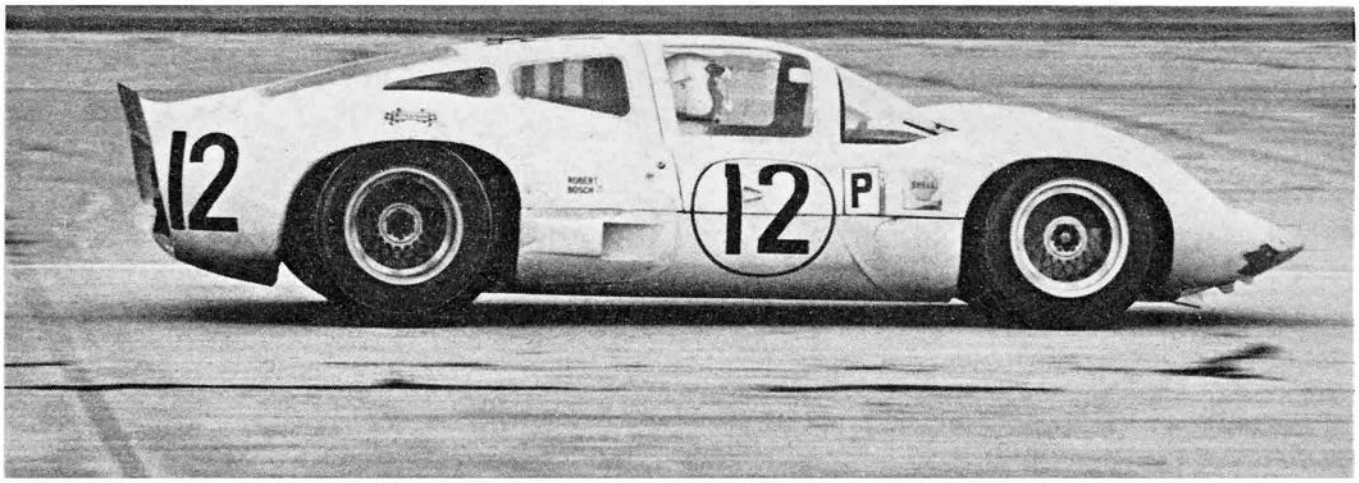



**REAR END** stabilization through the corner is provided by the upward tilt of the spoiler. Slipstream returns the control vane to its downward position.


ROBERT P. TRONOLONE PHOTOS

**LEFT FOOT** operated, a hydraulic cylinder actuates the control rod to tilt the spoiler airfoil and change rear end loading to meet course requirements.

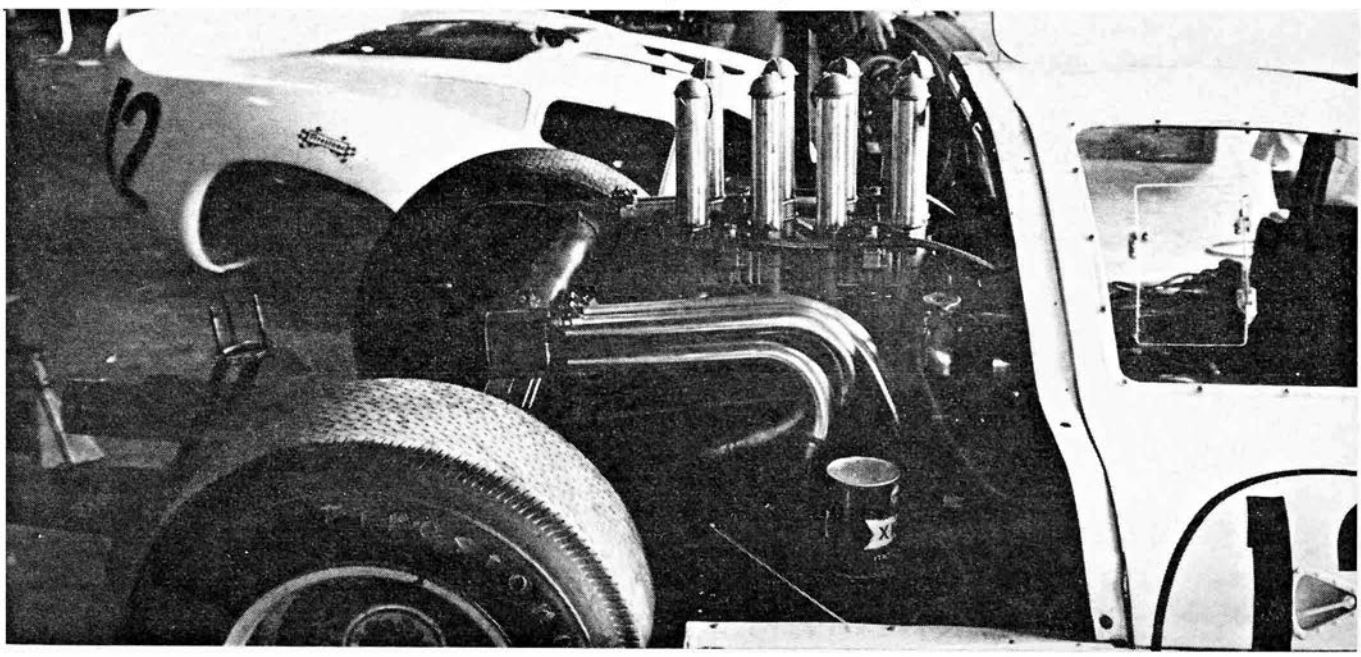





CAMERON A. WARREN PHOTOS

**CHAPARRAL 2D coupe, built to compete in FIA sanctioned sports/racing events, raced at Sebring and is slated to run at Le Mans. Previously, Chaparrals were entered in 100-200-mile events. They may encounter durability problems in longer European events.**

**FIRST THOUGHTS were that the 2D coupe would enter the 700-kg., 5-liter (1540 lb., 305 cu. in.) class, but weight piled up and Hall chose to install a 327-cu. in. engine for competition in the 750-kg. (1650 lb.), unlimited displacement FIA class.**

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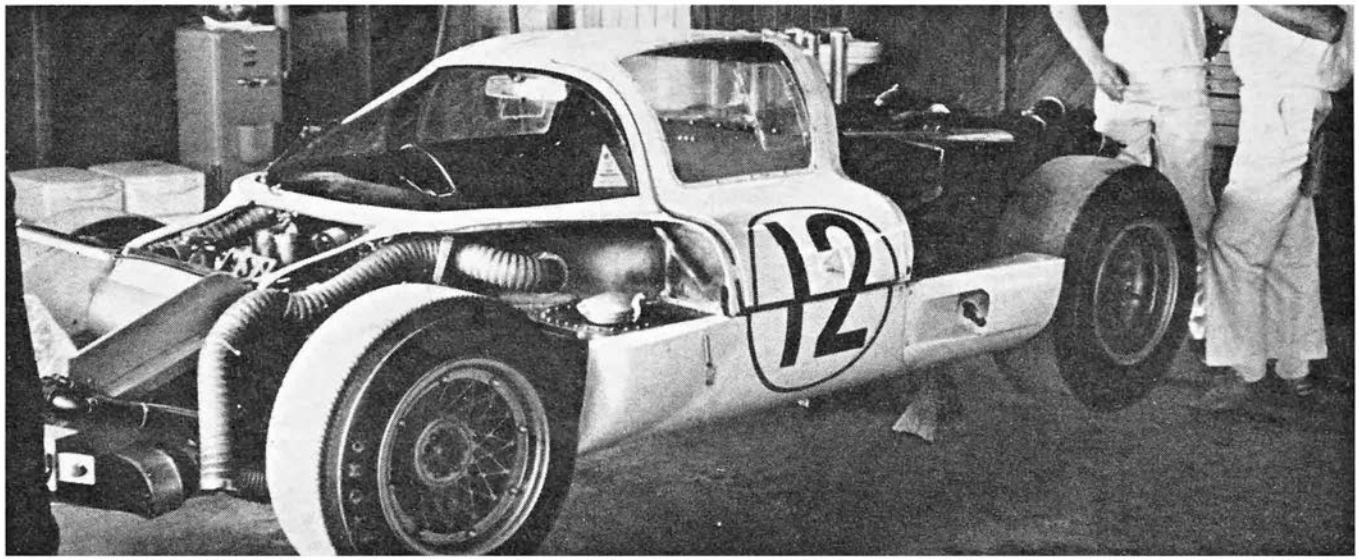
cars. All this may not be exciting to those who are impressed by wonderful new concepts, but this is the attention to detail that produces winners from basically sound design.

Now the new coupe for FIA-sanctioned competition has appeared. It was driven at the Daytona Continental 12-hour event by Jo Bonnier, only to be sidelined by a broken exhaust pipe and failure of a right rear hub carrier. The carrier was not a new component and had never given trouble before. And co-driver Phil Hill and Bonnier were put out of Sebring by mechanical failures. But Hall is well aware that he must face new problems brought on by the length and severity of major races.

The 2D coupe is built on a plastic chassis and displays the lower body configuration of the 2C. The front stabilizing tabs weren't there at Daytona and Sebring as the coupe configuration has eased the lift problem through minor shape changes in front end and windshield design. The movable spoiler was on the coupe at Daytona, but neither of the two at Sebring carried it. Rather, they were fitted with small, fixed spoilers such as those on other cars. Apparently there isn't enough reduction in frontal area of the coupe with the spoiler down to bother with installation of such a device. The car's overall height is 38 in., just 0.6 in. greater than the minimum allowed by the FIA, and the width of the cab section above the waistline is just enough for the required two heads for minimum frontal area.

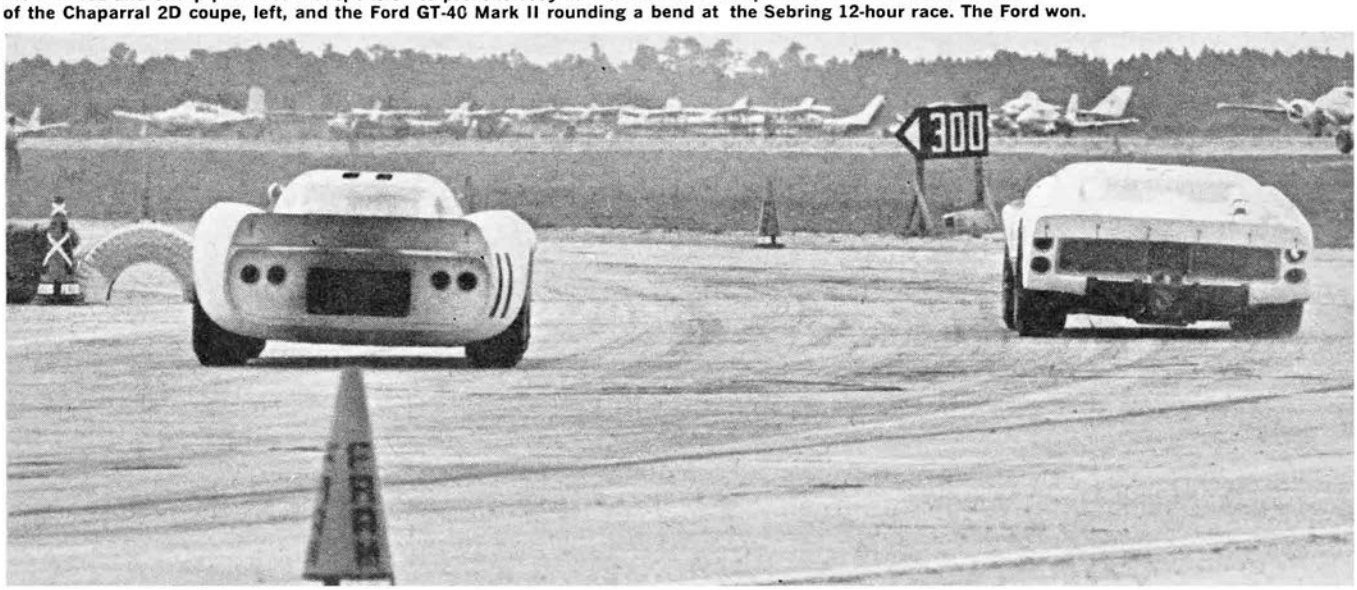
In the process of modifying for greater durability for long distances and making a closed car of the Chaparral, weight piled up to a disappointing degree. FIA regulations require a minimum weight of 700 kilograms (1540 lb.) for an engine displacement of 5 liters (305 cu. in.) or 750 kilos (1650 lb.) for unlimited displacement. Hall had aimed for the 700-kilo class and had a 302-cu. in. engine ready. But, when it became apparent the coupe would weigh over 1700 lb., he returned to the 327 for the time being. Bonnier practiced at Daytona with the 302, but the 327 arrived in time to be installed for the race. However, 327 cu. in. aren't impressive for 1700 lb. and Hall has been faced with the alternative of increasing stroke (the aluminum block confines him on bore)




**BUILT ON a plastic chassis, with lower body configuration of the 2C, the 2D coupe's overall height is 38 in., just 0.6 over the FIA minimum. The car weighs 1660 lb., hence weight paring, now in progress, will continue until Le Mans event.**

**THAT HALL and Sharp prefer stiff suspension to prevent body roll is evident in comparison of lean characteristics of the Chaparral 2D coupe, left, and the Ford GT-40 Mark II rounding a bend at the Sebring 12-hour race. The Ford won.**

JACK BRADY




and risking loss of reliability or sticking with 327. He has decided on the latter course. The 327 will develop 440 bhp at 6800 rpm, which he hopes will do the job. He is busy trying to pare away poundage and has weight down to 1660 lb. on one coupe and 1720 lb. on the other. It seems that for the first time in a long while the Chaparral organization isn't hitting on all cylinders, what with the showings at Daytona and Sebring, and consequently Hall and Sharp have decided that, rather than risking more gray days, they wouldn't race at Monza or in the Targa Florio, the first events in the European sports car season. Also, they skipped Le Mans practice because of all the difficult sorting out that was to be done.

While Hill and Bonnier are working in Europe, Hall and Sharp plan to race one roadster in the same class as before; but already the difficult European preparations have caused the early events to be crossed off the schedule. Most likely the first appearance will be in June. It is typical of the Chaparral people that they would rather stay home than even risk a bad showing. When they're ready, really ready, they'll be there. ■

### CHAPARRAL 2D COUPE SPECIFICATIONS

General
- Curb weight, lb. ..... 1660
- Weight distribution (no driver) ..... 38/62
- Wheelbase, in. ..... 90.0
- Track, front/rear ..... 57.5/51.5
- Overall length, in. ..... 148.5
- Width ..... 64.0
- Height ..... 38.0
- Fuel capacity, gal. ..... 41.0
- Tires ..... Firestone
- Size, front/rear ..... 9.20-15/12.00-15
- Brakes ..... Girling calipers, Chaparral discs
- Type ..... single caliper, solid disc
- Swept area, sq. in. ..... 220

Engine
- Type & make: V-8 ohv Chevrolet design with aluminum block & heads
- Bore x stroke, in. ..... 4.00 x 3.25
- Displacement, cu. in. ..... 327
- Compression ratio ..... 10.0:1
- Carburetion ..... 4 Weber 146 HCF 5
- Ignition ..... Bosch
- Bhp @ rpm ..... 440 @ 6800
- Torque, lb.-ft. @ rpm ..... 390 @ 5200

Transmission
- Type: Torque converter, planetary gearbox
- No. speeds ..... 2

Suspension
- Front: Unequal-length arms, coil springs, telescopic shocks, anti-dive geometry, anti-roll bar
- Rear: Unequal-length arms, trailing arms, coil springs, telescopic shocks, anti-lift and anti-squat geometry, anti-roll bar

Chassis & Body
- Type: Torque box sections bonded together, fiberglass-reinforced plastic