

CORVETTE COMPETITION PREPARATION



AN INFINITE amount of patience, an eye for minute detail and thorough organization sense were the attributes which made Herr Alfred Neubauer, of the great Mercedes-Benz racing department, the most outstanding race team manager of all time. No tiny facet of the preparation and support of the firm's competition vehicles was too small to be dismissed without investigation and almost every conceivable catastrophe was provided for in advance when this all-conquering racing group went on the move. The results were as might be expected: Victory after victory when the ears and drivers were evenly matched with the opposition. Often, faster automobiles, with better lap times, fell by the wayside from causes which Neubauer's experienced eye or passion for detail would have caught at once.

The average production car race, or week end drag meet is not going to call for Mercedes-Benz type preparation, but you will notice that when the chips are down at the Nationals or in the big money professional sports car road races, the winners and the serious contenders all enter with the idea of leaving no stone unturned.

So, the odds will favor you if you approach each and every competition event with as much of the Neubauer spirit as you can muster. Develop the habit early of never saying, "That's good enough . . ." if you don't *know* for sure that it is good enough. Limited experience will often prevent you from knowing if it is good enough, so for some sound advice about Corvette preparation, let's turn to a man who has an outstanding reputation with these cars, an old friend and associate, Bill Thomas.

Bill has been a kind of walking center of Corvette enthusiasm for a number of years, having owned one of the first of the V8 Corvettes to enter road races on the West Coast, and groomed more winners than any other specialist. There are lots of excellent mechanics behind Corvettes all over the country and they obtain winning performance using slightly different techniques, but basically, the procedure is the same, and having worked with Bill, I can expound his preachments more easily.

"The important thing is attitude," says Bill, "just assume that nothing is right and check every possible place where something could go wrong. In racing you will notice that many of the fastest cars don't finish the race. Neither do the slowest and it is strange to discover that often it is for the same reason . . . somebody overlooked something."

INSPECTION

The first step in competition preparation, either for road racing or drags, is a visual inspection of the utmost thoroughness. The attention to chassis detail is extremely vital in course racing. (Bill rates chassis preparation at about 70% as against 30% for the engine for this sport.) And, even if your Corvette is brand new, the following procedure is advised. This pre-race checklist should be run through after every event, in preparation for the next race or for driving on the street.

If the car is not new; have chassis and engine steam cleaned. Not only will it make inspection and repair easier, but an oily, greasy vehicle is much more apt to burn badly from a minor fire than a clean one. Once the car is clean, too, it is easy to spot oil, water or fuel leaks which should be noted and stopped.

With the car on a hoist or floor stands, look for missing nuts or bolts, broken or bent parts. Check the brake lines all along the frame for kinks or rock dents and the same with the fuel line. Eye the frame for places where it might have been straightened and observe the tires for uneven wear which would point toward a mis-aligned condition. A car which feels all right at highway speeds can exhibit strange handling qualities on the track if it is not perfectly in line.

Above, check the radiator mounts, hoses and connections. Any old, bruised or suspicious hoses should be replaced. Be sure that motor mount bolts are pulled down to correct torque wrench readings, check both the front pair and the rear, toward the back of the transmission. If the tail shaft mount bolts are not kept tight they can strip the threads out of the aluminum housing. Safety wiring these bolts is a good principle.

In the engine compartment, test the exhaust pipe flange nuts, exhaust manifold bolts, injector base bolts, its housing nuts, the water outlet connection nuts and the water pump bolts. The latter are critical and I have seen Bill tighten them between races in the pits, even though it is necessary to remove the generator support bracket which is attached to the pump. After tightening the water pump bolt, replace the generator support and tighten the nut finger tight, adjust the fan belt to the proper tension, tighten the bolt on the generator, then the nut on the water pump end of the support.

If the pulleys do not align perfectly now is the time to make corrections. The time spent in shimming the front or rear or the rear mount to bring the generator pulley into alignment will be amply repaid in the number of races you will finish or the money you will save from retaining fan belts.

The fan belt should be slightly tighter than the shop manual illustration calls for ($7/16$ to $1/2$ inch of deflection midway between the pulleys). I'd say that it would take a fairly heavy thumb to make a $3/8$ -inch deflection under proper tension. Installation of the dual pulley arrangement common to the "W" engine with viscous-coupled fan is a good guarantee against belt problems, incidentally.

If you do not have the late viscous-coupled "free wheeling" fan, by all means install it (part no. 988429). The same is true of the aluminum radiator. Common to 1961 and later models, this lightweight part is expensive, but well worthwhile. It is part no. 3150916.

This is the time to inspect hood hinges and latches. If you want to make doubly sure the hood will not pop up and get you a black flag, you can install leather tie-down straps at the back or attach two steel strips to the cowl which will extend forward over the hood. These bars, wrapped with tape or covered with rubber tubing will hold the hood down when you pull the vent handle down to full lock position. These precautions are necessary since the rough road course will often cause the body to work enough to pop the hood loose.

At the rear, clean out the luggage compartment and remove the helper springs from the lid so that it will not fly up in case it is accidentally jarred loose. On the 1963, this hazard has been removed, of course.

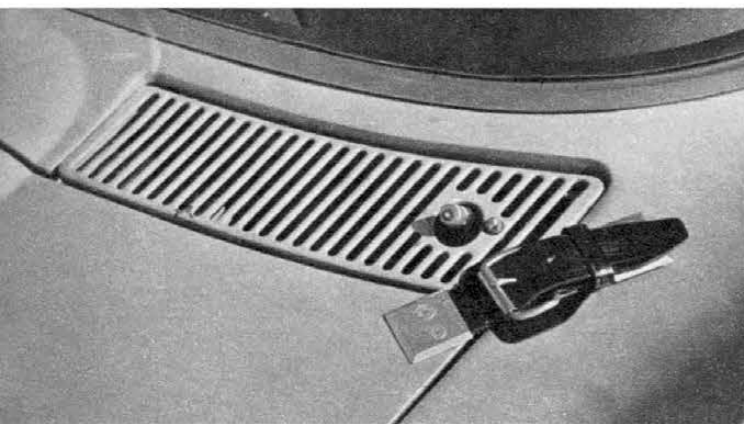
DRIVER'S COMPARTMENT

The item of paramount importance in the driver's cockpit is cleanliness. Removal of items which contribute weight or a hazard is also good. Carpets should come out and the interior should be vacuum cleaned. The assist bar, the package tray, kick panels on both sides, both arm rests, the radio and heater if so equipped and the clock should be removed as well. If you value the clock, by all means take it out since one race will probably finish its delicate mechanism.

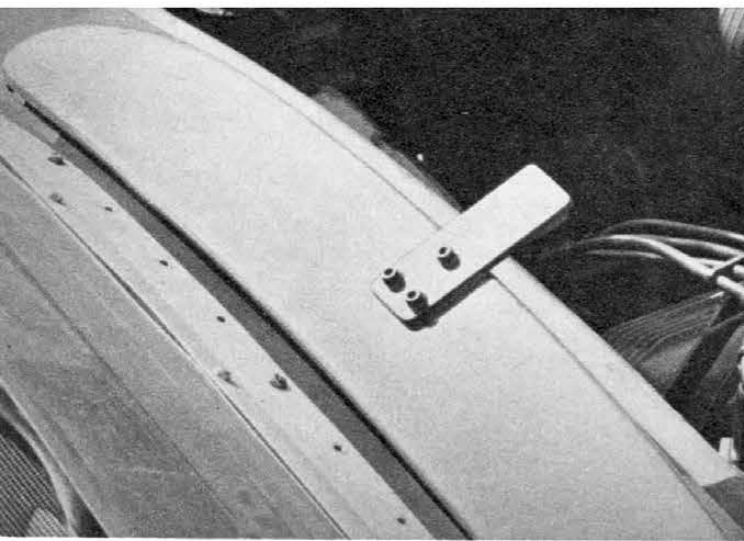
A roll bar is mandatory for road racing and required for the classes Corvettes compete in at many drag strips, so install a substantial one while you are about it. There are two basic types used on Corvettes—the full cockpit bar which can be either permanent or removable; and the hairpin style directly behind the driver's head which is generally a permanent affair. Either is accepted by racing associations, and there are even some pretty Mickey Mouse looking single-post jobs and others of that ilk in competition at various tracks, but they are to be avoided.



Correct alignment of pulleys and fan belt tension is required.



A short belt strap at each rear corner of hood (above) is good precaution. Snubber (below) on cowl vent holds hood down.



The Corvette is a substantial car, so two-inch tubing is not excessive. Bill habitually installs the same kind of bar in roadsters: two-inch diameter, 1/8-inch wall chrome moly tubing is formed into a "U" and attached to the frame at mounts welded in just back of the seat. This member is low enough to clear the top compartment cover, and to it is welded a hairpin shaped roll bar made of the same tubing extending to a height consistent with that of the driver. A brace from the top of the hoop extends back and down to the shock absorber mounting cross member behind the gas tank. It is welded to the hoop and bolted to the cross member. The hoop should not be less than a foot across for maximum safety. A fabricated aluminum cover, form-fitted to the compartment cover, which must be slotted and bolted down, adds a neat appearance.

A full-cockpit bar can be fabricated in the same way and located by mounts welded to the frame on either side. In it, the legs of the "U" are sufficiently long to place it above the driver's head, and it can be braced in the same manner. However, a simple installation of a ready-made Corvette roll bar, completely removable for street driving, has recently been made available by Moon Equipment Co., and is finding much acceptance. In it the mounts are bolted to the frame and the tubing drops into larger diameter tubes which are part of the mounts. This bar is well engineered and substantial.

Seat belt installation should be made with the use of eye-bolts installed into 3/8-inch steel plate welded to the frame. A competition type belt, three inches wide of 9,000 pound test Nylon and having a quick-release buckle is recommended.

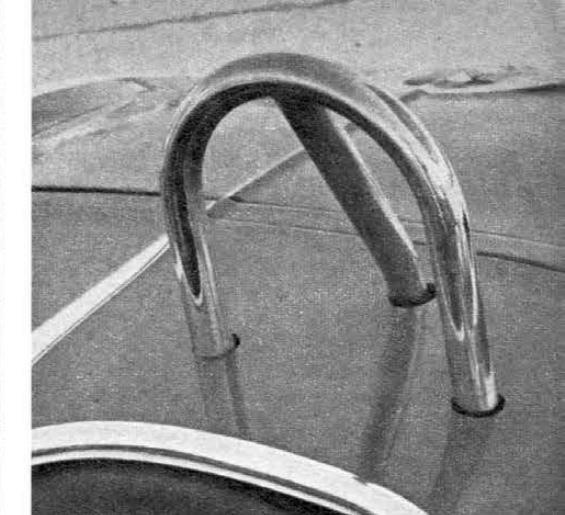
In passing, the 1963 competition coupe offers no special problems in roll bar mounting or seat belt installation. The frame kickup in the rear makes a good bracing point for the bar.

The windshield should be removed for road racing and replaced by a plastic windscreen about six inches in height. This can be a narrow screen formed around the instrument bubble or a full screen extending the width of the compartment; 1/8-inch to 3/16-inch plexiglas is suitable and can be formed by warming. For drag racing, leave the stock windshield and run with the plastic hardtop (but remember to remove the soft top and any attendant mechanism to save weight). Comparison runs with the same car showed a two mph gain in top speed and lowered elapsed time of .3 sec. with the closed car over the open car.

In removing the windshield posts, be careful to remove all the bolts. One, upper front inside, is sometimes covered by fiberglass. The trim molding is removed with the post and it



Well-prepared car has a sanitary interior, fire extinguisher.



Either full-cockpit or hairpin type of roll bar serves on Corvette. At left is Moon removable type; at right, permanent custom job.

is necessary to cut the weatherstripping. The front window guides should also be removed and it is necessary to remove the upholstered door panels and the inner metal panels to get at them.

The accelerator pedal should be secured to prevent it from coming adrift from the pegs. More than one driver has lost a race because he lost his throttle pedal. Put a bolt through the pedal between the pegs and through the floor and cap it with a locknut. Be sure there is full pedal travel, naturally.

In the firewall, it is a smart idea to cut a larger opening to permit a direct line to be assumed by the tach cable from the head to the distributor for steadier reading and longer cable life. A heavy-duty tach cable can be made up by a speedometer shop if wavering needles bother you. A Sun tach mounted on the cowl is preferred by some drivers.

The door glass and window lift mechanism should be removed entirely in the 1962 and earlier models. In the competition coupe, Bill has replaced the windows with 1/4-inch plexiglas, cut to the shape of the original glass and heated to contour. In the roadster, however, as long as you have the panel off to get at the front guide, take out the whole works . . . except the door latch and lock, of course. Replace the upholstered panel. It is also a good idea to make an aluminum spacer for the top of the door, where the glass has been removed, to strengthen it.

BODY & CHASSIS ALTERATIONS

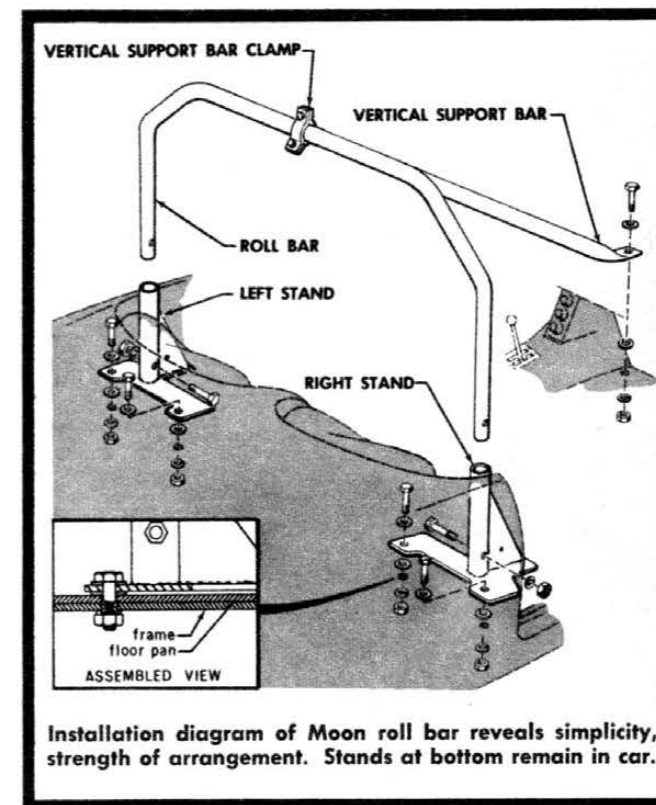
For road racing it is mandatory to get as much cooling air to the mechanical components as possible. Fortunately, for the appearance of production cars, the clubs won't allow overt body alterations, otherwise the cars might look like Swiss cheese. In the 1962 model, however, the panel in the oval indentation outboard of the radiator grille is subject to having a couple of four-inch holes cut into it. (Don't remove the whole oval, the panel is needed to lend strength.) These holes help create a better draft past the front brakes.

The inner fender panel (lower rear) should also be removed for better engine compartment ventilation in these models.

The bumpers and their brackets should be dispensed with entirely except for the bumper reinforcement bar at the rear in 1961 and later models which cannot be removed. Bolt this bar up at each end to hold it in place.

The regular fuel tank breather vent should be plugged and the vent hose which ends near the filler spout removed. Instead, solder a 3/4-inch tube into the top of the tank on the side opposite the filler and run a vent hose of neoprene

Sting Ray coupe bar, braced to rear frame kick-up, is fixed.



Installation diagram of Moon roll bar reveals simplicity, strength of arrangement. Stands at bottom remain in car.



straight up into the compartment above. This will eliminate fuel spillage.

The front suspension on pre-1963 models is extremely critical. The new car appears to be less sensitive, but there has not been enough time to work with it to be completely sure. It takes several racing seasons to really perfect a chassis and these recommendations are the end product of a lot of trial and error. The 1959 heavy-duty springs and stabilizer bar seem to be the best combination. The springs are 1145 pound, 11 1/8 inches in overall height, gray in color, part no. 3784140. The stabilizer is part no. 3823052.

For courses with long straights and large radius turns, use 0 to 1/4° negative camber on both wheels, 1/8-inch toe-in and 2 1/2° positive caster. The large amount of caster helps make the car stable at high speed and gives the driver a chance to relax.

For short, tight courses, where the driver is going to be working at all times anyway, use about 2° of negative camber and 0 caster. The minimum caster speeds up the car's reaction to the steering wheel and negative camber helps keep tire/surface contact to a maximum under severe body lean. It will be necessary to bend the upper A-arm to obtain this amount of negative camber, so entrust your alignment to the best shop you can find.

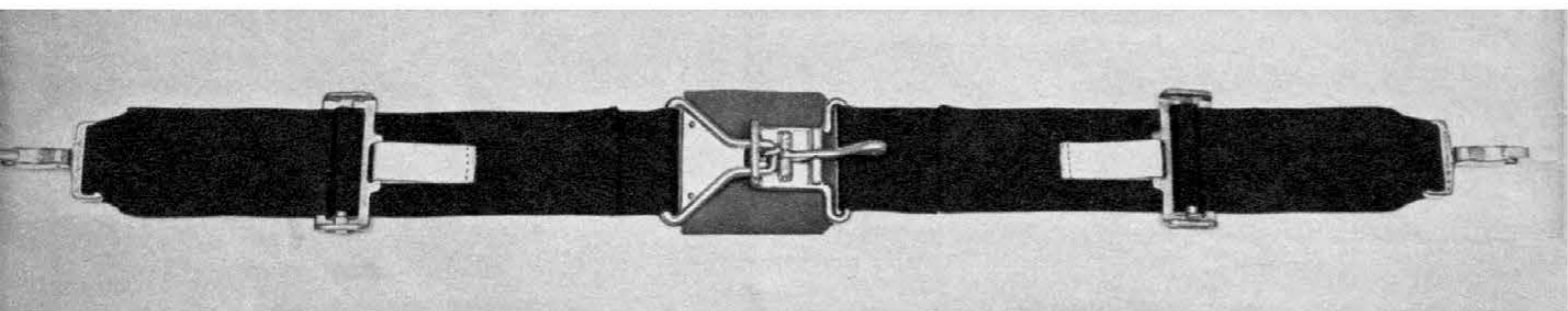
runs at the strip. The lowering of the rear as outlined above is a good idea. You can't go too far in this direction because of limited wheel clearance, however.

Corvette brakes are excellent (speaking of the sintered metallic linings), long wearing and quiet. But, they require just as much attention as any other type. Blow the accumulated dust out with compressed air after each race and replace the retractor springs after every third or fourth race week end. Be sure that the contact area between shoe and guide is properly coated with Lubriplate and that the wheel cylinder pushrods are parallel to the backing plate. The front wheel cylinders should be 1.125 inches in diameter, rear .875 inch and the pre-1963 car should be equipped with the HD finned drums of RPO 687 (some cars having sintered metallic linings . . . RPO 686 . . . are equipped with standard drums). Remove the covers from the vents in the backing plates and drill five 3/4-inch holes in the face of the drum for additional cooling. An air scoop helps too. Be sure there is ample clearance between the fan blades and the hold down spring.

An up-dating package is available for those who wish to install the self-adjusting brakes standard on 1963 models. You will have to see your Chevy dealer for the pieces in this. The entire setup, drums, fans and self-adjusting brake kits is part no. 3823053.



ABOVE—Surplus plexiglas bubble was formed into neat racing screen for this Corvette. ABOVE RIGHT—Full wrap-around type was made from sheets of lucite. RIGHT—Many drivers prefer electric tachometer mounted directly ahead. BELOW—The window post has been cut, but it can be removed easily.



A designated "competition" type belt is recommended for racing. This type features quick-release buckle, eyebolt floor mount.

The 1963 competition coupe seems to handle very well on a variety of courses with 1° to 1 1/2° of negative camber and stock caster. Its suspension option also seems adequate in stock form.

The 1957-1959 HD optional springs should also be used in the rear, but by switching the spring front hangers from left to right and vice versa, and turning them upside down in the process, you can lower the rear of the car almost an inch, which helps lessen weight transfer during braking and improves it during acceleration.

Optional suspension which could be specified for the 1957-1959 models, was discontinued when suspension changes were made on the 1960 model, but the older springs and shocks are preferable. The rear stabilizer bar on 1960 and later cars is generally sufficiently stiff, but if you want to induce more stiffness, change the stock bushings in the support brackets for those used by Oldsmobile in 1960-61 which have a harder rubber. The 1960 and later Corvettes have nitrogen-filled shocks which are good, but a stiffer action can be had from 1959 HD shocks (part nos. 5543738 front and 5543739 rear) and they will last longer. It is necessary to add a 1 1/2-inch spacer between the shock and the mount at the top and lengthen the rebound straps to prevent bottoming on full rebound, if yours is a late model.

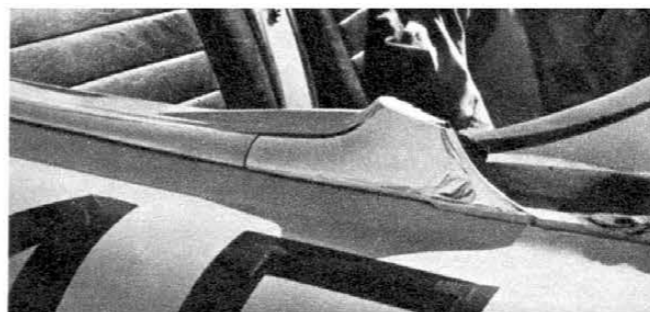
For drag racing, stock front springs are fine, and you can install a set of the most worn out shocks you can find for your

The optional 5 1/2-inch wide base wheels are mandatory for any kind of competition event and oversize lug nuts to prevent pulling the wheel over the lugs can be made up out of chrome-moly hex stock.

Tires are often a matter of driver choice, but be sure that your choice is a competition tire stressed for the high speed and abuse of a road course. Pressures, which contribute a great amount to handling, must be determined for each course and driver. But, as a rule of thumb, if the top speed is under 120 mph, start with about 30 pounds, front and rear, and go from there. Speeds over this call for more pressure, say 38 to begin with. If the car understeers, raise the pressure in the rear tires or lower the front, but remember, if pressure is too low, the tire rolls under and you lose adhesion.

For drags, use whatever tire you are allowed to legally which will put the most tread onto the pavement. Butyl rubber compounds in stock tires seem to adhere the best. (Bucron and Butyl-Aire are a couple of trade names.) Vogue casings work well for many. Pressures are, again, trial and error, but start with 30 pounds.

In the pre-1963 models, it is a good idea to make the steering tie rods parallel with the ground to reduce the amount of toe-in and toe-out change encountered on bumpy stretches and thus improve directional stability. To accomplish this, turn the fast steering adapter upside down and heat-form it so that the tie rod bolt holes are vertical.



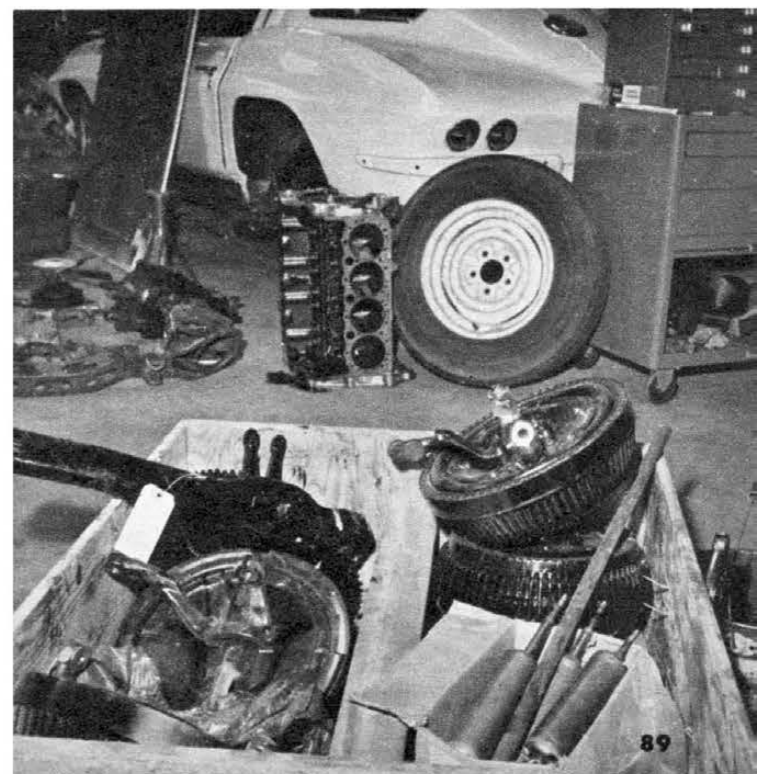
THE DRIVE LINE

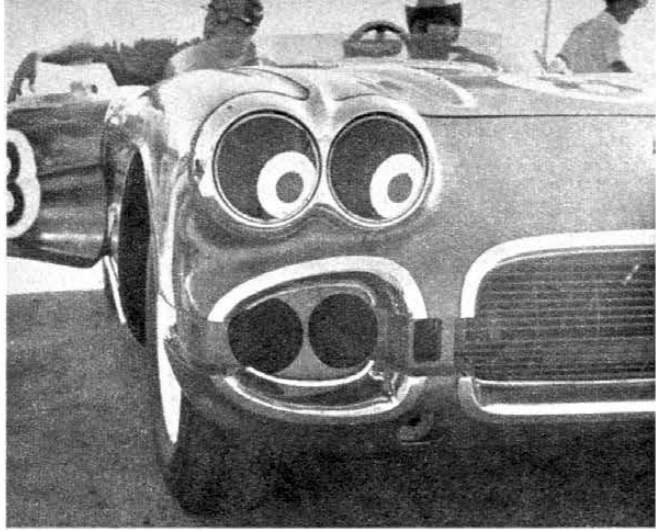
Presumably, your Corvette is equipped with Positraction, the limited slip differential which became an option on the 1957 models and is described elsewhere in this book. The clutch plates should be stacked alternately, as noted in that discussion, for maximum traction, and for neutral steering characteristics. The choice of final drive ratios will be based on course conditions, naturally, and a few hints as to gearing will be found in the same chapter.

The Positraction axle housing on Corvettes (pre-1963, of course) is based on the 1957 type Chevrolet passenger car unit; others are basically the same as the 1954 type. This housing has internal baffles in the differential case. The outer bearing retainer ring should be heli-arc'd to the axle in a couple of places as insurance.

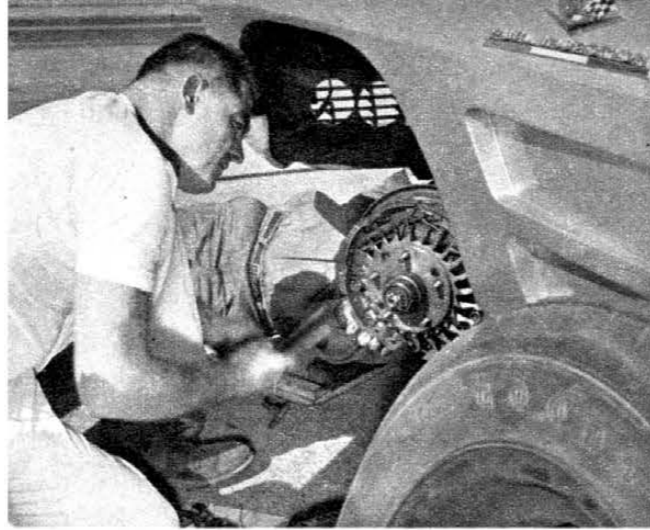
Power loss through the U-joints can be lowered and a smoother power transmission to the rear end attained by carefully checking the driveshaft and correcting the angle of the third member relative to the shaft. With the car level, the nose should have a 3° negative relationship. Although

RIGHT—It takes more than a car to win races. Thorough competition preparation includes fitting of optimum suspension.





Two four-inch holes in decorative panel help brake cooling.

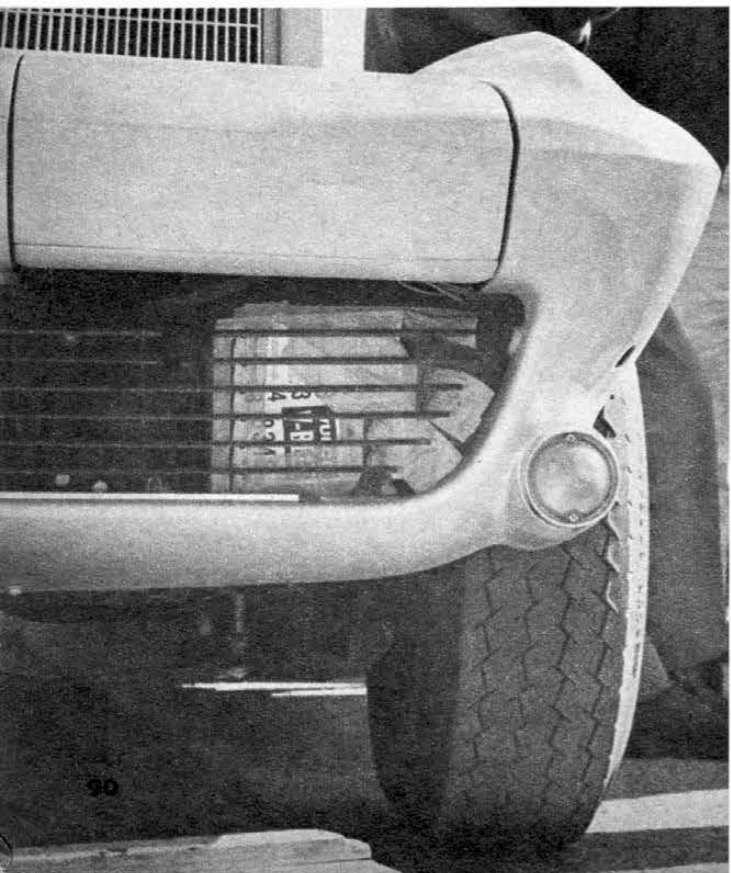


Mickey Thompson, speed expert, checks over Corvette brakes.



Cooling fan blades must be bent to provide proper clearance.

Uneven braking results from over-cooling. Vent must close.



this is a critical point, measurements on a number of Corvettes have discovered the angle to be as much as 12° off. It is necessary to break the spring mounting pads and radius rod brackets loose and rotate the axle housing to correct misalignment, then re-weld the pads and brackets in the same relative position.

RACE TUNING

The elements of engine tuning are the same for any competition event; get the most possible out of the engine with reliability. But in any non-Bonneville activity, acceleration seems to be the key to success. This means flexibility, as opposed to striving for a high peak of power in a narrow range. The Corvette gearbox, although "close ratio" in definition, still has some pretty good gaps and a broad torque range is essential for either drags or course racing. So, as a rule of thumb, it is better to avoid the cam which will extend top end at the sacrifice of lower end. Rework the distributor for full advance at about 3,000 rpm and about 38° ultimate at that point. Different engines call for different timing and power timing on a chassis dynamometer seems to be a good place to begin with the road race machine. For drags, there is no better proving ground than the strip itself. A good combination, with the fuel-injected engine and Duntov cam, is around 9° to 10° in the distributor.

Valve lash is another critical point on the 283-327 and a dial indicator such as the P&G gapping tool is extremely helpful to attain exactitude. Nominal settings are .008 inch clearance on the intake and .016 inch exhaust. For a little more low end torque you can go to .012 inch and .018 inch respectively.

A 12.4-to-1 fuel/air ratio, as determined by an exhaust gas analyzer while the car is on a chassis dynamometer, should be close to giving maximum power while guarding against burned valves. Plug checks are necessary, of course, to be sure that the mixture is in line with atmospheric conditions on race day.

AC 42-1 sparkplugs, or equivalent, gapped at .025 inch are recommended for road racing. All connections should be double checked and be sure the plug terminals are very tight. Don't start with dubious points, condenser or rotor in the distributor. If the points are blue or pitted, replace them and the condenser. If not, clean them by drawing a business card between the points until there is no evidence of dirt.

If the engine has been prepared thoroughly, and you have gone over the car with the eye of a Neubauer, there's nothing to stop you.

Now. Go out there and win! ■



ABOVE—The rear bumper should be removed, and brackets, if possible. LEFT—Wide base rims and special racing tires are a big contribution. BELOW—Properly prepared Corvette, as it is seen by a good many competitors on the road racing circuits.

