

it ain't necessarily stock

By GENE JADERQUIST

Hidden hop-ups threaten to upset production car racing on every level. Here is a guide to what is — and is not — legal.

NORMALLY when a man has an MG in top condition and \$1,500 in his pocket he trades for a more expensive sports car. Nobody, except possibly MG, objects to this. A more adventurous soul might keep the MG and put the fifteen bills into a racing fund for himself. This is good, clean fun, approved and sanctioned by everyone except the mink-minded wife. Quite the opposite is the case of the man who spent the entire \$1,500 creating the most thoroughly illegal MG ever to enter a production-car race.

The entire sum was so cleverly buried that the car could easily pass pre-race inspections and the usual cursory post-race spot checks. Even when protested, only the most experienced mechanic could detect the modifications.

For all I know the car is still running — and still winning races. My source of information was understandably discreet. Yet he did say one thing — the owner and the mechanic were surprised, not because the car could win but because it frequently had such a difficult time winning. It was painfully apparent that other hidden hop-ups were running as production cars.

Technical inspectors are almost helpless to prevent this. It is prohibitively expensive and time-consuming to examine the entrants, or even the first three finishers, in every production-car event. An effective examination would include stripping the engine and miking everything in sight; reading cam contours with a dial indicator; opening both the transmission and rear end and counting gear teeth; testing spring rates, both front and rear. The mild and swift inspections that are feasible catch only the clumsy or dull-witted offenders.

Herb Welch, chief tech inspector for the SCCA's Los Angeles region, admits: "There are only two ways we catch the hidden hop-ups. The first is when someone lays down the \$25 for a protest and we have the engine torn all the way down. The second is when the driver gets carried away with his car. We know that when one MG is passing all the others too easily and too fast, there's something wrong. The presumption is not that all the other MGs are bad, but that the victorious one is too good."

This problem of illegal modifications is as old, and as widespread, as racing itself. As early as 1908 the AAA ruled the entire Buick team off the tracks because they were non-stock, a decision that culminated in a screaming argument between William C. Durant and the chief of the Contest Board. In today's NASCAR stock circuits, officials have been forced to impose increasingly strict penalties on offenders. Where there's money involved, as there is in professional racing, the motive for cheating is clear. In sports car racing, and in such other amateur motor sports as hot rodding, it is not too clear.

This year the officials of the sports car clubs are trying to modify their regulations governing production sports cars to simplify the problem. They admit, now, that they got the whole thing almost impossibly snarled by permitting

Competition Regulations

Production Sports Category — Production sports cars are defined as standard sports cars which have been series produced in quantities of at least 500 per model sold, burden of proof for which shall be with entrant. Such "minor modifications" as trimming fenders, removal of air cleaners, wire wheels, etc., make a car ineligible for competition in the Production Sports Category. #

modifications to bring the cars up to date. The SCCA has now re-defined that to permit modifications up to October 1, 1955. To take advantage of factory changes after that date, you'll have to buy the new model.

Another troublesome regulation is the one permitting the owner to use optional equipment if supplied by the factory at no additional cost. Even with America's mass-production stock cars such rules have resulted in recriminations, accusations, and wild confusion; with European cars, many of which are barely able to qualify under the 500-or-more-per-model rule for production car events, nobody is quite sure what is or is not stock. Porsche camshafts are one example. No tech inspector I talked with could list the possibilities.

Above all this is the indisputable fact that an honest, top-grade, production-class competition car is one of the most expensive and difficult things in the world to build. I'm personally best acquainted with the Mexican Road Race Lincolns, stock class winners for three consecutive years. The Ford Motor Company hasn't released figures on the net cost of raising each Lincoln from its assembly-line status to that of race-winner, but a conservative estimate would be \$10,000. Add this to the original cost of the car and you'll find it will set you back a good Ferrari price to buy a top production car. Bringing an MG or a Triumph or a Jag up to this level isn't as expensive, but it does cost considerably more than the average owner can invest. So whenever a distributor, dealer or factory team goes into a production race with professionally prepared cars, the average car-owner — and it was for him that the production class was emphasized in this country — has about as much chance of bringing his home-grown job in ahead of the team as he has of beating a Ferrari.

The temptation to fudge a little on the rules is therefore strong. The logical beginning is to do as much as can be done legally, then pass on to the serious work.

Legally, you can rip the whole car apart and start from there. In the engine, the first step is to go out of the maximum allowable overbore — .030 of an inch over in SCCA national events, anything up to .060 with other sports car organizations. Thirty thousandths of an inch may sound like nothing, but it makes a difference in brute torque. In production-car racing, the tiny difference becomes great.

The rest of the engine work is all relatively insignificant. Insignificant, that is, when compared with the results of frank and open hopping up. The bearings are loosened slightly, and evenly, by grinding the crankshaft. The pistons are loosened slightly by grinding. This frees the engine and keeps it from losing too much horsepower to friction when it gets hot — and in a race it will get hot. All engine parts are statically and dynamically balanced. Combustion chambers are measured to the precision limits of the mechanic's tools and ability, then evened out to precisely stock compression ratio.

Perfectionists also check each valve spring and maintain steady, and maximum tension throughout the engine. Valves are hand-lapped for perfect seal. The factory gives you all the carburetor needles, jets and venturis you need, so it's up to you to experiment with them and use the proper sizes for the engine, first taking into account such small items as temperature, humidity, altitude. The rest of the induction system is left to the manufacturer, except that you are permitted to match the intake ports in the head with the manifold outlets.

In the exhaust system you can try your hand at tuning. Two things here. Your efforts will be less than satisfactory because legally you can't play with the header or headers. Your modifications are limited to the area from the muffler rearward. The muffler can be removed, but that is all. You should try to tune, by the way, for the least back-pressure in the rpm range you're going to use — not, as many do, in the attempt to hit the horsepower peak right on the nose. Most of your driving will, or should, be done in the range of the torque peak rather than the horsepower peak. Tune the exhausts to this point.

On the legally stock machine, the rest of your job involves selecting the correct rear-end ratio (if listed by the factory as optional equipment) for the course; in freeing the wheel bearings; in bringing the clutch and brakes up to their peak efficiency; in taking advantage of all the body modifications (removal of windshield, etc.) within the law of the sanctioning group. With the SCCA this includes removal of bumpers, replacing windshields with aero screens, removal of all gadgetry not part of the basic car.

All these legal modifications and improvements may sound silly. They're not. On the Mexican Road Race Lincolns, the expert work permitted top speeds of almost 25 mph over the top speeds of a good stock Lincoln. You'd be surprised how much stock horsepower is lost overcoming excessive friction, compensating for an uneven engine, trying to pull incorrect gears.

With these legal modifications done perfectly by exceptionally good mechanics, the team cars entered by factories and distributors can wipe up everything in the field. This isn't enough when two or more factory teams are entered against each other. At this point the mechanics get a notch ahead of the contest boards and invent modifications not yet covered by the rules. One sterling example concerned oil filters. Mechanics reasoned that the oil capacity of a car could be effectively increased by using a huge, one-quart oil filter. This greater oil capacity kept the oil cooler and lengthened the time between pit stops for oil additions. Then another mechanic mounted the huge oil filter in a finned casing and set the entire thing right in the slipstream of cooling air. Now the car had both greater oil capacity and good oil cooling. Both modifications are now illegal.

Tonneau covers are another example of this ingenuity. A tonneau cover effectively reduces the wind drag of the car and thus adds to the top speed. These are now illegal under SCCA rules.

The list is long. Aircraft batteries, much lighter than auto types, were used. Generators were gutted of brushes so there would be no drag. (Now you can set the voltage regulator for minimum output but you can't remove anything.) Louvers were cut in hoods to aid cooling. Piston ring gaps were cut for minimum friction loss. All these things have since been declared illegal in the production categories.

As the contest boards of the sports car clubs blocked the mechanics' moves, the fight became dirty. Up came the man who spent \$1,500 cheating, the factory teams that were going faster and faster with the same cars, the miserable, lonely amateurs who tried to get away with the most blatant forms of modification. Each time someone got

caught a new wrinkle was added to the story. Each time someone didn't get caught, the illegal operators were encouraged.

Today the situation is such that, as one mechanic said, "You can't win a major production-car race honestly."

So
Watch an inspection crew at work. One man checks suspension for safety and conformity to stock. He jacks up the front end and shakes a front wheel; he crawls under and looks at the springs; he examines the shocks. In the rear he checks the same items and also scrutinizes the differential housing to see if it looks different than stock. Another man is busy in the engine compartment. He knows the kind, size and number of carburetors you're permitted; the details of the electrical system; he even can estimate head gasket thickness and the height of the head above the gasket. If there's any question about the latter, a measurement from the top of the head gasket to the top of the head will give the answer.

Now the spot checks. On one car the inspector will pull a spark plug and measure the stroke of the engine. Another gadget can measure bore through the spark plug hole. If these are OK, the rocker cover can be pulled and the valve springs checked visually. A dial indicator attached to the pushrod end of the rocker arm can quickly check valve lift. And that's just about as far as you can go without pulling everything down.

From observations like these you can compile a list of don'ts. Don't mill the head to increase compression ratio because head thickness will give you away. Don't put shims under the valve springs to increase tension because these can be seen. Don't use a highlift cam because it's too easy to spot. Don't bore or stroke over the allowable limits. Don't buy special shocks or substitute heavier springs or install racing brake drums.

What should you do? If you're a good boy, nothing. It's not whether you win or lose, and all that. But if you'd like to hear what others have done . . .

Easiest and best, according to one good mechanic, is to use an illegal rear-end ratio. Production sports cars are generally designed for street and highway use, not for racing. They carry a choice of gears to cover all normal contingencies, but none designed particularly for, say, Pebble Beach. All other things being equal, a set of Pebble Beach gears will win the Pebble Beach race. To the highly-practiced eye and ear the performance of the car will be slightly suspicious, but nothing short of a tooth-counting and diameter-measuring session will furnish proof.

While on the subject of gears, we might as well mention the driver who not only ran an illegal rear end but a special transmission as well. He had his rear-end gears made up by a machine shop. At the same time he had the shop cut a special second gear for his transmission. This gear was noticeably higher than the stock second gog, so high that the ratio between second and third now equaled exactly the ratio between third and fourth. Coming out of tight corners he had so many more useful revs in second he pulled away from the stock-gear cars. There are only two methods of catching this unusual, and expensive, method of cheating. You can open the transmission or you can run the rear wheels on a dyno and check horsepower against rpm in all gears.

On cars with independent front suspension and coil springs, the front springs can be stiffened. Use the stock springs as a pattern and have a special set made up. Spring tension can be varied by using special steels or using different tempering techniques. On any car, the stock shock absorbers can be rebuilt to give 50-50 action. The special springs are almost impossible to spot without removing them and giving them a compression test; the special shocks are easier to detect, but it takes experience.

Most of the fun is inside the engine. Instead of milling the head for higher compression, you mill the block. (Not that you're going to do this, but if you do be sure and see that the piston doesn't hit the head gasket.) No outside measurement will catch this, and only an old pro who knows the engine intimately will see that the pistons are sticking up 1/16 of an inch or so higher out of the block at top dead center. Some tech inspectors run a compression pressure test, but this is not infallible. Unless the compression ratio has been jumped severely the increase in pressure won't be high enough to convict you on the spot.

With valve springs you can work the same gimmick used on front suspension coils. Get tougher ones made up from the same diameter stock as furnished by the manufacturer. Valve lift is dangerous to trifle with because it's so simple to measure, but the safest, and most expensive way to do it is drill a set of blank rockers off center and take advantage of the difference between lever arms. The lift on the pushrod end will be stock and this is where the lift is usually measured.

Valve duration and timing is safer to vary because it can't be measured precisely without setting the engine up with a degree wheel. However, if you must play with camshafts, it would be safer to leave both lift and duration stock and simply change the rate of opening and closing of the valves. To do this, have a cam ground with almost suicidally fast opening and closing. You'll need your illegally tough valve springs to handle the abrupt action. About the only way to discover this kind of special cam is to remove the cam from the engine and run a contour curve on a bench set-up.

Where most of the ambitious outlaws run into a snag is in the vital process of porting. It does no good at all to run higher compression, better valve timing, perhaps special but disguised carburetors (sometimes you can get by the inspectors by using stock carburetors and boring the venturis out to a larger size); it does no good to do all this if the engine is going to choke to death in the ports. MGs, particularly, are subject to port disease. All that can be done legally is to match ports with manifold.

Of course no port modifications can be detected unless the head is removed, but mechanics kept looking for a way to beat a teardown. Today the best bet is to grind out the ports to a rough-grind surface, leaving the port openings almost stock in area but taking huge hunks out of the interior of the head. Then, to cover the grinding marks, they sand-blast the interior. One mechanic claims he can turn out a ported job that won't measure wrong at the opening, won't look wrong in the interior, yet will give the engine racing breathing at high rpm.

Then there is the type of stunt that seems easy to detect but that escapes the eye of the inspector by its very simplicity. Inspectors have already wised up to the "break-away" fan belt that is designed to snap during the first surge away from the starting line. They are also quick to inspect the too-loose fan belt that makes insufficient contact with both fan and generator pulleys. But they don't ordinarily measure the diameters of the fan and crankshaft pulleys. So a special, small, pulley is installed on the crankshaft and a special, larger, pulley on the fan. If the diameters of the special sheaves are not too far from stock, they'll be hard to detect. The car will gain horsepower formerly lost turning fan and generator at high speeds. It won't miss the cooling because the air stream through the radiator will handle that function. A fan is only essential at low speeds and in traffic driving.

Why is there so much cheating on stock in the production classes today? One major reason is that the penalties are so small. Usually they're left to the discretion of the local race committee and they vary from simply being disqualified for the particular race in which the cheating is discovered

to disbarment from racing for another event or two. To the guy who has been beaten consistently by "production" cars he thinks are hopped up, it is worth this small penalty to have the pleasure of beating the other wisecracks at their own game. There is the bonus of having a car that will perform better on the highway and in the city, even if it is disqualified from racing.

Or, as one expert mechanic-driver told me, the whole thing boils down to a case of "you-don't-challenge-me-I-won't-challenge-you." He happens to be an inspector as well as an entrant. He says that when he finds a quiet (i.e. not easy for the average inspector to find) modification, he keeps his own mouth shut but takes notes on the gimmick for his own future use. Only once has he blown the whistle, and that was when he found a Mercedes 190SL with its rear springs bolted down to nothing. This would give the car better cornering but it also was just too much of an eyecore to put up with. This inspector rejected the car at a preliminary inspection, but he noted that it showed up at the race and got in under the wire in precisely this condition. So he promptly figured the hell with the whole thing and went to work to beat the car by better modifications.

He adds a lot of interesting details. Jaguars, for example, have slushy rear ends that keep both themselves and the front ends from racing properly. Jaguar, however, has unwittingly given an assist to the hop-up artists by lacing the rear springs into a friendly boot. So all that has to be done is to play hell with this rear end springing, modifying everything in sight, installing special gimmicks, and then again lacing everything together. Who is going to unlace the wrappings? Not the average tech inspector. The Jag comes out on the course with MG tightness in the rear-end.

Still we're under the let's-not-protest-each-other rule. In the next race, or the previous one, there's the MG with a fuel log that's been blocked off. As you probably know, MG installed this log between the two carburetors to even out the idling. It's nice for street jobs but not for hot ones. So the wise operators jam a block between the two carbs in the fuel log and put the thing back on the engine. It looks stock but the MG won't idle below 1,500 rpm. Sounds just like a hot cam, and adds almost as much as a hot cam at the upper end of the rpm range. This MG driver knows the Jag driver has had his rear-end suspension modified; the Jag driver knows the MG owner has this fuel log blocked in the center. Neither complains. Not even when you can see the vise marks on the fuel log.

Then there are the quibblers: "Who says this head is shaved! I had to take off sixty thousandths to take care of the warps!" "Headers, Hell! They're stock. You've got to shim up these valve springs to get them up to stock."

And so on. As we said in the beginning of this piece, it is almost impossible to win a production-car race with a stock car. One strong group argues that this is healthy. They claim that both the sport and the science are gaining by the modifications being used. True or not, it's an interesting idea.

As every racing organization in the world has discovered the hidden hop-ups are with us forever. They're morally wrong, but you can't help but admire the tremendous technical intelligence that goes into their construction. They're a challenge of possibly greater dimensions than building strictly racing machines, since they involve critical assessments of the personalities and capabilities of technical inspectors and curious competitors. The top "production" mechanic builds right up to the borderline between heavy suspension and actual protest, then stops.

This is what you're up against in the production class. It might be easier just to buy a Ferrari and forget about the whole damn thing. At least you'll be able to live with yourself. #

ALTERATIONS ON PRODUCTION CARS

	Allowable	Not Allowable — Examples
TIRES	Racing tires. Tires of different sizes than original. Tires must be suitable size for wheel.	Asphalt slicks, badly worn tires. Recaps, defective casings, retreads. Unusable spare.
SPARK PLUGS	Dual, multiple, or platinum point plugs — Different makes, special plugs.	Dual Ignition (2 plugs per cylinder) unless original.
BATTERY	Different make. One twelve volt instead of two six.	Aircraft, Motorcycle or special lightweight types.
SHOCK ABSORBERS	Different make.	Different type or design. Reworked (50-50). Adjustable (unless originally supplied).
PISTON RINGS	Different make. Compound or expanding type. Plated or chrome rings. Pistons may be "nurlized" or expanded.	Different thickness. Cutting grooves to different specs.
BEARINGS	Any make of same specifications. This includes plain, roller, or ball types.	Substitution of one type for another — i.e. roller for plain, etc.
BRAKES	Any type of lining.	Drums and/or liners of different specs — Master or wheel cylinders of different specs — Ventilating backing plates or air scoops.
CLUTCH	Any type of lining. Optional springs available from factory at no extra cost.	Special springs or pressure plates. Installation of vents.
POINTS	Any make that requires no alteration to plate or distributor.	Dual points if not originally fitted.
COIL	Any make.	
LIGHTS	Any light conforming to local state statutes.	Lights not conforming to state statutes.
INSTRUMENTS	Any make or type or additional instruments not affecting performance.	Devices affecting performance
OIL FILTER	Any make or type.	Filters over one quart capacity. Filter mounted in slipstream.
REAR AXLE	Ratios from same make and model available from factory at no extra cost. Installation of vents.	Ratios from other models or makes. Limited-slip, Z-F, or locked differentials.
WHEELS	Wire wheels of TF spec. on previous model MGs. Reinforcing plates or devices; 16" wheels on TC MGs.	Alloy or lightweight wheels to replace heavier or steel wheels.
BODYWORK	Bumpers may be removed for races only. Windshields may be replaced by aeroscreens.	Scoops, vents or louvres added. Removal of trim, hardware, or top. Tonneau covers. Austin-Healey windscreen folded.
BALANCING	Balancing of wheels. Balancing of any moving parts.	Counter-balancing. Removal of sufficient metal such as to constitute deliberate lightening.
COOLING	Use of anti-freeze or coolants other than water. Removal of thermostat.	Removal of fan (or any part of) or belt.
INDUCTION	Aircleaner of different make but same type. Matching and cleaning of intake ports.	Different type or "gutting" of aircleaners. Blanking off or addition to induction passages or pipes.
EXHAUST	Straight pipes.	Alteration to any part of the exhaust system forward of the muffler. Systems not sufficiently exhausting gases away from driver.
SEATS	Any seat supplied by manufacturer as optional at no extra cost. Tying down or taping of loose squabs or upholstery.	Bucket or lightweight seats not supplied by manufacturer at no additional cost. Removal of seat squabs or pads.
TRANSMISSION	Vent added to prevent pressure build up and consequent leakage of oil.	Any other alteration.
CARBURETION	Different size needles, jets, or venturis as supplied optional by factory for that model car. Matching of carburetor ports to induction ports.	Special needles, jets, or venturis. Blanking off or addition of, or to, induction passages.
ELECTRICAL	Adjustment of regulator to low output. Removal of "accessory" (i.e. radio, heater, etc.) equipment.	Removal of major electrical components, generator brushes, etc.