

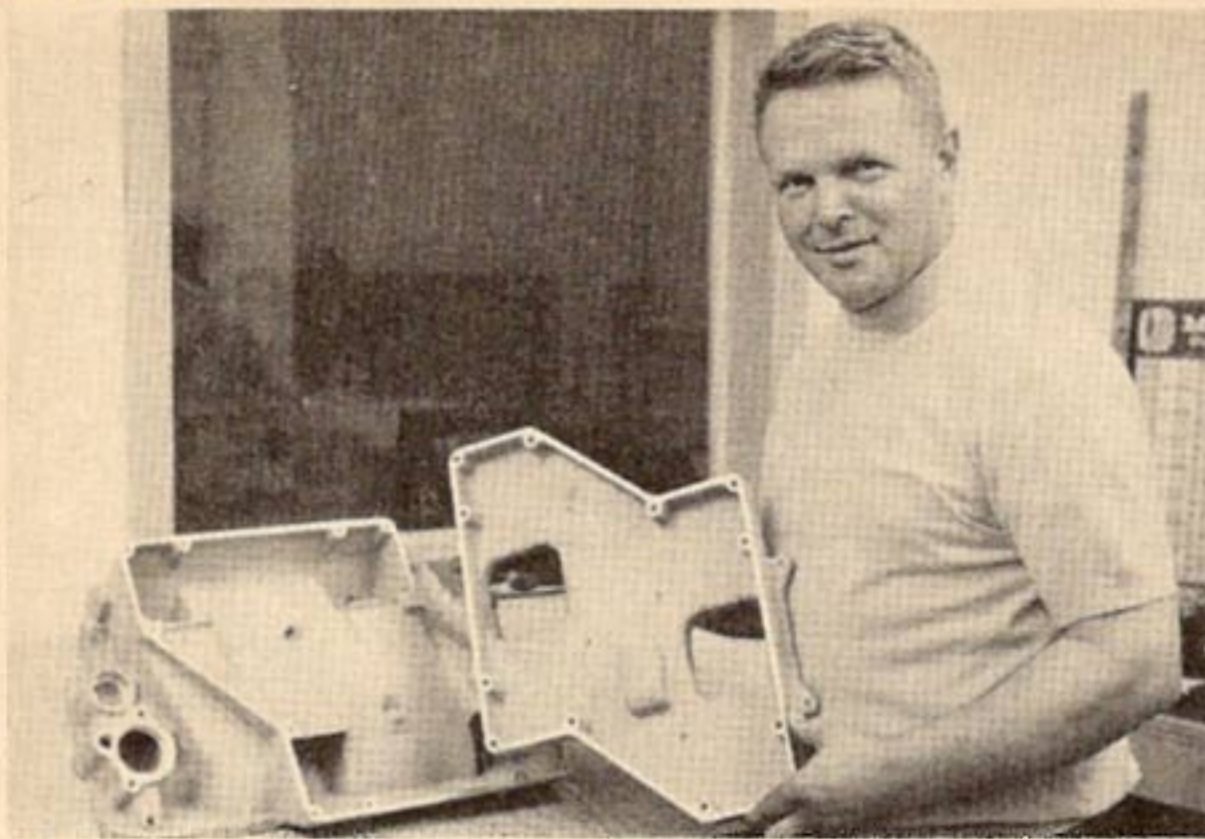
All the majors are investing big bucks into
ponycar road racing.
But American Motors, the smallest investor,
is showing the biggest
return and has become

THE AM IN TRANS AM

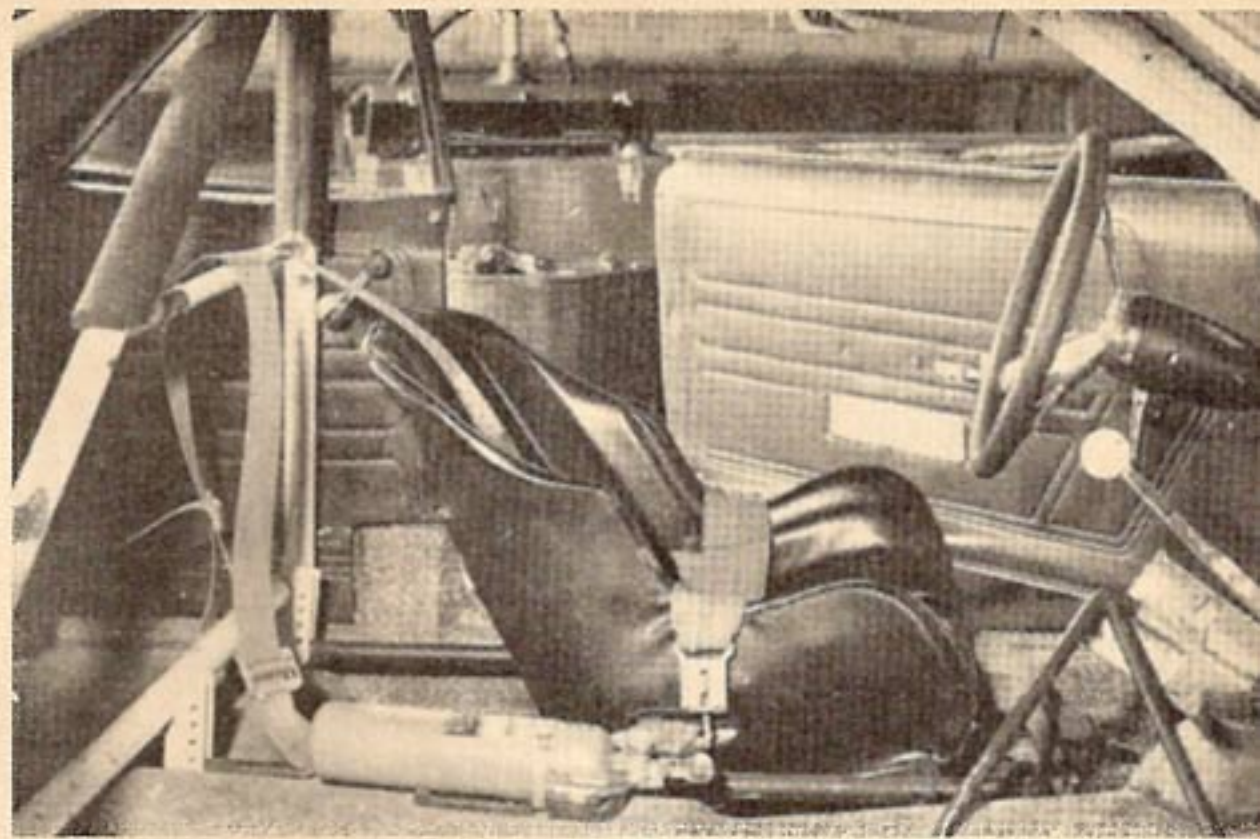
BY ROGER HUNTINGTON



Peter Reyson at Riverside. In 12 Trans-Am
events Javelins never placed lower than fifth.



Javelin team manager Ronnie Kaplan holds dual four-barrel cross-ram manifold made by Edelbrock for Trans-Am racing. Good from 5000 rpm up.



Inside of cars are gutted, with ultra-stiff roll cage, body bracing and tight bucket seat to hold driver against high cornering loads.

ONE OF THE hottest stories on the current auto sport scene is the fast rise of little American Motors Corp. in the competitive youth/performance market. Only three years ago this company was stressing bread-and-butter economy and utility in all their cars—and they were gradually going bankrupt. Then a new management team made a dramatic turn-around with a brand new youth-oriented Javelin sports coupe with plenty of flash and zip. They promoted it with a clever racing program aimed at getting maximum exposure and publicity for minimum investment. And we all know the result: AM sales and profits are now coming up fast, and the Javelin has made a deep penetration into the youth market in less than two years.

One of the key factors in this rise was the fantastic performance of the two-car Javelin racing team on the "Trans-Am" road racing circuit last summer. This series is designed for basic production sports coupes with wheelbase under 116 inches and en-

gines under 305 cubic inches. Major competition was between Camaro, Mustang and Javelin—all factory teams. Mark Donohue won the point title in the Penske Camaro. But the Javelin team (with drivers Peter Revson and George Follmer) amazingly won second place in points over the big-money Mustang factory team campaigned by Carroll Shelby! The Javelin team entered 12 of the 13 Trans-Am races last season, and won second place in six of them. They finished in every one of the 12 races entered, and never placed lower than fifth. Their ding-dong battle with Mustang for second place in the points race was the feature of the series. Javelin finally won.

And remember that this was a team that had been in big-time racing less than a year. Against a million-dollar Ford effort backed by years of experience and dozens of engineers. It's one of the most amazing Cinderella stories in the whole auto sport picture in recent years.

And little American Motors will

be out this year to prove that it wasn't a fluke. There will be two separate one-car factory teams in '69. One will be raced by Hurst Performance Products (Detroit), with Bob Tullius driving, and they will campaign on the SCCA Trans-Am circuit. Then another team under the direction of Huggins Tire Sales of Thomasville, N.C.—with Jim Paschal driving—will campaign the new NASCAR "Grand Touring" (GT) circuit on the banked oval speedways in the south. Both circuits have virtually the same rules; but it isn't practical to try to run the same car on road courses and oval tracks because they call for entirely different chassis set-ups. It was decided to run two separate teams.

AM hopes to get twice the exposure for practically the same investment this way. And it seems like they're just sharp enough to do it!

I thought you might be interested in how the new Javelin was developed to be so highly competitive in this wild new "sedan" racing. There are good lessons for any backyard speed mechanic here.

Look at the engine. It's basically the 290-cubic inch production design, with cylinders bored out to 304 cubes. Trans-Am rules require basic production blocks, heads and intake manifolds, but you can modify by removing material. Thus the head ports are opened up considerably and combustion chambers are machined for more clearance around the edges of the valves, for better breathing. Stock valve head diameters are required (2.02 intake and 1.62-inch exhaust diameter in this case); but stem diameter is reduced from 3/8 to 11/32-inch to reduce the weight of the valves. (Keep in mind that the cylinder heads used here are the big-

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Fast pit work by the Javelin team gained precious seconds in the Trans-Am races. These averaged 300 miles long, and required at least one pit stop with max 22 gallon gas tank.



Javelin Trans-Am factory team cars for '68 season, used modified 290 V-8 engines bored out to 304 cubes developing 445 hp.

port type for the 390 AM engine, not the small-port design used with the 290 production engine. But the big heads are a service option with the 290.)

The rules are wide open on cams and valve gear. Ronnie Kaplan, who supervised the build-up of most of the '68 race engines (and will do so in '69), chose an Engle solid-lifter cam with 312 degree duration and .528-inch lift. Stock AM heavy-duty pushrods and rockers were used, with Chrysler valve springs and specially-machined titanium retainers—(for maximum strength with minimum weight). As it turned out this valve gear gave most of the trouble encountered by the team in the '68 season. An odd angular relationship between the pushrod and rocker (at high valve lifts) induced a violent whipping vibration in the pushrod that limited engine revs to 7000 or 7200 rpm. This, in turn, severely limited the through-the-gears

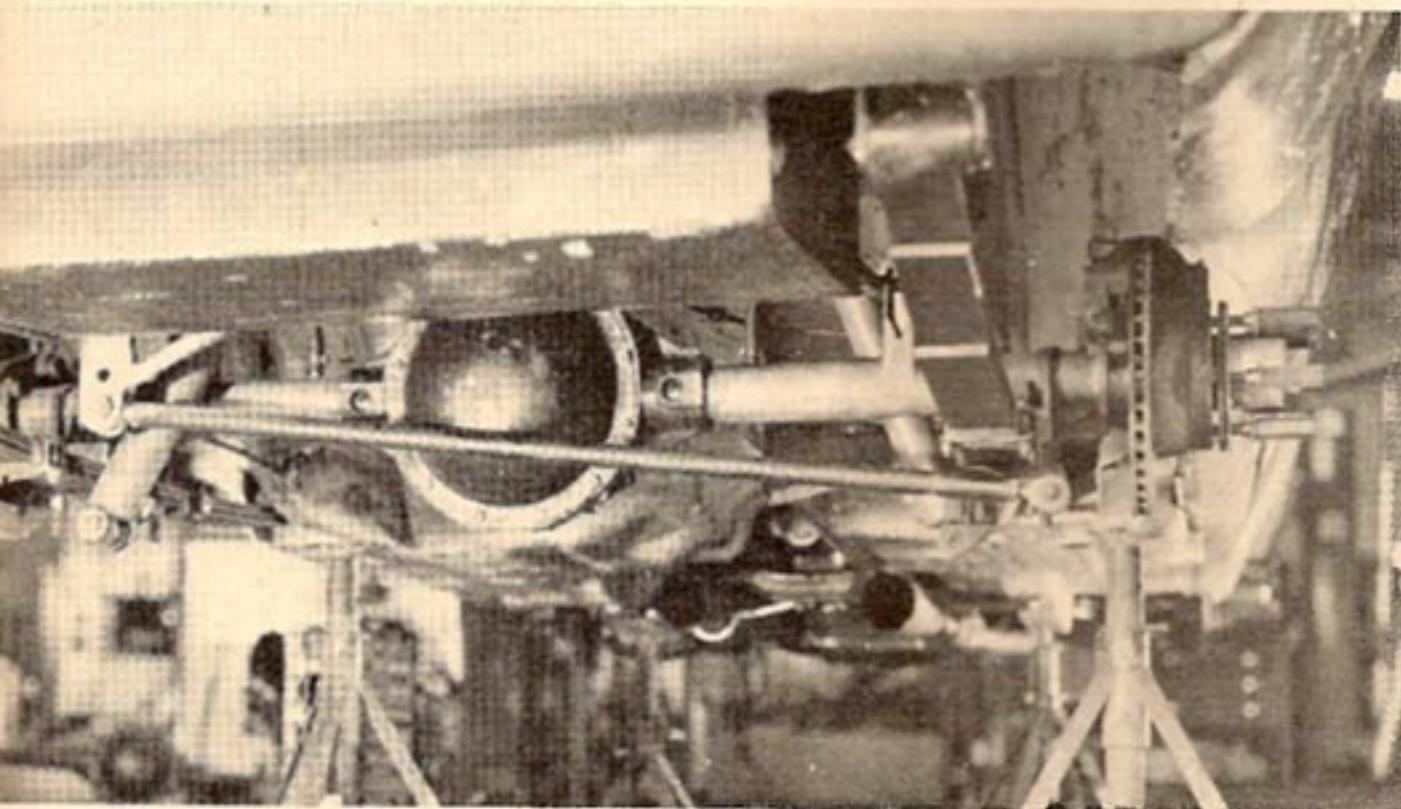
acceleration of the car because the engine peaked its power curve at 7000—and we all know you have to wind well *above* the peak of the power curve for maximum acceleration. The Camaros and Mustangs were shifting at 7500 to 8000 rpm.

Anyway a new pushrod design has solved this problem for '69. The engine can now buzz safely to 8000 with no danger of early blow-up. And preliminary performance tests at Riverside on the '69 cars show that this higher shift point can knock two or three seconds off the lap time—with the same engine horsepower! It's a matter of using the available horsepower in a more efficient way by winding tighter. That is, with the Engle 312-degree cam maximum torque comes at about 6000 rpm, and power falls off fast below that. With close-ratio gears in the Warner T-10 four-speed, a shift at 7000 rpm would drop the revs back to around 5400—where there's a deep dip in the

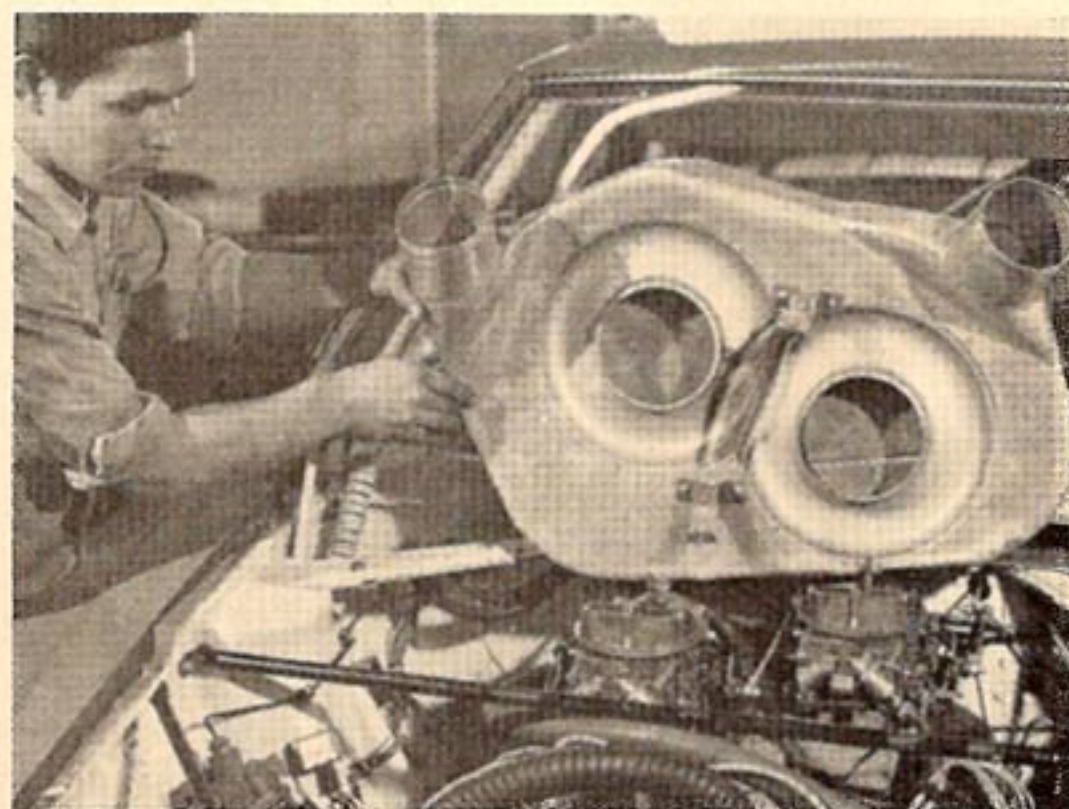
torque curve. The Camaros and Mustangs that were shifting at 8000 rpm were dropping back to only 6200 or so. This would let them gain one or two car lengths on a straightaway that came off a slow 2nd gear corner. Now that the Javelin drivers can rev up to 8000 before shifting, it could be a different story.

See what I mean about *using* the available power?

The engine bottom end has surprisingly little modification to allow this wild revving. Forged true pistons are used with stock rods and heavy-duty Clevite bearings. Both main and rod bearing clearances are increased some. Crankshaft is stock forged. A stock heavy-duty oil pump sends the oil out through an oil cooler and remote filter before putting it into the engine bearings—and the oil passages inside the block are opened up substantially to get higher flow. (This is in line with the rules that allow material to be removed.)



Cross sway bar, was used in '68 for lateral stiffness on rear suspension and to keep body from swaying and shifting going in and out of turns.



Sheet metal air box around carbs ducts cold air from scoops through tubes to carbs. Good for 20 hp above 100 mph.

Dry-sump systems are not allowed, so Kaplan uses a huge 12-quart oil sump to carry enough mass of oil so they can run the necessary 300 miles at high revs without adding. A special windage tray between the whirling crankshaft and oil sump prevents whipping losses with a full load of oil. Bottom end reliability proved very good through the whole '68 season, and no trouble is expected at higher revs in '69.

The bulk of the engine performance development last year was done with intake manifolding. The rules call for a "factory production" manifold or optional service design. AM had no high-performance manifold available for the V-8 engine. Hot rod supplier Vic Edelbrock, Jr. had a big-port aluminum design for the AM engine to mount a large single four-barrel; but this was basically a street manifold, and not competitive with the exotic Camaro and Mustang ram-type designs on the racetrack. Anyway the Javelins used

the Edelbrock design with a big 950-cfm Holley three-barrel carb at their first race in Sebring—and developed a rather astonishing 410 hp at 6800 rpm on pump gas! (The manifold was made legal by putting a factory part number on it.) This output wasn't too far behind the early '68 Camaros and Mustangs with *dual* four-barrels; Revson proved to have reasonably competitive lap speed—and managed to finish fifth.

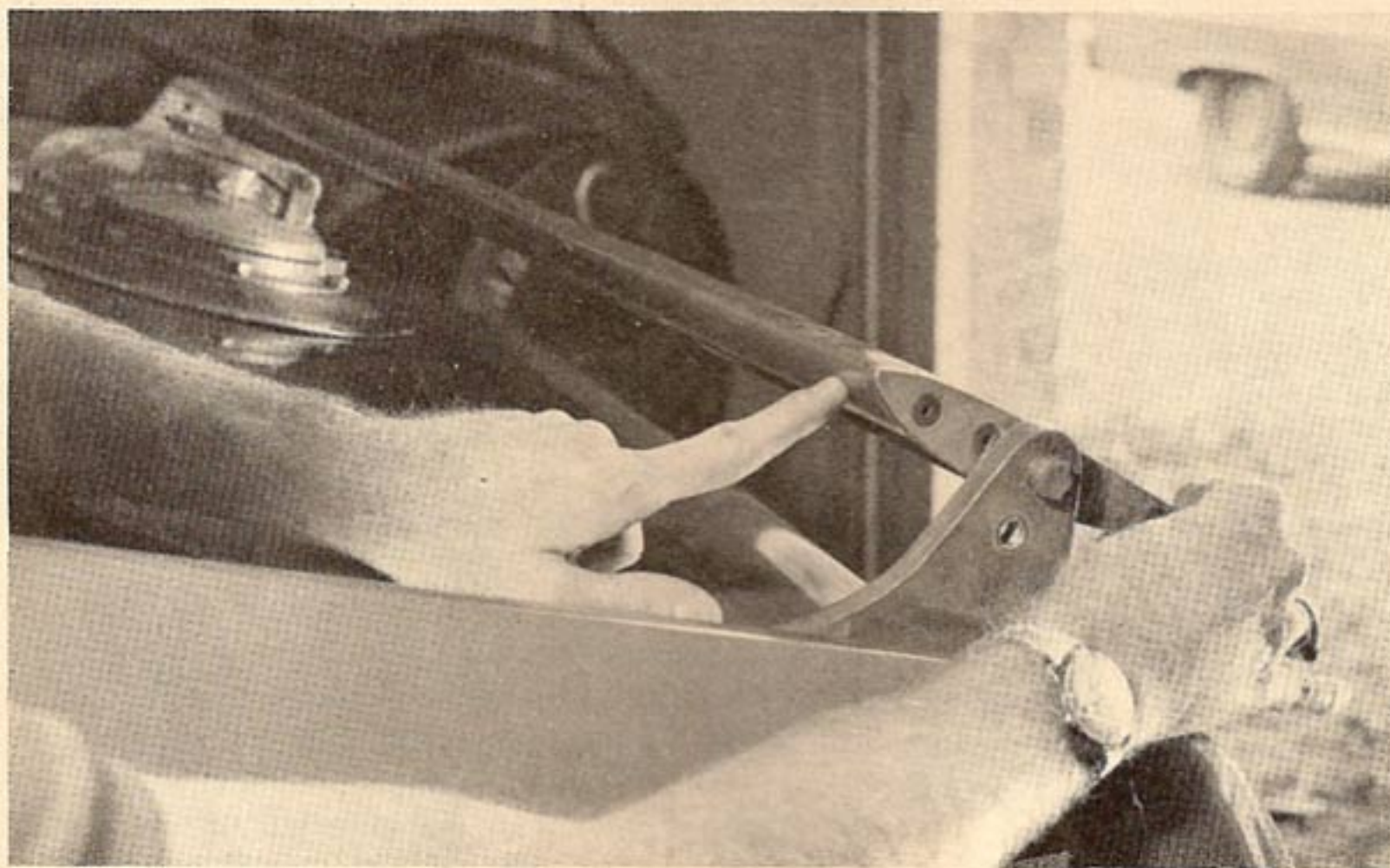
But even while this was going on the AM management had commissioned Vic Edelbrock to design, test and tool a dual-quad cross-ram manifold for the remainder of the '68 season. This turned out to be entirely unlike Edelbrock's famous cross-ram hot rod manifolds for Ford and Chevy engines that he introduced in the early 1960's. These had separate plenum chambers for each carb over the rocker covers, with long 15-inch passages going across the top of the engine to ports on the opposite bank. The new Javelin de-

sign used just one big plenum going the full width of the manifold casting, with the two carbs dumping direct into this huge chamber. Then shorter 10-inch passages come off the bottom of this chamber, crossing over to ports on the opposite side. It's kind of like the famous Chrysler "rambox" single-four-barrel manifold for NASCAR track racing with the Hemi engine.

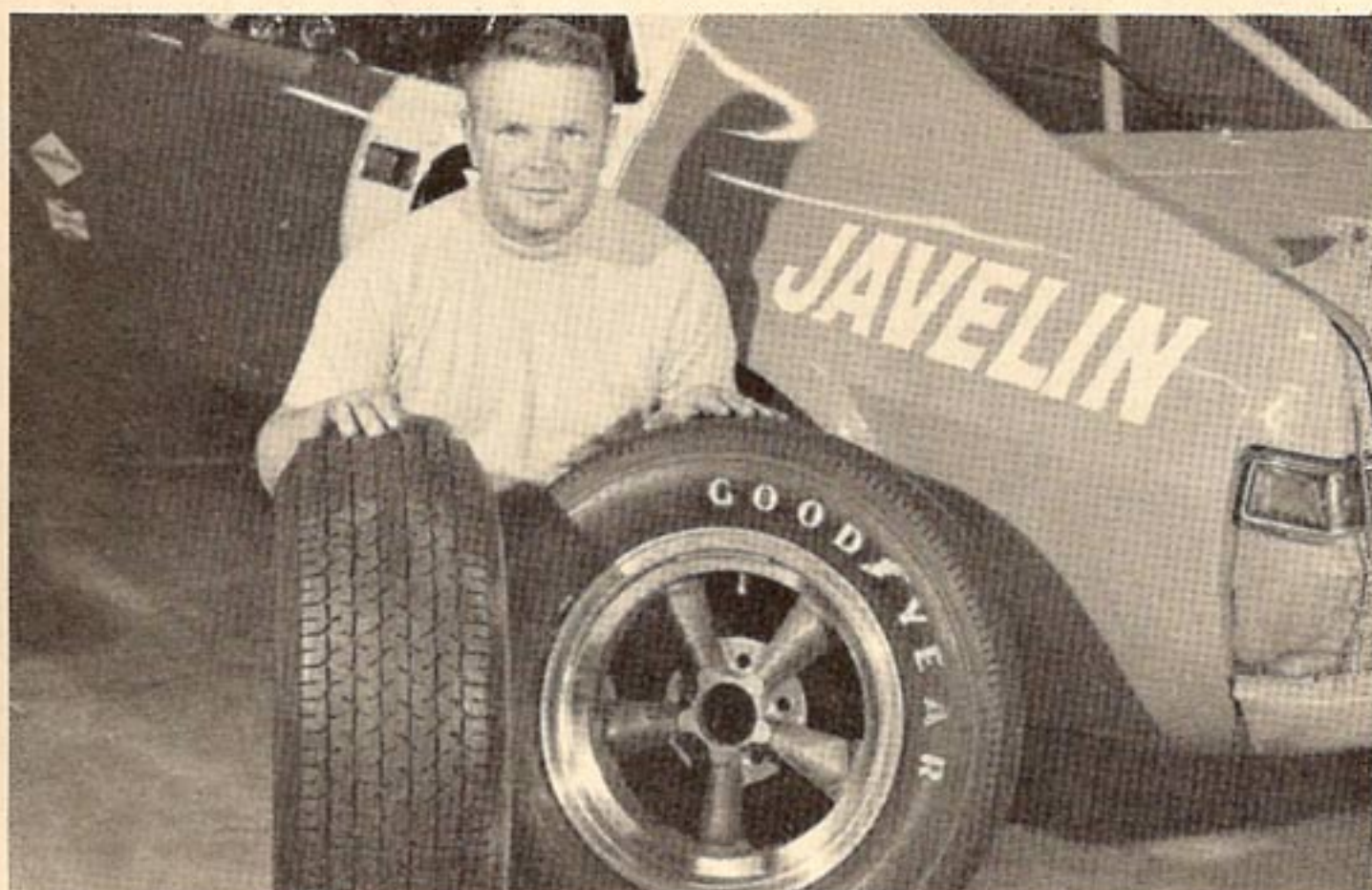
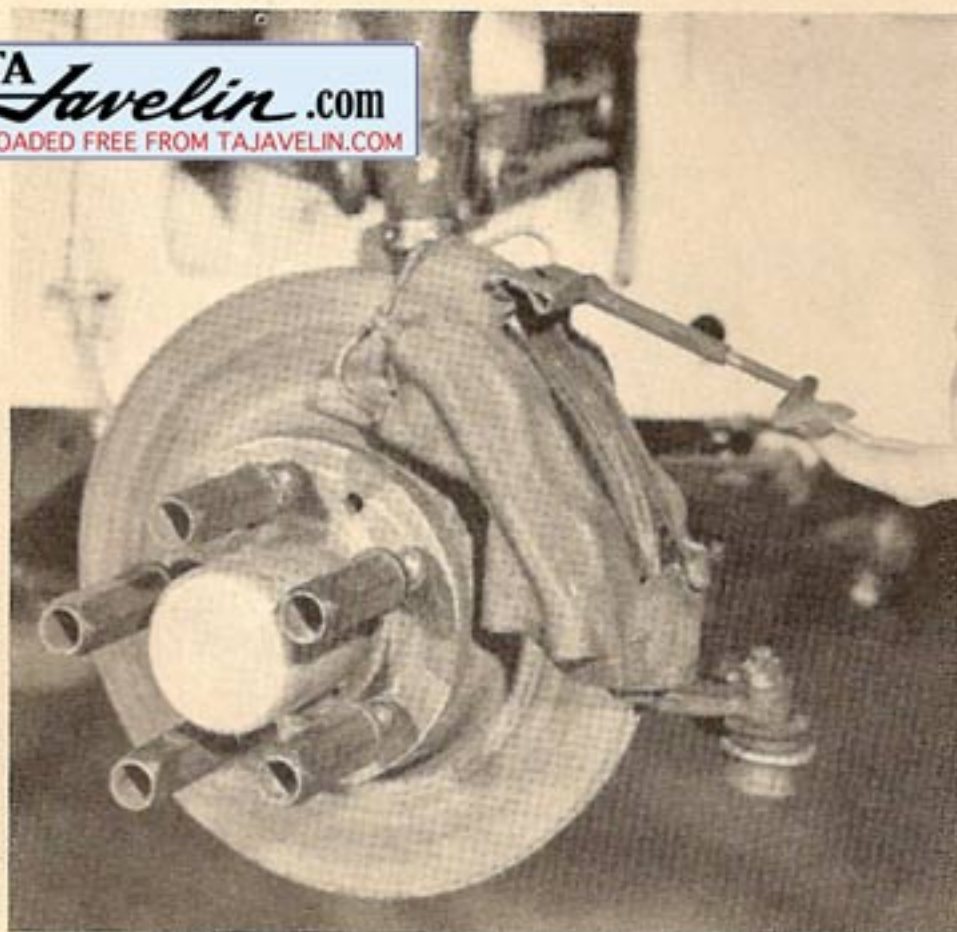
The reasoning behind the new design is obvious: The engine doesn't have to pull below 5500 rpm in Trans-Am racing, so the more restricted double plenums were not necessary. And the shorter cross passages give their major ram boost in the 7000-8000 rpm range instead of in the 5000-6000 range of the 15-inch passages. This gives more peak horsepower.

And this was proved right now when the little 304-cuber gave 40 more horses on the dyno with the new manifold and two 600-cfm Holley carbs! The highest dyno reading achieved was 458 hp at 7000 rpm—and the average race engine would put out between 445 and 450 horses at this speed. Is that ok for the little 290 American Motors engine that nobody thinks of when they think of hot small-block combinations for various hot rod and racing applications? Maybe we'd *better* start remembering this basic engine in our plans. It's small, it's light, it has a rugged bottom end (with the usual

(Continued on Page 70)



Trans-Am Javelins had adjustable airfoil type spoilers over rear deck to improve stability at high speeds. Angle of spoiler was varied for different tracks and suspension setups.



Left, Kelsey-Hayes disc brakes on all four wheels are based on production units. Right, Javelins mount special Goodyears on all four corners.

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TORQUE EAST continued

October has other virtues, though. It's new car time again. Here come the 1970s looking fast and groovy. To see them all, go to the Detroit Automobile Show November 15-23. It's, as always, at Cobo Hall in Detroit, Michigan.

Shows come back east in November. In Allentown, Pa. there's the big one at the Agricultural Hall. No date listed yet. And in New York, there's the 8th annual rod and custom show at the Coliseum.

In December, the only thing of interest to east coast auto fans is the Annual World of Wheels presented in the War Memorial Auditorium in Boston. Have a merry Christmas and drive carefully. You know how treacherous the roads are in December.

TRANS AM continued

beef-up tricks), and it apparently has better port design in the heads than we figured. It *must*—because this 450 hp is as much as they were getting from the tunnel-port 302 Mustangs at the end of the season. And the Penske Z-28 Camaro didn't get much over 460 horses in '68. Think

that over very carefully. I was very surprised myself.

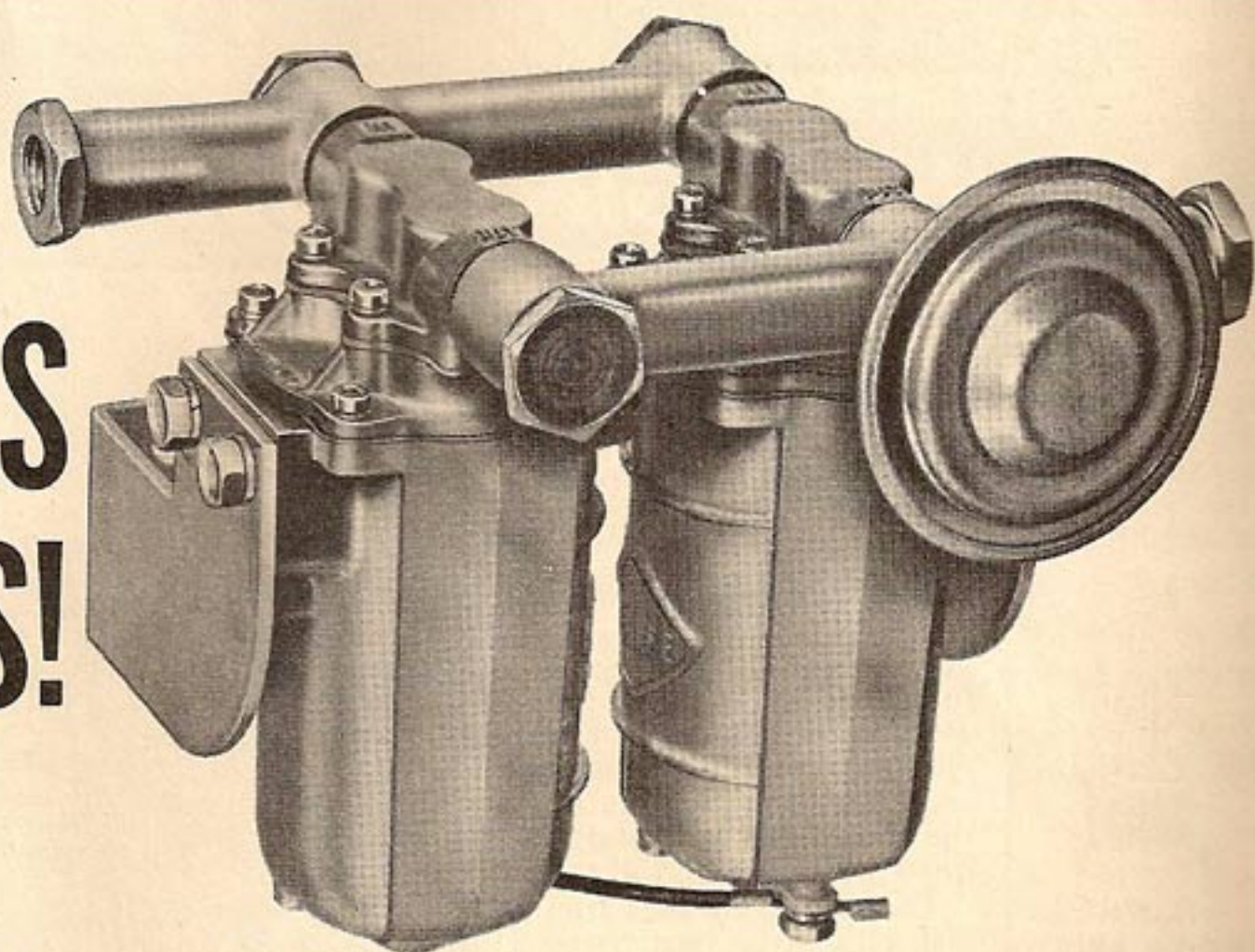
The Javelin chassis featured some clever "hop-up" tricks to get the ultra handling, cornering and braking demanded in Trans-Am racing. Actually the AM factory has a package available for the Javelin and AMX with very stiff springs, shocks and front roll (sway) bar that are eminently suitable for track racing. However Ron Kaplan decided they needed to go stiffer for ultimate cornering with the improved tires that became available during the '68 season, so all the parts are now considerably stiffer than the original factory service package. Probably by as much as 30 to 50 percent.

And there are several entirely new twists that have been added. One, an anti-roll bar is used on the rear of the car as well as the front. And a very clever gimmick is that the roll stiffness of these bars is *adjustable* by changing the effective lever length with a pivot collar moving back and forth on the splined end of the bar. The relative front/rear roll stiffness can be changed in just a few minutes in the pits, to adjust the handling of the car for different
(Continued on Page 72)

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courses. As you know, this relative front/rear roll stiffness critically affects the oversteer-understeer feel of the car. If you just had a roll bar in front the car would understeer heavily, and the front end would tend to push and plow in the turns. The rear bar forces the rear end to absorb more of the "roll couple", so the rear tires work harder and the car feels more neutral in the turns. You *want* more oversteer on *slow* corners. But on fast 100-mph bends too much oversteer makes the car skittish and dangerous. This calls for *less* roll stiffness in the rear. And all this can be adjusted to a hair in just a few minutes in the pits—to give the driver any kind of handling he wants.

Another important addition to the Javelin suspension for racing is a cross sway bar, or "Panhard rod", in the rear. This merely pivots on the frame at one end and on the rear axle at the other, and prevents the body from shifting and swaying going around corners. This rigid lateral location is necessary to keep the handling from changing and the tires from losing bite when the car enters and leaves a corner—while the suspension is changing from straight-line to cornering conditions. This is called "transient response" among engineers, and you can't have any weird goings-on here if you want to get around the corners quick. Incidentally, Kaplan is replacing the cross rod with a "Watts link" setup for the coming '69 season. This has a crank pivoted in the center on the rear axle housing, with pivoted cross rods top and bottom going to the frame on each side. It does the same thing as a sway bar; but the up-and-down motion of the body and axle are exactly vertical—where there is a very slight arc motion with the Panhard rod. This can theoretically upset tire bite going into the corners. Most modern suspensions now use Watts links instead of Panhard rods.

I mentioned tires earlier. This is one area where the Trans-Am racers have been in beautiful shape, and will be in the future. The Goodyear people have taken a special interest in this series. Before the first race at Daytona over a year ago Goodyear had designed and produced a special series of racing tires for the Trans-Am cars—with carcass design, profiles, tread patterns, com-

(Continued on Page 74)

pounds and cord angles tailored for the weight, performance and handling of these cars. They even had special rain tires prepared, in case any of the races were run in bad weather (though these were not needed). The Trans-Am cars are limited to a maximum rim width of 8 inches, so Goodyear came up with a casing width of 11 inches for front wheels and 12 inches for rears, both on 15-inch rims. The section height-to-width ratio was around .50, so these tires actually had a lower profile than the Goodyear tires for the heavier NASCAR racers (which could use up to 8.5-inch rim width).

Furthermore Goodyear engineers improved the tires during the '68 racing season. Tread width started out at 9.0 inches, and was eventually widened to 9.8 inches. With accompanying changes in compounds and tread patterns for better bite and cornering power. An inner safety liner in these tires prevented accidents caused by blowouts—(since the driver could get back to the pits at reduced speed after the main outer casing blew out). In most cases these tires could run the necessary 300 miles or so without changing. It was a perfect example of racing performance being increased by close cooperation of a tire company. Big-time auto racing couldn't survive without this factor.

And it looks like we'll have more of this invaluable service in the '69 season, maybe even with Firestone getting into the act. Last year the Goodyears were so much superior that everybody used them. We'll see this time.

Brakes were not as much of a problem as expected. Trans-Am officials permitted the teams to fit disc brakes on all four wheels—and this was the key. The Javelins used Kelsey-Hayes disc brakes (same ones used on production models) on front and rear wheels, with much "harder" friction pads for high heat resistance and the front-rear proportioning of braking force tailored to make the rear brakes work as hard as possible. This tended to even out the heat load on all four brakes—(though the fronts always do the most work). Raybestos 19M quick-change friction pads were used, so they could be changed in less than two minutes in the pits. But this was seldom necessary. The brakes did a beautiful job

(Continued on Page 76)

all season, and don't look like they will be a problem in '69.

Other goodies that might be mentioned: Belanger steel tubing tuned exhaust headers; rear deck spoiler for anti-lift at high speeds; 22-gallon Goodyear safety fuel cell in the rear compartment; twin electric fuel pumps; transmission oil cooler; rear axle oil cooler; Standard AM rear axle converted to full-floating principle for safety; American Racing Equipment mag wheels, 15 x 8-inch transistorized ignition.

Now the big question: How quick and fast did this beast go in full racing trim? Unfortunately Kaplan and his crew never had time to make extensive acceleration tests on the race cars. But I can estimate this pretty close on the slide rule, using the known horsepower of ground 445 and the "curb" weight of 2840 pounds. Assuming the Goodyear racing tires (9.8-inch tread width) and, say, 4.44 axle gears—I think one of these cars could have turned a drag strip with an et around the low 12's or high 11's at a trap speed of 115 to 120 mph. There's enough power there to run mid 11's with slicks; but

not with these hard track tires.

And speed? With the right gear and a long build-up there's certainly enough power here to run over 170 mph. Kaplan tells me they tached as high as 162 mph on some of the longer straights in the '68 season, and the car was still accelerating. Figure it out. Speed is always a simple question of horsepower vs. wind and rolling resistance.

So that's the story of the Javelin Trans-Am cars. It will be interesting to see how they do in this coming '69 season, both on the Trans-Am circuit and the NASCAR speedways. The prospects look good. There have been few significant changes on the car. But if they can get another 1000 revs out of the engine before shifting, they will sure be in better shape than they were in '68—and they did pretty good then!