



How to prepare your car for the 'Parking Lot Grand Prix.'

BY PETER SESSLER

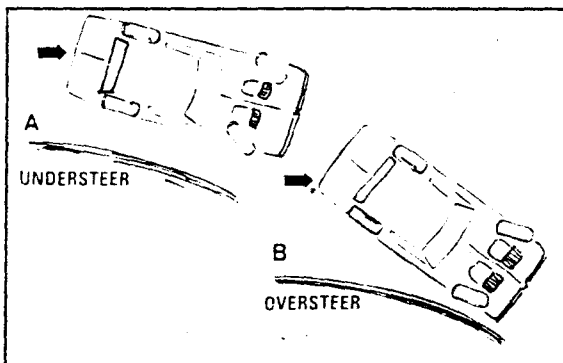
Mopar Handling

Unlike other musclecars, Mopars have an image that categorizes them (rightly or wrongly) as single-purpose cars—cars that have tremendous straightline performance, but offer little else. Handling is generally not a word that's associated with 1960-70s Mopars.

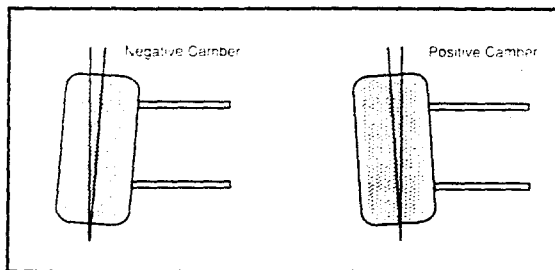
The reality is that the big Mopars weren't any worse than other musclecars of that era because they were all limited by 1960s tire technology. While it is certainly nice to have a car that can accelerate, it is no fun to be put down by some of today's four- and six-cylinder performance cars when the road becomes a little twisty.

Driving some of these cars in anything other than a straight line can be a handful, especially to someone who is used to today's handling standards. Those old skinny tires seem to squeal even in moderate corners and excessive body roll, poor rake and slow steering tend to detract from the total driving experience that these cars have the potential to provide. Let's face it, by today's standards, they just don't handle.

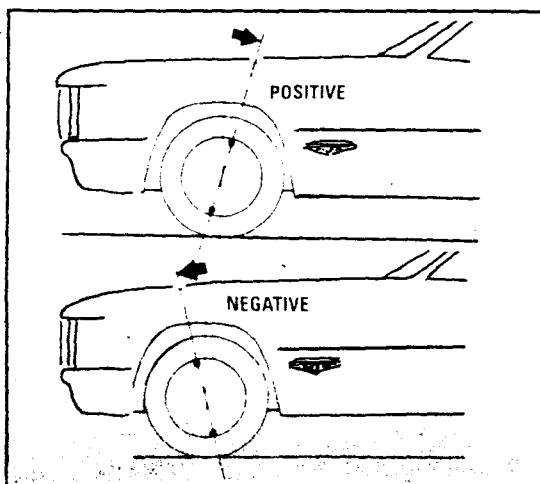
Luckily, it is fairly easy to make your A-, B-, or E-body Mopar handle better. It might seem that all that's required is to install some bolt-on suspension parts, yet it takes time and patience to dial in the correct combination. However, we are fortunate indeed, that there are Mopar enthusiasts who want good handling along with great acceleration. One who fits



In an understeer situation, the front tires have to be turned into the turn to compensate for the car's tendency to go straight. In an oversteer situation, the front wheels are pointed in the opposite direction so that the rear of the car won't spin out.



A wheel has negative camber if its top tilts inward, while with positive camber the wheel tilts outward.



With positive caster, the top of the steering axis tilts backward. This provides high-speed stability, but does increase low-speed steering effort. With negative caster, the opposite occurs.

into this category and is willing to share his knowledge is Mitch Lelito who, over the past 15 years, has literally won hundreds of autocross and time trial events with his 1970 Challenger T/A. Through a lot of effort, Mitch has found what will and won't work when it comes to Mopar handling, and we will be drawing from his vast experience in this article.

While the subject of handling may lack the "romance" of modified engines, the results of good handling are just as easily apparent.

Handling is a complicated subject that can encompass a lot of different things, but it all really boils down to one thing: traction. This doesn't just mean traction during cornering; handling involves all facets of driving—during acceleration, braking, and cornering under all types of conditions and on different types of road surfaces. Good handling means control and predictability. A good-handling car is a blast to drive, while one that doesn't handle well will not only be difficult to drive, it will be unsafe and dangerous.

In spite of what other enthusiasts may think, Chrysler invested quite a bit of time and money developing the suspension systems of the rear-wheel-drive A/B/E-body cars. The suspension was designed for average, everyday use, and not for high performance. Still, with a very modest investment, you can take any Mopar and have it handle as well as late model Z28s and TransAms.

The guidelines given in this article are aimed at preserving a balance among the qualities that constitute good handling, while maintaining a reasonable ride. The enthusiast who is concerned with performance is usually willing to give up some ride quality, but it is unwise to go overboard and sacrifice driveability and comfort. It's also important to keep costs down and get the most for your dollar.

Another point worth remembering is that if your Mopar is an appreciating collectible, you really don't want to go overboard because you'll hurt your car's value. Keep all the parts you replace and limit modifications to the bolt-on variety. In this way, you can easily reconvert your car back to stock if you must part with it. You can have your cake and eat it, too!

Under- and oversteer

When it comes to handling, probably the most important terms to know

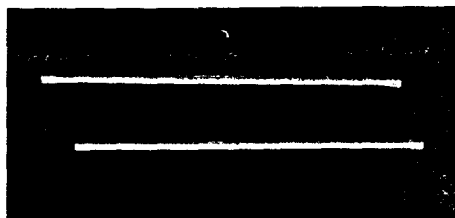
The springs in the foreground are made by Flex-A-Form. Both metal and fiberglass springs are rated at 220 lbs./in. The metal springs have a 7 1/2-inch arch, while the fiberglass versions have a 5-inch arch. Stock AAR/TA springs used a 10 1/2-inch arch, which was necessary to give enough ground clearance for the stock side exhaust system.



This high quality 1 1/8-inch plated front antisway bar is available from California Suspension. Always add a rear bar first, rather than substituting a larger front bar, and always use a larger bar in the front, or you'll introduce oversteer.



In addition to antisway bars, for better handling it will be necessary to install firmer torsion bars.



and understand are *understeer* and *oversteer*. All Mopars—in fact, most cars—are designed to understeer. This means that as your car approaches and enters a turn, it would rather continue going straight (due to centrifugal force). Enter a turn too fast and the car's front end will start to slide. Turning the steering wheel more won't do any good; the only thing you can do is to slow down and turn the wheel away from the turn. Most manufacturers consider understeer preferable because simply by following your natural driver's instinct you can still control the car and save yourself from spinning out.

In an oversteering situation, the opposite occurs. Because the rear tires slide out first, the car will continue turning tighter relative to steering input. Deliberate suspension design and rear weight bias cause this. If not corrected, the car continues making a tighter turn and at the limit of adhesion, the car will spin to the inside. Slight oversteer is preferred in racing because a skilled driver can control the car more easily and corner faster. However, most cars will understeer going into a turn and oversteer going out.

With most rear-wheel-drive cars you can also induce what is called

power oversteer in a turn by stepping on the gas, assuming you have enough traction and horsepower.

Driving a car that understeers excessively is no fun at all. You can reduce understeer by adding oversteer through: (a) increasing front tire and wheel size, (b) stiffening the rear springs, (c) increasing front tire pressure and (d) increasing rear stabilizer bar diameter (or adding a bar).

Another handling term you may come across is *bump steer*. As the suspension moves up and down, steering angles change slightly, usually resulting in understeer. This is built into the suspension and the only way you can change it is by changing control arms and their attaching points (pivot points), front knuckles and steering linkage.

Anti-dive means that the car's suspension, usually the front, resists diving down under braking. This is achieved by locating the front upper control arm pivot point higher than the rear point. *Anti-squat* is designed into the rear suspension to resist and counteract the forces that push the car down under hard acceleration. *Anti-squat* raises the rear body, thus loading the rear tires and improving traction.

Unsprung weight consists of sus-

pension components not supported by the car's springs. These include wheels, tires, spindles, brakes and, in the rear, the entire axle and housing. Suspension components that are attached to the chassis—such as A-arms, drag links, trailing arms and the driveshaft—have their weight divided in half, half sprung and half unsprung weight. The lower the unsprung weight, the less shock will be transmitted to the spring when a tire hits a bump, and the less deflection to the chassis. We'll explore other terms in the alignment section.

Wheels/tires

Tires are obviously the most important factor in handling, and could easily fill a separate article. Tires are the only link the car has with the road. Increase the tire's contact patch with the road and, generally speaking, you get better handling.

Your best bet for improved handling is to get the largest wheel/tire combination that will fit your car and budget. Stick to well-known tire brands and to radials. For instance, a radial with a smaller contact patch than a bias-type tire may outperform the bias type.

There are three ratings you shouldn't forget when choosing a tire. The Department of Transportation requires these ratings to be imprinted on the tires. The first is Tread Wear. It is based on certain tests to show how well a tire wears. A tire rated 200

would wear twice as well than one rated 100. Obviously, a good sticky tire won't wear as well as a tire that is made from harder rubber. Tires that offer good traction are usually rated at about 200 and below; tires in the upper 200 range and over 300 will last a long time, but you'll experience skidding when there is the slightest wetness on the road. If you don't drive your car every day, get a good sticky tire.

The other ratings cover Traction and Temperature. The Traction test rates how the tire performs under braking conditions in the wet. It does not measure cornering ability. The Temperature rating shows how the tire handles and dissipates heat. In both of these ratings, the tire is graded A, B or C, with the best tires getting the A designation. Obviously, you'll want tires with an A rating in Traction and Temperature.

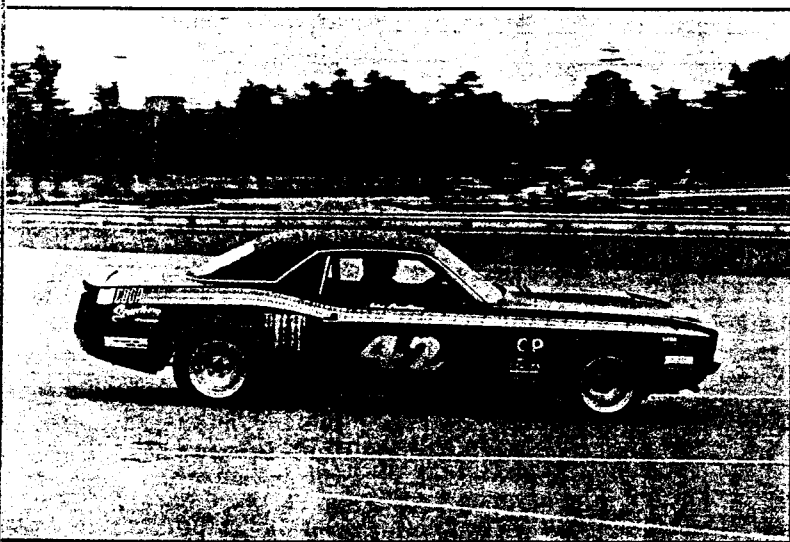
It is really important that you research the tires you are going to buy. For example, in a recent tire test article (*Car & Driver*, November '89) nine different tire brands were tested on the same vehicle. The differences between the best and worst tires were amazing. In dry roadholding the best rated tire generated 0.86g on the skidpad, while the lowest rated got 0.81g. In dry braking, the best stopped from 70 mph in 179 feet, the worst in 195 feet. The difference between the best and worst rated in wet braking was even more noticeable: 260 feet versus

316 feet. (However, even the "worst" rated in this test will run circles around the best 1960s-type tires). The point is that you can negate a good deal of the improvements you make by choosing inferior tires.

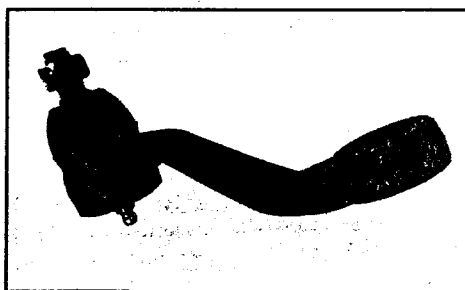
Most Mopars came with 14-inch-diameter steel rims in various widths, but never exceeding 7 inches. Some had 15-inch rims optional. Why go to a 15-inch rim? The taller rims allow the installation of lower-profile tires which, all things being equal, provide better handling. If you want to maintain a stock-looking car, you are obviously limited to what came with your car or what was optionally available. In any case, with most B- and E-bodies, you can fit 15x7-inch wheels in the front and 15x8s in the rear. Many times the only body modification you may have to make is to have the wheelwell lips tucked in to provide additional clearance.

Mitch Lelito uses 16x10-inch wheels all around with Hoosier 255/50-16 Autocrosser tires and they do not hit the body. The 16-inch rims clear the front discs and ball joints and provide the necessary 5-inch backspacing.

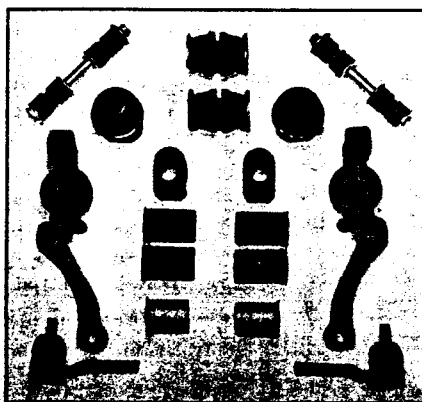
Why limit yourself to only excellent dry-weather handling when you can have great all-weather handling? All-weather performance tires, such as B.F. Goodrich's Comp T/A HR, Goodyear's Eagle GT +4, Michelin's XGT H4, Yokohama's AVS A Plus 4 and General's XP2000 AS, can give



John Sandberg's AAR Cuda competes in SCCA's Solo II C/Prepared class, which allows more radical suspension and engine modifications. Awesome performance!



This longer pitman arm, which must be used with a 1973 and later steering box, will effectively give you a 12.7:1 steering ratio.



If you are going to modify your suspension, it is worthwhile to replace any worn components. By starting with a clean slate, you will eliminate any possible future problems. This is a kit available from California Suspension; it comes with stock rubber or optional polyurethane bushings.

you tremendous dry-weather performance coupled with exceptional road-holding in the wet. There is no need to park your car or move over to the slow lane when it rains or snows.

Naturally, when you are replacing tires, get rubber rated at least HR (good to 130 mph) or VR (over 130 mph).

Springs

Chrysler differed from other change than conventional springs, but the biggest advantage they offer is that body height is readily adjustable. In the rear, strictly conventional leaf springs are the byword. Regardless of which Mopar you have, it is definitely under-sprung by today's standards and the installation of firmer springs is highly recommended.

What do we mean by firmer springs? Two things should be understood when dealing with springs and they are spring rate and spring load.

Spring rate measures the stiffness of a spring. For example, a 100 lb./in. spring requires 1000 pounds to deflect it 10 inches. The spring rate will remain the same during its life, because rate is dependent on the spring's size and shape. Thus, as long as the spring is not broken, it will not wear out.

Spring load measures how much weight a spring can hold at a certain height. We have seen that spring rate doesn't change, but spring load can. Sag, overloading and fatigue can make your spring lose load, thereby lowering the car. Even new springs will lose load after they take a set.

It is difficult to make specific recommendations on what torsion bar is best for your car. For example, on Mitch's T/A, the stock .92-inch bars are rated at 125 lbs./in. The bars he currently uses measure 1.24 inches and 425 lbs./in. These are too stiff for everyday street use, but for good handling, you'll need torsion bars rated in the 200-225 lbs./in. range—depending on your car's engine size and weight.

For the rear, you may want to consider lowering. There are many ways to do this. You can use lowering blocks to lower the rear about 1 1/2 to 2 inches. This is generally the recommended way to go because if you decide to de-arch your rear springs, you may lose some of the anti-squat characteristics that are so beneficial for acceleration.

The same applies to longer rear shackles. They effectively de-arch the rear springs. You may also want to consider fiberglass springs made by Flex-A-Form. These springs can be made to any specs required and at any arch height. In addition, because they are lighter than steel, you'll save over 60 pounds of road-hugging weight.

One tip that Mitch has discovered is that by simply reversing the front ity will help cornering.

Shocks

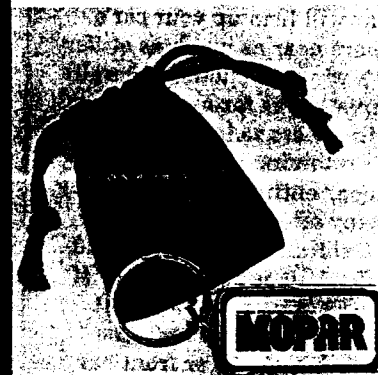
Shock absorbers control the up-and-down movement caused by the springs when a car hits a bump. Without shocks, your car's ride would be an endless series of bounces. Shock absorbers absorb the energy generated when a wheel hits a bump.

The typical factory shock exerts its dampening force mainly on the rebound stroke. When a wheel hits a bump, the shock offers small resistance. The major portion of the shock's dampening force is exerted when the wheel is on the way back down to the road, and this results in a smoother ride. Most performance shock absorbers divide the dampening closer to a 50-50 ratio, which improves handling at the expense of a harder ride. Most of the better shocks today use nitrogen gas to improve shock dampening and the gas does provide a mild booster-spring effect. The best shocks can be fine tuned to your vehicle. Koni shocks have been a long-time favorite because of their high quality and adjustability. They are expensive, but will probably last as long as you own your car and they can be rebuilt. There are also other less expensive brands, such as those offered by KYB and Monroe, which provide excellent performance.

Always be suspect of a replacement shock that fits all models of a particular car, regardless of engine size. A Hemi-powered Mopar weighs quite a bit more than one equipped with a 318, yet in most cases, the same shock will be listed in the manufacturer's catalog. An adjustable shock is preferable as it can be adjusted to your car. Another point to remember is that with adjustable shocks there is a break in period. Run the shocks at the initial factory setting for about 500

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miles and then adjust them to your needs. You'll find the shocks will last considerably longer.

Stabilizer bars

If your car doesn't have a rear stabilizer bar, adding one will improve its handling more than any other single modification you can make. Even if you've installed larger tires and better shocks, you need a rear stabilizer bar to take full advantage of them.

Stabilizer bars are designed to twist when a car leans during a turn. When both wheels are pushed up, there is no loading on the bar. Any resistance is exerted when one wheel hits a bump, or when the car is leaning in a turn. Thus, a stabilizer bar will firm up your car's ride but nowhere near as much as stiffer springs. That's why you should generally remain conservative as far as springs go, but use stabilizer bars to improve handling, thereby retaining a decent ride.

For the Mopar enthusiast, there aren't that many aftermarket bars to choose from. California Suspension and Addco both offer 1 1/8-inch front bars. If your car doesn't have a rear bar, don't install a larger front bar without first installing a rear bar. A larger front bar by itself will increase understeer even though the car may enter a turn with less body roll. Addco offers rear bars measuring 3/4 inch. This bar will make a tremendous difference in your car's handling, and is highly recommended. Mitch Lelito uses a custom-made 1-inch rear bar on his Challenger, but Addco can make larger bars on request. For maximum street handling on a big-block car, a 1-inch rear bar with the 1 1/8-inch front bar is the way to go.

Mitch has found that handling can be improved if you adjust your car's ride height with the driver (or equivalent weight) in place. However, it is important to first unbolt the sway bar from its links. After the correct height is set, you may need shims to compensate for the different height on the sway bar links, otherwise the bar will be preloaded on one side only.

You can also enhance the performance of your existing front bar by substituting polyurethane bushings and end link bushings for the stock rubber ones. Solid polyurethane bushings will make your bar have the same effect as a 20-25 percent larger bar.

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When it comes to stabilizer bars, bigger is not always better. That is because the effect a bar may exert can be modified by its arm length. A 1-inch bar, for example, can have the same effect as a 1 1/8-inch bar that has longer arms. The extra thickness is used to compensate for the longer arm length.

Incidentally, the bars sold through your friendly Mopar dealer are all made

Front Bar		Rear Bar	
5/8"	100%	1/2"	100%
3/4"	160%	5/8"	167%
7/8"	200%	11/16"	179%
15/16"	210%	3/4"	212%
1"	226%	7/8"	222%
1 1/8"	244%	15/16"	228%
1 1/4"	262%	1"	234%
1 3/8"	278%	1 1/4"	252%

sional stiffness as bar size increases:

You'll notice that your car will now corner much flatter and considerably quicker. That is because the new stabilizer bars, while preventing body roll, enable the tires to remain perpendicular to the road surface, letting them do what they were designed to do.

Brakes

If you plan to drive fast, make sure that your car stops quickly. At the very least, make sure your discs and drums are balanced and that both are machined smooth. Use premium pads and shoes. A good choice for a dual-purpose car would be semi-metallic pads, which will last a lot longer and provide better braking action.

A lot of high-performance Mopars have drum brakes all around. These are barely adequate for street use, and for any sort of performance use drums are totally inadequate. The easiest remedy would be to swap the front discs/spindle assembly from another car (like yours, of course!) that came with front discs. It is also possible to use the discs from the larger C-body Chryslers. With any such swap, make sure you use the correct master cylinder that is for disc brakes.

You can also use the front and rear disc brake conversion kits made by JFZ and available from California

Suspension. The front disc conversion kit uses the stock drum brake spindle. Rotors measure 12 1/8 x 1 1/4 inches. The front aluminum caliper uses 2-inch dual pistons, while the rears use 1 1/4-inch dual pistons. The only disadvantage on the rear is the lack of a parking brake provision.

Another useful modification would be to install braided hoses in place of the stock rubber brake lines at the wheels. When the brakes are used hard, hydraulic pressure causes the stock rubber hoses to expand, which creates a include moving the battery to the trunk, which improves weight distribution by about 1 percent. As all Mopars are front-heavy, any modification that reduces front end weight will improve handling. You can purchase a battery relocation kit from Mopar Performance. You may also want to consider changing your stock front upper control arm bushings to those made of polyurethane. These allow hardly any deflection, thereby improving cornering. There are many to choose from. Most aftermarket suppliers offer polyurethane bushings but the problem with most of them is that they will squeak once the supplied grease "goes away." You can install zerkl fittings, which will enable you to grease them periodically or you can use the poly-graphite bushings available from Performance Suspension Technology. These are impregnated with graphite, so there is no noise to worry about.

Whichever bushings you decide to use, you'll have no bushing deflection when cornering. Steering response and front end stability under hard usage will be markedly improved, with the only disadvantage being a slightly harsher ride.

Another area where most Mopars can benefit is in the steering department. The only Mopars that had fast ratio steering were the AAR/TA E-bodies. The steering ratio was a responsive 12.7:1. California Suspension offers a reproduction of the AAR/TA pitman arm, which is two inches longer than the standard arm. However, you'll have to change the steering box to a 1973 and newer unit because these boxes and pitman arm use a thicker spindle.

Mitch advises that if you change your steering box, make sure you use a Saginaw unit as it is the only one that keeps up with sudden and repeated steering input. Mitch also found that on his TA, the idler arm was the standard

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**COMING SOON:
CAN YOU
NAME THE
10 RAREST
MOPAR
PARTS?
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issue of**

MOPAR

**The November '90
issue will be on sale
September 4.**

Broadcast News

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was rescinded. They reverted back to an orderable option.

2/68: A wide sill molding (code 529) was offered as an option on all Charger models.

2/1/68: The transmission availability on the Super Bee was clarified. The 4-speed was standard, TorqueFlite optional and 3-speed not available. The full horn ring steering wheel (code 571), which was delayed from entering production, was made available effective 2/1/68 on all Coronets and Chargers.

2/23/68: Options added to the Charger models were bright red paint (code 33) and locking gas cap (code 538).

5/20/68: After 6/1/68, all Charger R/T models ordered with the Hemi/4-speed combination were built with exposed headlights, flush grille and chrome windshield reveal molding. "This more functional approach is in response to survey results showing that a majority of buyers prefer exposed headlights with this high-performance machine." ●

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unit, which means that his Challenger has a tighter turning circle on one side. To get equal turning you can use the idler arm from a full-size Chrysler, such as a 1971 Fury. Apparently, the factory "forgot" to change the idler arm on the relatively few AAR/TAs built.

According to a Chrysler letter dated January 4, 1971, addressed to Plymouth dealers, the AAR fast ratio power steering superseded the conventional power steering on all 340 Cudas from February 1. There was no special order code for this; rather, the dealers were instructed to continue using the S77 sales order code. However, if the dealer ordered the AO4 basic group (AM radio, variable-speed wipers, remote left mirror), the car would not be equipped with fast-ratio steering, but with conventional power steering. Apparently, the only way to get the fast ratio steering and the AO4 components would be to order each separately. If you have a 1971 Cuda built after February 1971, you may have fast steering. You can measure your pitman arm or, if you have access to your car's invoice, you can check what options it came with.

Alignment

One final point to consider is alignment. Alignment angles of the front suspension exert an influence on the car's steering ease, steering stability, ride quality and tire wear. This is a complex subject because these angles vary as the suspension does its job and the body moves up and down in relation to the wheels. The load in a car and its speed may also cause these angles to change. In addition, they are affected by changes in the car's attitude caused by acceleration, braking and the type of road surface and cornering forces.

Camber is the amount (measured in degrees) that the front wheels tilt in or out at the top when viewed from the front of the car. When the top of the wheel leans inward, camber is negative. It is best to try for zero camber when aligning the front wheels. A little negative camber (from 0 to 1/2 degree) will help cornering, but any more that this will cause uneven tire wear on a street car. With zero camber, the full width of the tire's tread makes contact with the road.

Caster refers to the angle made by a line between the upper and lower steer-

ing pivots (ball joints) and a vertical reference line. The angle is positive when this line tilts backward (when the upper ball joint is behind the lower ball joint). It is negative when this line tilts forward (when the upper ball joint is in front of the lower).

Positive caster is beneficial as it keeps the wheels pointed straight ahead and reduces any tendency for the car to wander at high speeds. Positive caster also causes the steering wheel to return to a straight ahead position as you exit a turn. Early Mopars, for example, specified negative caster, which was to help the car turn by providing less steering resistance. This was especially prevalent on cars equipped with manual steering. Whatever car you have, have your front end aligned to give 2 1/2 to 3 degrees positive caster.

Toe is the difference (distance) between the front and rear inside edges of the front tires. Toe is usually set "in," measured in inches. Toe-in increases high-speed stability and takes the slack out of the suspension as the car moves from rest. Incorrect toe greatly affects tire wear. You can stay within factory guidelines for toe. If you autocross your car, you should dial in toe-out, which will give you better cornering.

We have seen that the point of installing firmer stabilizer bars, shocks and springs is to reduce body lean and prevent the front wheels from tilting in or out (camber change) in a turn. By keeping the tires flat on the road, better handling will result.

What kind of handling improvement can you expect after following the guidelines in this article? While "g" cornering force should not be considered as the only criterion in good handling, we can use it here for comparison purposes. For example, the typical B/E-body probably generates .65-.70g on the skidpad. This includes the AAR and TA as well as other performance Mopars. They really didn't handle that much better than their nonperformance counterparts—they just rode harder. Following the recommendations given here and assuming that you are using a good set of tires, your Mopar should generate .85g and possibly more, depending on your combination. This is a very respectable number indeed and one that will put you in Z28 and Trans Am territory.

Because of the higher cornering speeds you'll be able to generate, you'll probably scare yourself a bit at first. You'll find that you are driving a "new" car, and you are. Not only will your car

be more satisfying to drive but it will also be a lot safer and confidence-inspiring. There are few things that are as satisfying as blowing the doors off of a smug driver of a current performance car, around a corner!

If you are interested in autocrossing, sometimes referred to as "parking lot grand prix," there are several organizations that hold such events throughout the country. Among them are the SCCA (Sports Car Club of America) and CMC (Council of Motorsports Clubs). ●

SOURCE LIST

Addco Industries
672 Watertower Rd.
Lake Park, FL 33403
407/844-2531
Anti-sway bars and nitrogen shocks

California Suspension Inc.
936 Detroit Ave., Unit C
Concord, CA 94518
415/685-7487
Suspension components

Koni-America Inc.
ITT Parts Supply Div.
8085 Production Ave
Florence, KY 41042
606/727-5000
Shock absorbers

KYB Corp. of America
901 Oak Creek Dr.
Lombard, IL 60148
708/620-5555
Shock absorbers

Performance Suspension Technology
P.O. Box 396
Montville, NJ 07045
800/247-2288
800/299-8019 (in NJ)
Polygraphite bushings & front end rebuild kits.

Performance Suspension Components
P.O. Box 14706
Phoenix, AZ 85063
602/931-8522
Polygraphite bushings and front end rebuild kits.

Sports Car Club of America (SCCA)
9033 E. Easter Pl.
Englewood, CO 80112

Council of Motorsports Clubs (CMC)
P.O. Drawer A
Daytona Beach, FL 32118

TriState Sports Car Council
P.O. Box 2705
Des Plaines, IL 60017