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A+ HANDLING FOR '64-'72 GM INTERMEDIATES

KNUCKLE Sandwich

By Marlan Davis

Back in the good old days when cars had real frames, real back seats, separate trunks, doors you could lean against, and cubic inches to the max, a car was judged solely on its ability to traverse 1320 feet as fast as possible. "Radials" were engines found on old World War II fighters. A "disc" was something you screwed up in your lower back trying to lift that big-block engine out of the real trunk.

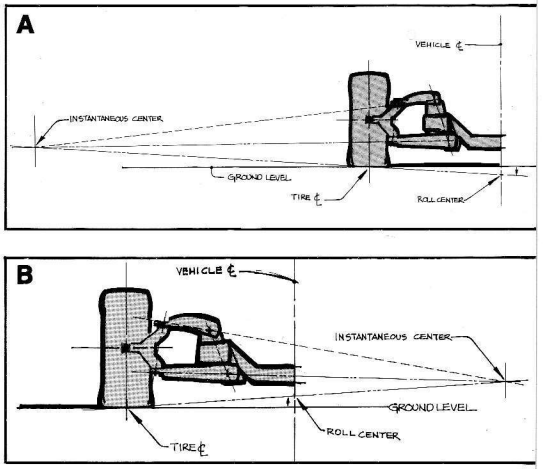
The very epitome of the classic fire-breathing musclecar was the 1964-'72 GM intermediate chassis. Collectively known as the "A-body," they included the Chevy Chevelle and El Camino; Buick Special and Skylark; Pontiac Tempest, LeMans, and GTO; GMC Sprint; and Olds F85, Cutlass, and 442. In their big-inch versions, they ran like stink, but handling and stopping numbers were dismal by today's standards.

For you musclecar fans, it doesn't have to be that way anymore. Ken Crocie's H-O Racing Specialties has introduced an integrated suspension package for the A-cars that produces handling on a par with the latest Detroit offerings. Just bolting on H-O's new heavy-duty springs, front and rear anti-sway bars, and polyurethane suspension bushings produces remarkable improvement. However, H-O has also found a way to improve these cars' basic front suspension geometry via the installation of the 1970-'79 Camaro/Firebird steering knuckle (spindle). If that's not enough, would you believe 16-inch wheels, and 50 series tires underneath a '64 GTO's *stock* wheelwells? We didn't, until we saw it. But let's start at the top.

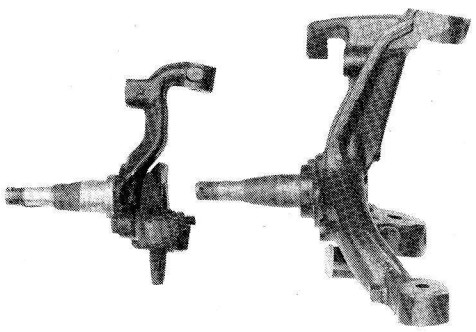
DON'T FOLD—SPINDLE

The key to improved handling is to both reduce body roll and maximize the tire contact patch in a turn by keeping the tire perpendicular to the pavement. The suspension geometry on most old GM cars (not just the intermediates) is designed to place the roll center (the point about which the body rolls) about two inches below ground level. With these vehicles' relatively high center of gravity, the result is an inherently large amount of body roll (because of the great amount of leverage between the roll center and center of gravity). As a result, the tire tucks under, along with excessive weight transfer in the turns. One way of combating this problem is to use extremely stiff springs and huge sway bars, but the end result is a car too stiff for normal street use.

The solution GM took on the 1982 and up F-body (Camaro/Firebird) and new Corvette was to design the suspension with a negative camber curve. With negative camber, the tire tends to remain perpendicular to the pavement in a curve. Negative camber is achieved by designing the front suspension geometry so that the roll center is located slightly above ground level. With the aid of Koni western sales rep Dean Dodge, H-O



With an independent front suspension, a vehicle's roll center is found by extending lines through both upper and lower A-arms, with the axis of the lines defined by each arm's ball joint and plane of attachment to the frame. These lines will intersect at the vehicle's "instantaneous center." The point where a third line drawn from the instantaneous center to the center of the tire contact patch crosses a vertical line corresponding to the car's centerline is the roll center. If the instantaneous center is located outboard from the A-arms, the roll center will be below ground level (A)***; if the arms angle inboard, the roll center is above ground level*** (B)**.**



"When I grow up I want to be a Trans Am." Not only is 1970-'78 F-car disc brake steering knuckle (right) ***much beefier than old GM intermediate drum brake knuckle, it's also about 1¼ inches taller. Being taller, it alters the upper A-arm angle, in turn raising roll center from below ground level to above.***

Racing was able to apply this modern suspension geometry concept to correct the handling deficiencies of the old GM A-cars.

Dean discovered that a negative camber curve can be achieved on the A-car suspension by replacing the stock 10½-inch (end-to-end) knuckle and its separate bolt-on steering arm with the taller one-piece 11¾-inch 1970-'79 Camaro/Firebird knuckle. The new knuckle raises the roll center to approximately two inches above ground level. In the process, the old, obsolete stock front drum brakes are replaced by modern Camaro/Firebird front disc brakes, for which (unlike the early optional A-car front discs) all components remain available new from GM.

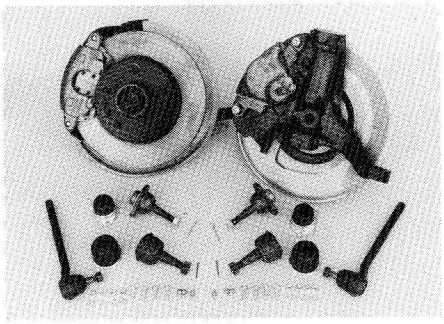
The Camaro/Firebird knuckle is widely available in the boneyards, since besides its use on GM's ponycars, it is also found on 1975-'79 X-car compacts (Nova and its "clones"), 1973-'76 A-car intermediates, and some 1977-'79 full-size GM cars with 5x4¾ wheel bolt pattern and 11-inch rotors (discs). The 1970-'78 knuckles also use the same inner and outer wheel bearings as the old 1964-'72 A-cars. In 1979, GM went to a different outer wheel bearing, which also requires a different rotor, but since the ball joints and tie rod ends remain the same, it will still work for this swap. Later 1980-'81 Camaro/Firebird knuckles use the different outer bearing and disc, along with a *metric* tie rod end; as of this writing, it is not known whether they can be adapted to the early A-car. Of the essentially similar 1970-'78 parts, the best is the 3½-pound-lighter 1977-'78 knuckle, which was treated to a computer-analyzed weight reduction program without any sacrifice in strength (this is also the current GM service replacement for earlier 1970-'76 knuckles). Over the years, there were some minor caliper and hose design variations, so it pays to procure a complete knuckle, caliper, disc, and hose assembly from the same model year. Interestingly, 1971-'72 half-ton two-wheel drive Chevy/GMC pickups and 1972-'74 half-ton vans in many cases used the same caliper and disc (but not knuckle) as the similar vintage Camaro/Firebird. When swapping to disc brakes, safety considerations mandate the use of the appropriate disc brake-compatible dual master cylinder, proportioning valve, and (if used) power booster. Do not use a master cylinder designed for power brakes without a power booster, or vice versa.

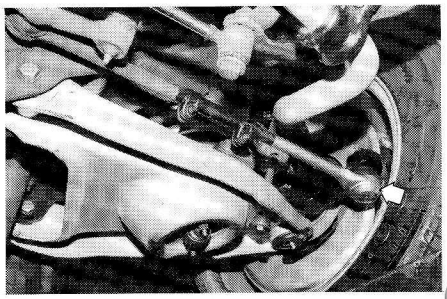
Any sandwich (knuckle or otherwise) has to have its filler, its ham and cheese, if you will, and that's where the rest of H-O's "Strong Arm" suspension comes in.

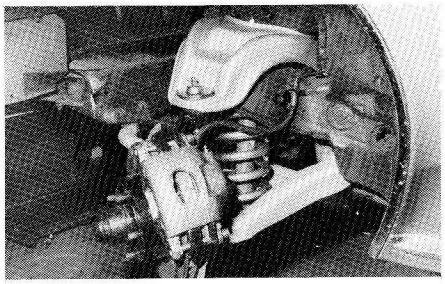
HOLDING SWAY

H-O is the only company that offers 1⅜-inch diameter sway bars for both the front and rear of the A-car. Most outfits use a smaller bar in back, but H-O points out that the rear bar is effectively softer because its moment arm (lever length) is shorter. Hence, it is not as effective as a front bar of the same diameter.

To maintain proper suspension bal-







H-O supplies special new tie-rod ends (A) ***and different-taper upper and lower ball joints needed to mate the new knuckle with the existing A-car suspension. Lower ball joints must be pressed in by local front-end shop. Upper ball joints bolt in, but existing bolt holes may require reaming to accept new joint.***

CAMARO/FIREBIRD STEERING KNUCKLE CONVERSION

H-O's 1964 GTO test car used parts from a 1974 Trans Am. Below are listed the current service part numbers needed to duplicate the assembly (all are GM unless stated otherwise). Also recommended is a suitable disc brake-compatible master cylinder and proportioning valve.

GROUP	DESCRIPTION	PART NO.	AR
4.665	CALIPER, Front Disc Brake, LH (*Note 1*)	18004978	1
4.665	CALIPER, Front Disc Brake, RH (*Note 1*)	18004979	1
4.671	WASHER, Brake Pipe Conn., Frt. Hose (copper)	231343	4
4.680	HOSE, Brake, Front	9758860	2
4.681	BOLT, Front Brake Hose	487293	2
5.002	GASKET, Support to Knuckle	3966202	2
5.002	SHIELD, Splash, LH	344023	1
5.002	SHIELD, Splash, RH	344024	1
5.809	HUB & DISC, Front Wheel Brake	334348	2
6.020	KNUCKLE, Steering, LH	329349	1
6.020	KNUCKLE, Steering, RH	329350	1
6.311	BEARING, Front Wheel, Inner (*Note 2*)	7450630	2
6.313	BEARING, Front Wheel, Outer (*Note 2*)	457478	2
N/A	CONVERSION KIT, Disc Brake (H-O Racing/*Note 3*)	SB-55	1

1. Complete assembly with all internal parts, plus mounting bolts, sleeves, bushings, brake shoes (pads), and anti-rattle spring.
2. Same as existing '64-'72 A-car front wheel bearings.
3. Includes (2) upper and (2) lower ball joints, (2) tie rod ends, and all necessary zerk fittings and miscellaneous hardware.

H-O STRONG ARM SUSPENSION COMPONENTS

In addition to the Camaro/Firebird steering knuckle/disc brake conversion, the following parts were used on H-O's 1964 GTO test car (with the exception of the oil pan):

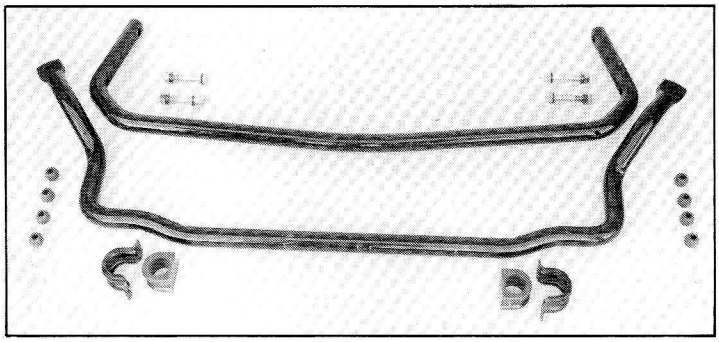
PART NO.	DESCRIPTION
HW-601	HD rear bar hardware
OS-29	Baffled Pontiac V8 oil pan
SB-26	Front Koni shock absorber, '64-'67 A-body
SB-27	Rear Koni shock absorber, '64-'67 A-body
SB-71	Polyurethane front shock absorber grommets
SB-76	Polyurethane front upper control arm bushings
SB-79	Polyurethane rear upper and lower control arm bushings
SB-601	Rear anti-sway bar, '64-'72 A-body, 1⅜ OD
SB-646	Rear coil springs, '64-'66 A-body, 156-lbs./inch
SB-647	Front coil springs, '64-'67 A-body, 480-lbs./inch
SB-689	Front anti-sway bar kit, '64-'72 A-body, 1⅜ OD (includes bar, polyurethane mounts, HD mount brackets, polyurethane end link bushings, molybdenum bushing lube)
TB-20	HD rear lower control arms, '64-'72 A-body

ance, the front and rear bars should be installed at the same time. The front bars include polyurethane mounts, heavy-duty mounting brackets, poly end-link bushings, and special anti-squeak moly bushing lube. The rear bar bolts to the lower control arms just like the factory O.E.M. bar. If your car doesn't have a factory rear bar, you'll need new reinforced and gusseted lower arms with the correct mounting holes; they're available either from H-O (part No. TB-20) or GM (part No. 9791773).

important in the case of the rear progressively wound springs, which are difficult to trim. The customer must state his vehicle/engine combo so H-O can fine-tune the springs before delivery.

BUSHINGS YOU CAN'T BEAT

Trick springs, sway bars, and steering knuckles only work if the rest of the suspension can keep up with them. The key is to avoid deflection, which becomes even more critical once the stiffer components are utilized. Typical rubber suspension bushings deflect too much, but race car-type aluminum or steel bushings are overly harsh and wear out too quickly on the street. In between are polyurethane components. They come standard with H-O front sway bars, but H-O highly recommends them for the front and rear control arms, too. To prevent discordant squeaks, their arm bushings are graphite-impregnated. At present, H-O does not offer front lower control arm poly bushings. The problem is that factory cars came with either oval- or round-shaped lower bushings, and there's no way to tell for sure which you have without disassembling the arms. Even the GM service replacement arms aren't consistent.

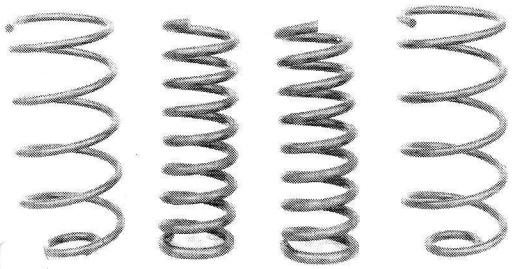


H-O's 1⅜-inch o.d. front and rear anti-sway bars are about the biggest that can fit under the A-chassis. Poly bushings and end-link grommets are standard; optional is rear bar mounting kit, which includes ½-inch Grade 8 mounting bolts and nuts to replace the O.E.M. 7/16-inch fasteners.

SPRING AHEAD

H-O also offers front and rear coil springs for all 1964-'72 GM intermediates. Compared to typical stock spring rates of 300-lbs./inch front and 110 to 115 lbs./inch out back, the H-O units are considerably stiffer, specing out to 480 and 156-lbs./inch, respectively. There is a design break between the various years: In front, 1968-'72 springs (SB-682) have a different cup diameter compared to the 1964-'67 models (SB-647). Out back, 1964-'66 springs (SB-646) are "pigtailed" only on one end, while the 1967-'72s (SB-672) are pigtailed on both ends.

H-O springs come ready to install, with no trimming necessary. That's especially



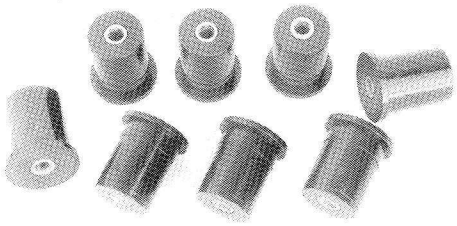
Compared to new factory springs, H-O springs lower the average car about 1½ inches in front and ½ inch in back—enough to lower the CG to improve cornering while maintaining enough travel to avoid bottoming out on rough roads and permit carrying heavy loads.

A MATTER OF A TIRE

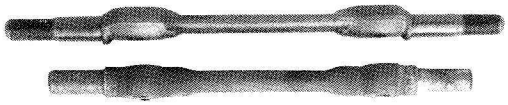
H-O's own shop demonstrator, a 1964 GTO, currently runs the latest P255/50VR-16S speed-rated soft-compound Goodyear Eagle GT radials. They fit under the stock sheetmetal (no, the rear-end isn't narrowed). The secret? Use of three-piece modular wheels permits large tires and wheels to fit even under early cars, because the customer can specify virtually any backspacing and diameter desired. Ken procured these trick Simmons wheels from Beck's Ultra-High Performance. The 8½-inch front wheels have 5¼-inch backspacing; in the rear 4¼-inch backspacing is used with a 9-inch overall width.

PROOF TEST

Talk is cheap. How do these goodies actually perform in the real world? To find out, we took H-O's '64 GTO to the Chrysler/Shelby California Development Center. The Mopar boys graciously let us use their superb 200-foot-diameter skid-



Polyurethane bushings and grommets are much firmer than standard OEM rubber bushings, without the undue harsh characteristics of full-race aluminum or steel components. H-O's new rear upper and lower control arm poly bushing set shown.

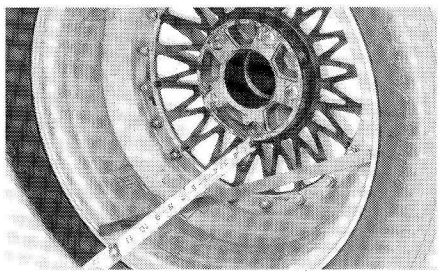


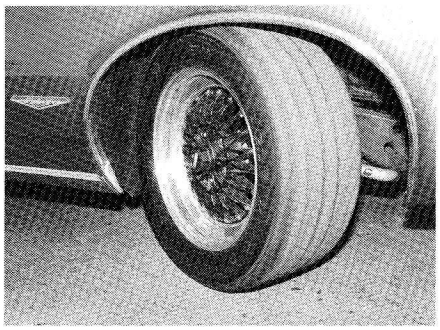
Offset upper control arm shaft (top) ***corrects middle age frame "spread," helps insure correct alignment settings with wide tires and wheels. They're offered by Remco/Moog, Perfect Circle, Sealed Power, and TRW.***

RECOMMENDED ALIGNMENT SPECS

H-O recommends the following front end alignment specs for A-bodies equipped with their suspension components. These settings produce excellent directional stability, along with outstanding adhesion and good tread life.

Caster	+3½ degrees
Camber	-½ degree
Toe-in	⅛-inch



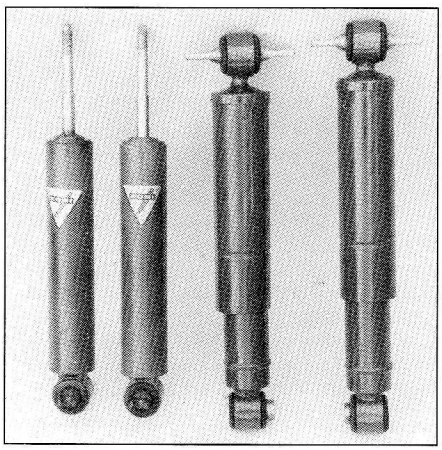


Ken was able to fit huge P255/VR50-16S Goodyear Gatorbacks under his old Goat. Correct wheel backspacing was the key. Backspace dimensions are calculated by measuring from wheel's rear mounting flange to outer wheel rim, not counting tire bead lip. Since some wheel makers may use different methods, be sure to tell your supplier how measurements were derived.

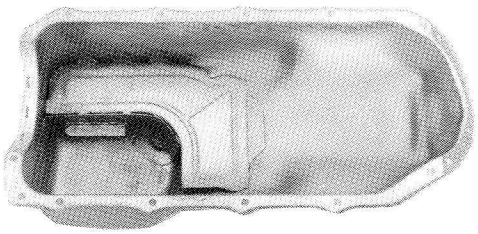
pad and slalom course. For the "before" test, the GTO was equipped with the original stock heavy-duty suspension, H-O polyurethane upper control arm bushings, and Michelin GR70-15 "Wide X" radials mounted on 15x7 American magnesium "Torque Thrust D" wheels. Ken's old goat literally "wallowed" in misery, generating counter-clockwise (left-hand) skidpad numbers in the .67g range. The stock Pontiac oiling system couldn't handle steady-state clockwise turns. Slalom course times averaged 31.12 seconds, slower than some late-model pickup trucks.

The following week, with the entire Strong Arm suspension installed, the Camaro knuckle and brakes added, the Goodyear Gatorbacks bolted on, and Dean Dodge there to fine-tune the suspension, Ken's Goat was ready to "eat" the course. Right off the street, with 36-psi tire pressure, the GTO pulled an average .87g, with some runs in the .91g range. Then Dean went to work with the alignment, setting the Konis to full firm, and jacking up the tire pressure to 45 psi. The fine-tuning paid off, with left-hand skidpad averages rising to the .94g mark, with occasional runs netting numbers in the .96g range—the equal of the latest 'Vette. Clockwise, the car was able to generate .93g. On the slalom, the oh-so-slow *manual*-steering box, long-wheelbase car turned in a blistering 26.40, about on a par with brand-new IROCs.

Since there was a question as to how much of the improvement was due to the Gatorbacks and big wheels and how much was due to the suspension, we bolted on smaller P215/65R-15 Goodyear Eagle tires mounted on '83 Trans Am 15x7 wheels for a final test. (The original Michelins on American mags would not clear the new Camaro hub and disc.) Skidpad averages dropped to .8g, mainly because the earlier-generation tires quickly overheated. Single-lap times with cool tires netted times in the .87 to .88g range. Slalom times were slower by nearly two seconds, to a 28.23 average. Looking at the results, the suspension contributed roughly two-thirds of the handling improvement, with the modern tires and wheels contributing the final one-third.



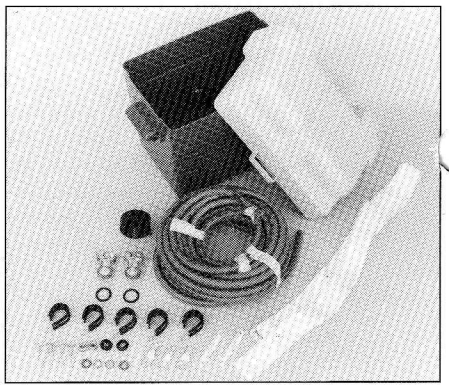
Koni shocks are preferred because of their adjustability, precision components, rigid inspection, and quality control procedures. H-O sells special Konis optimized for their suspension—'64-'67: SB-26/front, SB-27/rear; '68-'72: SB-24/front, SB-25/rear.



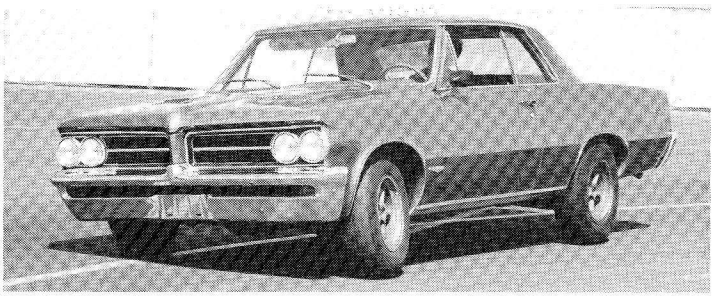
Your oil system has to keep up with the handling mods. For Pontiacs, H-O offers this special baffled pan that works with existing stock pump and pickup.

CORNERING THE MARKET

Making a 20-year-old car cut corners on a par with modern handlers is quite an accomplishment. Interestingly, Ken's GTO—at 3460 pounds—is no heavier than the present Camaro/Firebird. And that's despite having a full frame, big 389 Poncho, long wheelbase, and heavy-duty rearend. It just goes to show how far suspension theory and tire design has come. But this isn't some pie-in-the-sky race car, or some dreamland high-buck package—just a sensible blending of classic big-inch power with modern sure-footed finesse. Now that the technology is here, it pays to use it. (Wonder what a similar package would do to a '55 Chevy or other classic hot rod—hmmm?) It's also important to remember that you can install this package in stages, as finances permit, since the bars, springs, and bushings can be added incrementally. Then when you need brakes or ball joints, spring for the new knuckle and discs. Doing it this way, the package is quite affordable. Best of all, next time some foreign econo-box cuts in, you can cut him out—with a knuckle sandwich. **HR**



Trunk-mount battery transfers 50 pounds of weight from front to rear, enhancing both off-the-line traction and skidpad handling characteristics. H-O relocation kit includes #2 gauge rope-stranded welding cable, under-hood junction block to simplify jump starts, and aircraft cushion clamps. Enough cable is included to run ground wire from engine block all the way back to trunk.



Modern muscle may still shake and rattle, but it shouldn't roll (under)! Original suspension was "lean and mean." After installing mods described in this article, Ken's old Goat "flat cornered" the market.

SOURCES

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