TURNPIKE CRUISER

AUTO INDUSTRY observers long have predicted Detroit would build cars specially designed for long-distance, high-speed cruising on tomorrow's super highways. These cars would be considerably different from cars intended for normal city-suburban transportation. They would be designed for smooth, effortless cruising at 60-90 mph, with a minimum of engine vibration and noise. Fuel consumption at 80-90 mph would be what owners now expect at 50-60 mph. The handling would have to be firm and stable, especially in crosswinds, but without a harsh, choppy sports car ride. Very important, the acceleration in the normal passing range, from 50 to 70 mph, would have to be up to current 400-cu. in. engine standards, with no great compromise for high-speed fuel consumption.

Just such a car is available now at Oldsmobile dealers. The car represents Detroit's first serious effort at a specific car design to meet the challenge of the 41,000-mile network of interstate super highways to be completed early in the 1970s. Efficient, high-speed, long-distance travel on these highways calls for a very special combination of equipment that cannot be readily "designed" on current option order forms.

Oldsmobile engineers have taken the first significant step with their development of the "Turnpike Cruising Package," cataloged as Option L-66. This package is available with F-85 Cutlass Supreme coupes, hardtop coupes and convertibles—models which also are offered with the 4-4-2 high-performance package.

The Turnpike Cruising Package basically is a special 400-cu. in. high-torque economy engine, 3-speed Turbo Hydra-Matic transmission, 2.56 axle gear ratio, 4-4-2 heavy-duty suspension, including springs, shock absorbers and front and rear antiroll bars and 7.75-14 white-stripe nylon tires. The list price of the complete package, including the Turbo Hydra-Matic, is only $380 over the cost of the standard 330-cu. in. V-8 and 3-speed manual transmission in Cutlass Supreme models. A price breakdown on the options is $142.18 for the L-66 Turnpike Cruising Package and $236.97 for the M-40 option, which is the Turbo Hydra-Matic. It appears a very reasonable price for what is delivered. (As released for sale, the Turnpike Package will carry a 2.56:1 axle rather than the test car's 2.41 ratio.)

Consider that Oldsmobile engineers believed from the start that the key to the entire problem was use of the lowest possible rear axle gear ratio, while retaining brisk acceleration in the medium speed range. Axle ratio is by far the most important factor in high-speed fuel economy, much more important than total piston displacement, stroke length, camshaft timing and carburetor calibration. Internal engine friction increases roughly as the square of rpm, and is relatively unaffected by the load on the engine or the degree of throttle opening. The ideal situation for fuel economy then is to cause the engine to lug at low to medium speed. This is accomplished by the low axle ratio.

Friction loss in a large displacement V-8 engine turning at 3000 rpm actually can consume more horsepower than it takes to push the car down the highway at 60 mph. If engine speed can be reduced to 2000 rpm or less, friction is reduced by more than 50%. It doesn't matter that it takes a larger throttle opening to produce the same bhp at lower speed. Reduction in friction loss is far more important. In fact, the larger throttle opening is beneficial in that it reduces manifold vacuum, so pistons have less vacuum to pull against on the induction stroke. The pull against vacuum is known as "pumping loss." It also is an important factor in fuel economy, but is not as important as friction loss.

Actually, this is part of a current design trend throughout the automobile industry. The industry gradually is adopting larger and larger displacement engines. These engines turn at slower and slower speeds with very low axle ratios. Detroit engineers once thought that large displacement engines inevitably would gulp a lot of gasoline. Now they've learned that maintaining low rpm is more effective than attempting to limit the engine size or stroke length. The favored combination now is a large displacement engine, turning slowly, with high mid-range torque to maintain acceleration in the highway cruising speed range.

OLDSMOBILE SIMPLY has extended the idea a little farther than other manufacturers. Olds at first used a low, 2.41:1 axle for its Turnpike Package. With 7.75-14 tires, the 2.41 axle produces high gear engine speeds of 1850 rpm at 60 mph and 2800 rpm at 90 mph. At 40 mph, in city traffic, the engine turns at just over 1200.

Obviously, with this axle gearing, peak horsepower output of the engine at maximum rpm ceases to be meaningful with respect to overall performance. If the bhp peak is at 4600 rpm, it would be achieved in high gear at a mere 150 mph. Even when accelerating in the kickdown gear of the Turbo Hydra-Matic 3-speed automatic transmission, the engine wouldn't reach 4600 rpm until about 100 mph. The top of the normal passing range on the highway is about 70 mph, which represents 3200 rpm in second gear. About the only time in which peak horsepower would be useful with 2.41 gearing would be when accelerating at full throttle up through the gears. Engine speed would reach 4600 rpm in low gear at about 60 mph.

The useful engine range with the test car's gearing is not 2000-5000 rpm as it is with normal high-performance gearing. It is 1000 rpm to not over 3000 rpm. The 3000 rpm figure represents about 65 mph in second gear and nearly 100 in high.

And, the engine is designed for mid-range torque, not top-end horsepower. This is not as complex as it sounds. Oldsmobile engineers accomplished this feat by merely taking a 400-cu. in. 4-4-2 engine, including the large valve heads and 10.5:1 compression, and installing a 2-barrel carburetion system and a special short-duration, low-overlap camshaft. The carburetor is the 2-barrel Rochester with 1.687-in. throttle bores that is used for many other 1967 Oldsmobile engines. This unit is mounted on a standard manifold. Venturi area actually is quite large for a 2-barrel carburetor, but this makes it a good compromise on breathing. However, the camshaft is ▶

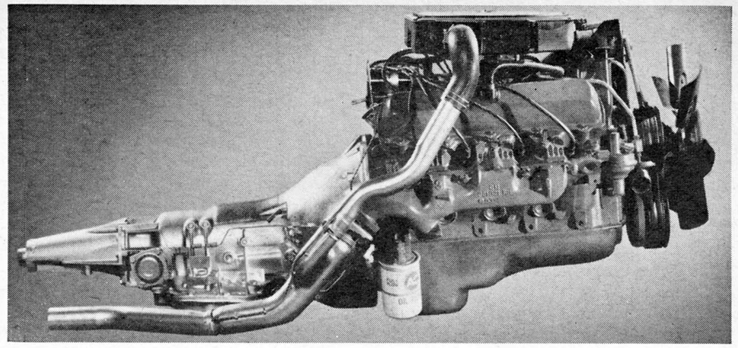
CAR LIFE
ROAD TEST

Oldsmobile Designs a Long-Legged, Strong-Willed Gas Miser

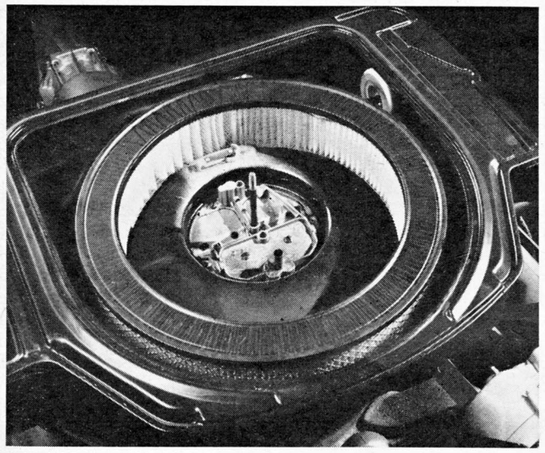
BY ROGER HUNTINGTON

WHAT MAY be the forerunner of tomorrow's cars is a carefully engineered blend of 400-cu. in. engine, switch-pitch 3-speed automatic transmission, 2.56:1 rear axle ratio, metallic brake linings and radial ply tires. Low engine speed insures smooth cruise; reduced engine friction aims at fuel economy; and converter transmission provides adequate breakaway acceleration.

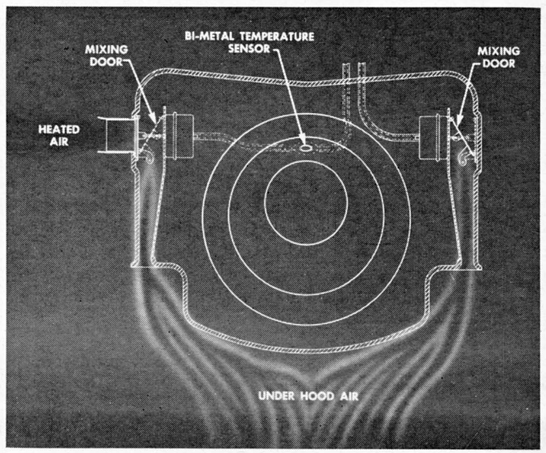
CRUISER



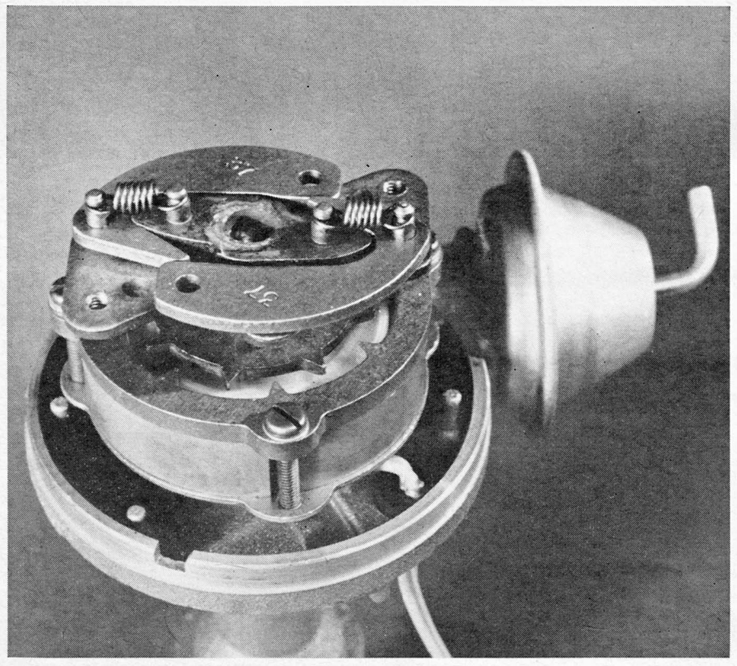
HEART of the Cruiser concept is this specially assembled 400-cu. in. engine, coupled to a switch-pitch converter/3-speed automatic.



CLIMATIC COMBUSTION Control system is calibrated to maintain 100° F carburetor air inlet temperature.

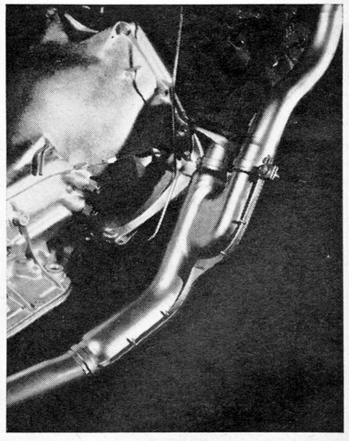


BIMETALLIC SENSOR bleeds manifold vacuum to regulate the inlet diaphragm to control preheated air mixture.



PULSE generator replaces the conventional distributor in Oldsmobile's ultra-high-voltage capacitor discharge ignition.

WARM air heater and duct supply preheated air to carburetor intake air temperature control unit fitted to Turnpike Cruiser.



the key. Intake duration is reduced from 286 to 250°, and from 286 to 264° on exhaust. Overlap is reduced from 58 to 36°, and lift is reduced from 0.472 in. on the 4-4-2 camshaft to 0.435 on the special Turnpike Cruising Package camshaft. Actually, the lift rates are higher on the latter, because of the short duration. For this reason, Turnpike engines float valves at 4700 rpm, compared with 5100 for the 4-4-2.

Special camshaft and carburetion systems completely transform the performance of the 4-4-2 engine. Advertised peak power is down from 350 bhp at 5000 rpm to 300 bhp at 4600. But peak power, as noted earlier, has little significance in the overall performance picture. The vital point of maximum torque is dropped from 3600 to 2600 rpm. The two torque curves cross at 2900 rpm. Thus it can be seen that the Turnpike engine develops greater torque at all speeds below 100 mph in high gear. Well down at 1200 rpm, 40 mph in high, the Turnpike engine delivers 390 lb.-ft. of torque, compared with the 350 for the 4-4-2. This makes a definite difference in throttle response.

The Turnpike Cruising Package, however, would fall on its face without a good 3-speed torque converter transmission. With the low axle ratio, it is as important to have a close-ratio kickdown gear for passing, as it is to have very high overall torque multiplication at breakaway for adequate standing-start acceleration. The Turbo Hydra-Matic low gear ratio is 2.48. Stall torque multiplication of the converter is 2.20:1 with the stator in low pitch. An overall breakaway ratio of 2.20 x 2.48 x 2.41, or 13.2:1, is the result. This produces rubber-burning starts and 0-30 mph acceleration within 3 sec. Of course, the switch-pitch feature of the transmission is very useful on streets and highways because a small extra surge is available without actually kicking down into the next gear; it's almost like having a 4-speed transmission. However, the Turnpike Cruising Package would be impractical with either a 4-speed manual transmission or the 2-speed Jetaway used in standard F-85s.

THE TURNPIKE engine includes another feature that contributes a great deal to fuel economy. This is the new "Climatic Combustion Control" air intake system, which is option No. K-50, available at $33.70 on all Olds V-8 engines. The system employs vacuum-operated valves in the air cleaner housing to mix warm underhood air with hot air from a muff around the exhaust pipe to maintain a constant inlet air temperature of approximately 100° F. Warm air arrives at the carburetor within seconds after a cold start. Thus, for all practical purposes, carburetor air temperature remains constant. The system offers several advantages, including close control of exhaust emissions to meet antismog laws. What helps overall fuel economy most, however, is that the carburetor can be calibrated for the constant 100° intake temperature. Normally, the carburetor must be jetted for the lowest underhood temperature in normal operation, which can be as low as 20 or 30° F in northern states. Tests show the difference in overall fuel economy is 0.75-1 mpg. Olds decided to include the air temperature control system in the Turnpike Cruising Package to derive that last ounce of fuel economy.

Concern that hot carburetor air will reduce power on full-throttle acceleration is unfounded. The system is designed so the air valves close and admit only underhood air through twin snorkels when manifold vacuum drops below 6-8 in. Hg. Tests show the carburetor inlet air temperature drops from 100° to the underhood temperature (or close to it) within 2 sec. after the throttle is opened.

Heavy-duty 4-4-2 suspension components are a vital part of the Turnpike package. A relatively firm suspension always is more restful for long highway trips because less pitching motion occurs. Soft suspension is best at lower speeds around town. Perhaps the most important ingredient is the increase in rear roll stiffness given by the rear antiroll bar in the 4-4-2 package. This keeps the rear end from walking from side to side in crosswinds. It also gives the car a more neutral feel on curves and lessens steering effort. ▶

Cruising the Turnpike . . .

OLDSMOBILE'S CUTLASS Cruiser is eminently fit transportation for the long haul. The car is largely designed for the man who lives 100 miles or more from his job; for the interstate traveler who must leave Kansas City to make a call in Chicago; or for the inveterate weekender who seeks his pleasures by driving, calmly, quietly and at sustained legal speed.

Clean of line, neatly attractive in F-85 Cutlass Supreme trim, the Turnpike Cruiser appears a real sleeper in Oldsmobile's lineup of cars. Once those who prefer the quick and the quiet discover the Cruiser option, it undoubtedly will become popular.

The mildly tuned 400-cu. in. engine starts readily; the windows slide up silently, electrically; the torque converter whispers the car away with perhaps the smallest of tire chirps; and FM-received cool jazz beats softly.

From the on-ramp, the Cruiser quickly matches the speed of traffic flow. The speed limit, 65 mph, shows on the speedometer. The button in the end of the turn signal lever is pushed, and 65 mph is maintained without flutter for 150 miles to the off-ramp.

Unfortunately, on the turnpikes of a megalopolis, traffic conditions do not often permit full exercise of Turnpike Cruiser capability. Though the Perfect Circle speed control device was perfect, controlled speed proved troublesome in congested situations where, with the Cruiser set at 65 mph, other cars traveled at 68, 63, 71 and 58 mph, but not 65.

And, the UniRoyal radial ply tires fitted to the car for their minimal rolling resistance, hence minimal demand for horsepower, performed very well on dry pavement. But, as observed of other high-performance tires from the same manufacturer, the radials' rubber compound seemed excessively hard for operations on rain-soaked streets and highways. The drive tires could be spun at will on any start under dry conditions. In the wet, the radials were exceedingly slithery.

Fuel consumption figures, so carefully recorded on GM's flatland proving ground at Milford, Mich., suffered from *CL*'s testing through mountainous territory, a small traffic jam, a major and prolonged traffic jam, several stints of freeway crawl and minor stoplight GP activity. These conditions are not usually encountered on the research roadway at Milford, thus the GM-recorded mileage is notably greater than *CL*'s.

However, given clear freeway, sometime after midnight, perhaps, with FM tuned low, air slightly warmed by the efficient heater, speed control set at the 65-mph limit, the driver could progress at a fuel consumption rate of 19 mpg within the tight, comfortable, rattle-free unit-body/perimeter-frame construction, directional control maintained with only small arcs described by an index finger—and that's cruising the turnpike. —*The Editors*

FUEL FLOW meter, electric tachometer and decelerometer were used to test the Oldsmobile Turnpike Cruiser's performance on GM proving ground.

Several other options help the highway performance of the Turnpike Cruiser. Oldsmobile's new capacitor-discharge ignition has no breaker points and is less affected by spark plug fouling, hence full acceleration always is available without missing, even after hours of slow city driving. The optional Cruise Control automatically maintains a constant pre-set speed on the road. With the new 1967 F-85 system, speed is not set on a dial. A button on the control system locks on that speed. Touching the brake pedal instantly releases the speed control mechanism.

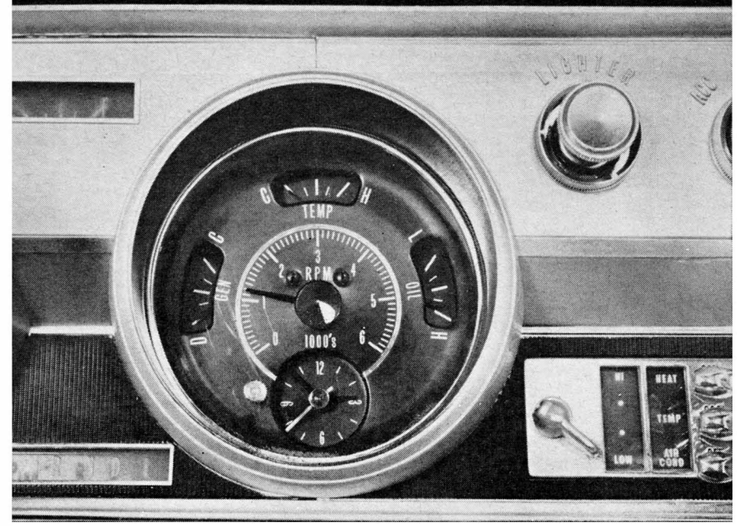
New UniRoyal radial-ply tires, expected to be an F-85 option by the time this reaches print, offer slightly less rolling resistance, which is said to improve fuel consumption by 0.5 mpg at highway speeds. The radials also offer long wear and a good ride. European radials tend to deliver a thumpy ride because of stiffer belts under the treads. Apparently Akron is making progress.

What does this special package engineering really offer in usable performance? Oldsmobile has achieved a compromise between brute acceleration and good fuel economy.

HERE ARE precise mpg figures measured on the GM Proving Grounds with fuel meter and fifth wheel, running at constant speeds in 40° weather—30 mph, 23.15 mpg; 40 mph, 23.65 mpg; 50 mph, 21.04 mpg; 60 mph, 19.26 mpg; 70 mph, 17.22 mpg; 80 mph, 15.26 mpg; and 90 mph, 13.18 mpg. Here are acceleration figures, compared with the standard 1967 4-4-2:

	Turnpike	Typical 4-4-2
0-30 mph	3.2	2.8
0-60 mph	8.2	6.5
Standing quarter-mile	16.2 @ 86 mph	14.8 @ 94 mph

Very impressive! The car proved extremely responsive to the throttle in the 50-70 mph range, with engine speed at approximately 2000 rpm. At lower speeds, with the engine turning in the 1000-1200 range, plenty of response remained because of the short-duration cam, but the converter dropped into low pitch more frequently. Those who desire additional performance can kick down into low gear at 30-40 mph. The pitch switched at about half throttle and kicked down at the detent point beyond full throttle. The excellent breakway acceleration with the 3-speed converter already has been discussed. Nothing was sacrificed because the short-duration camshaft pulled hard at stall speed. This would not be true with the hotter 4-4-2 camshaft. To reiterate, the secret of this car is the brilliant combination of camshaft timing, carburetion and gearing. It's out on the highway that this engineered blend really comes into its own. One doesn't realize there is an engine pulling. It feels as though the car is being whisked along by a silent electric motor. There are no engine sounds or vibrations. The engine can't be heard even at 90 mph. Where it may be difficult to control other cars at 60-70 mph, the Turnpike Cruiser creeps effortlessly up to 80 and 90 and even 100. Cruise Control is a good preventive for speeding tickets as well as for tired throttle feet.



SPECIAL INSTRUMENT cluster, including ammeter, temperature gauge, oil pressure gauge, tachometer and clock, is called Rocket Rally Pac.

It is safe to predict that Oldsmobile's new Turnpike Cruiser will be widely copied in the next few years. This is a new concept in automotive package design: Top-end power is ignored; the aim is for low- and mid-range torque. A very low final drive ratio keeps the engine in the middle of its speed range in all normal driving. The torque converter 3-speed automatic provides adequate breakaway acceleration. Low engine speed insures smooth, quiet city and highway cruising. Reduced engine friction and pumping loss means good fuel economy with very little sacrifice in acceleration. The Turnpike Cruising Package may be the prototype of tomorrow's passenger car. ■

1967 OLDSMOBILE
F-85 CUTLASS CRUISER

DIMENSIONS

Wheelbase, in.	115.0
Track, f/r, in.	58/58
Overall length, in.	204.2
width	76.0
height	54.4
Front seat hip room, in.	54.0
shoulder room	58.8
head room	38.1
pedal-seatback, max.	43.5
Rear seat hip room, in.	51.9
shoulder room	58.8
leg room	35.9
head room	37.2
Door opening width, in.	42.2
Floor to ground height, in.	10.4
Ground clearance, in.	4.75

PRICES

List, FOB factory	$2831
Equipped as tested	3884

Options included: Turnpike Cruiser Pkg., auto. trans., power metallic brakes, radial-ply tires, power steering, windows, antenna; Rally Pac, vinyl roof, tilt wheel, AM/FM radio, rear speaker, CD ignition, power seat, lamp-mirror group.

CAPACITIES

No. of passengers	6
Luggage space, cu. ft.	20.1
Fuel tank, gal.	20.0
Crankcase, qt.	5.0
Transmission/diff., pt.	23.0/3.0
Radiator coolant, qt.	16.2

CHASSIS/SUSPENSION

Frame type: Perimeter.
Front suspension type: Independent by s.l.a., coil springs, telescopic shock absorbers, ball joints, link-type stabilizer.
ride rate at wheel, lb./in. 124
anti-roll bar dia., in. 0.937
Rear suspension type: Live axle, coil springs, 4-link control; anti-roll stabilizer.
ride rate at wheel, lb./in. 130
Steering system: Power-assisted integral gear, transverse linkage, 2 tie rods.
gear ratio 17.5
overall ratio 20.7
turns, lock to lock 4.06
turning circle, ft. curb-curb 41.7
Curb weight, lb. 3730
Test weight 4140
Weight distribution, % f/r 57/43

BRAKES

Type: 2-circuit hydraulic, tandem master cylinders; duo-servo system with sintered metallic linings in drums.
Front drum, dia. x width, in. 9.5 x 2.50
Rear drum, dia. x width 9.5 x 2.50
total swept area, sq. in. 291.0
Power assist: Integral, vacuum
line psi @ 100 lb. pedal 1180

WHEELS/TIRES

Wheel size 14 x 6K
optional size available none
bolt no./circle dia., in. 5/4.75
Tires: UniRoyal Radial Ply
size 195R-14
recommended inflation, psi 26
capacity rating, total lb. n.a.

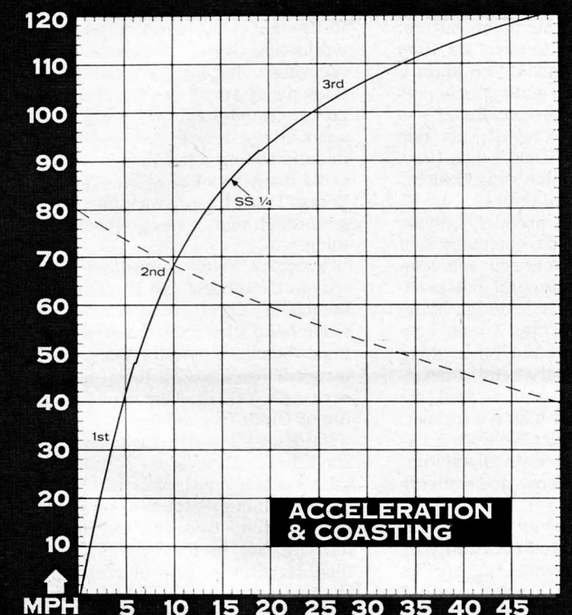
ENGINE

Type, no. cyl. ohv, 90° V-8
Bore x stroke, in. 4.00 x 3.975
Displacement, cu. in. 399.408
Compression ratio 10.5
Rated bhp @ rpm 300 @ 4600
equivalent mph 145
Rated torque @ rpm 425 @ 3000
equivalent mph 95
Carburetion Rochester, 1x2
barrel dia., pri./sec. 1.687
Valve operation: Hydraulic lifters, pushrods, overhead rockers on stud-mounted pivots.
valve dia., int./exh. 2.062/1.624
lift, int./exh. 0.435
timing, deg. 15-58, 60-24
duration, int./exh. 250/264
opening overlap 36
Exhaust system: Dual mufflers and resonators.
pipe dia., exh./tail 2.25/2.00
Lubrication pump type gear
normal press. @ rpm. 35-50 @ 1500
Electrical supply alternator
ampere rating 37 @ 12 V.
Battery, plates/amp. rating 77/70

DRIVE TRAIN

Transmission type: Torque converter and 3-speed automatic planetary.
Gear ratio 3rd (1.00) overall 2.41
2nd (1.48) 3.57
1st (2.48) 5.98
1st x t. c. stall (2.20) 13.2
synchronous meshing? planetary
Shift lever location column
Differential type: Hypoid, semi-floating axles.
axle ratio 2.41

CAR LIFE ROAD TEST



CALCULATED DATA

Lb./bhp (test weight)	13.8
Cu. ft./ton mile	106.2
Mph/1000 rpm (high gear)	31.5
Engine revs/mile (60 mph)	1900
Piston travel, ft./mile	1260
Car Life wear index	23.9
Frontal area, sq. ft.	23.0
Box volume, cu. ft.	488

SPEEDOMETER ERROR

30 mph, actual	30.2
40 mph	40.0
50 mph	49.8
60 mph	58.8
70 mph	66.7
80 mph	76.0
90 mph	85.8

MAINTENANCE INTERVALS

Oil change, engine, miles	6000
trans./dif., mo.	24/as req.
Oil filter change	6000
Air cleaner service, miles	24,000
Chassis lubrication	36,000
Wheelbearing re-packing	as req.
Universal joint service	none
Coolant change, mo.	24

TUNE-UP DATA

Spark plugs	AC 445
gap, in.	0.030
Spark setting, deg./idle rpm	0/650
cent. max. adv., deg./rpm.	24/4000
vac. max. adv., deg./in. Hg.	21.5/22
Breaker gap, in.	magnetic pulse
cam dwell angle	magnetic pulse
arm tension, oz.	magnetic pulse
Tappet clearance, int./exh.	0/0
Fuel pump pressure, psi	7.75-9
Radiator cap relief press., psi	15.0

PERFORMANCE

Top speed (4100), mph	130
Shifts (rpm) @ mph, automatic	
3rd to 4th ( )	
2nd to 3rd (4300)	92
1st to 2nd (3800)	48

ACCELERATION

0-30 mph, sec.	3.3
0-40 mph	4.8
0-50 mph	6.3
0-60 mph	8.2
0-70 mph	10.5
0-80 mph	13.6
0-90 mph	17.9
0-100 mph	24.4
Standing ¼-mile, sec.	16.0
speed at end, mph	86
Passing, 30-70 mph, sec.	7.2

BRAKING

(Maximum deceleration rate achieved from 80 mph)

1st stop, ft./sec./sec.	22
fade evident?	no
2nd stop, ft./sec./sec.	21
fade evident?	no

FUEL CONSUMPTION

Test conditions, mpg	16.2
Normal cond., mpg	16-19
Cruising range, miles	320-380

GRADABILITY

3rd, % grade @ mph	14 @ 76
2nd	23 @ 54
1st	32 @ 37

DRAG FACTOR

Total drag @ 60 mph, lb. 120