

CYCLE ROAD TEST

BMW R75/5 Sport

BMW has made a bold risk-bid for the performance buyer. Will a flat twin as big as the R75 really handle? Take a ride, baby—you'll see.



PHOTOGRAPHS BY ROBERT LACKENBACH

• Back in the good old days, Bavaria was ruled by an emperor looked on most fondly by today's Bavarian. He was Emperor Ludwig II—or "Mad Ludwig"—whose particular bag was building castles. Nineteenth-century Ludwig wanted to recreate the glories of the past by building castles all over Bavaria. He built so many that he eventually bankrupted the state, but the Bavarians admire him anyway. After all, he had style and, though "mad", he did in fact do his own thing. In some ways, the spirit of Ludwig II lives on at the Bavarian Motor Works, whose motorcycle division continues relentlessly to do its own thing. That means it

produces motorcycles with horizontally-opposed flat-twin engines and with power transmission to the rear wheel by shaft drive. Now BMW has introduced a new series of these devices, the biggest and fastest of which is our test bike—BMW's 750cc model R75/5.

For BMW the new models, and particularly the R75, signify a great leap forward into the present. That is, the firm senses that today's big-bore motorcycle buyer doesn't buy utility transportation. What he wants is a street sport machine with emphasis on good handling and high performance. BMW wants to please the new breed of rider, but not by sacrificing its hard-earned reputation

for quality and durability—certainly not by abandoning a basic design concept so integral to its identity.

The new BMWs are lighter and faster than their predecessors and they have been brought up to date technically in many ways. They now have alternator-fed 12-volt dc electrics. They now have electric starters, concentric float bowl carburetors, battery-and-coil ignition systems, plain bearing crankshafts and high-volume trochoidal-type oil pumps. The new machines have received such thorough redesign that they genuinely deserve the label "new".

A look at the R75 tells you instantly that this is a motorcycle created by

It's got all that touring stuff: electric start, turn signals. But you can corner it honked way over, stand it on end with a throttle twist, and cruise full-song all day long.

engineers. The hand of a designer or stylist has never been laid on that metal. If you ever wondered what happened to the Honda hump, now you know. A short wheelbase and a high, arching gastank give the BMW a stubby, lumpy appearance that takes getting used to. From the side, the BMW's crankcase castings resemble a giant tadpole just before it sprouts legs. And then there are those turn signals front and rear, sticking out on stalks like monster eyes. In styling, you might call the R75 motorcycling's own Volkswagen, except

that the power of this machine rules out an image of homely cuteness. Maybe some people will regard its appearance as a kind of blocky muscularity. Certainly it looks big.

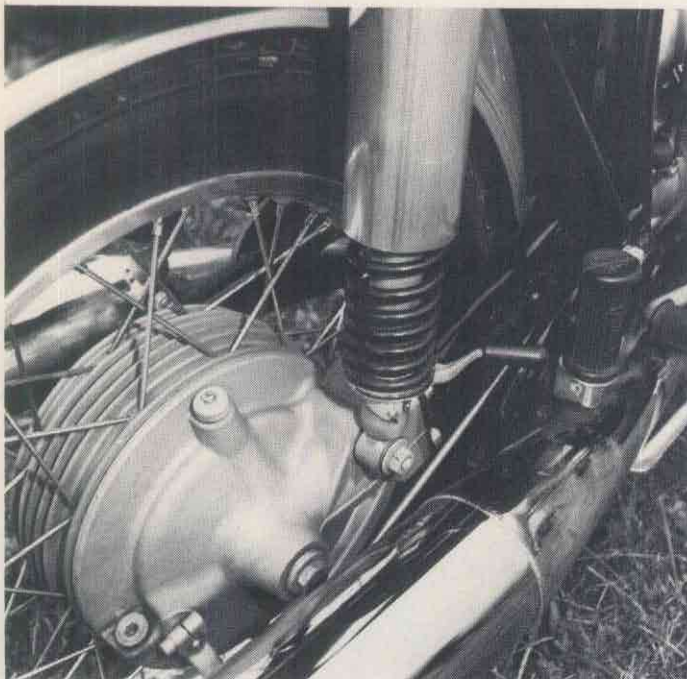
Fortunately for BMW, going, not looking, matters most in motorcycling and the R75 will go like no BMW ever before and like few other motorcycles today. That redesigned flat-twin engine delivers 57 bhp at 6200 rpm, which puts it squarely among the new superbikes and ahead of the sport 650s. I tested the new bike in West Germany, shortly after

its official September introduction. There is no better testing area, for not only are there Germany's fabled no-speed-limit *autobahns*, but also the incredibly challenging roads of the Bavarian Alps. Road surfaces vary from seamless cement to gravel and *pavé* (a kind of granite cobblestone). And the Alpine roads offer grades and turns that would never meet U.S. highway codes. Steep and tortuous. They are a motorcyclist's delight. For three weeks I thrashed the R75 along those roads and I can tell you, it has a long suit in going.

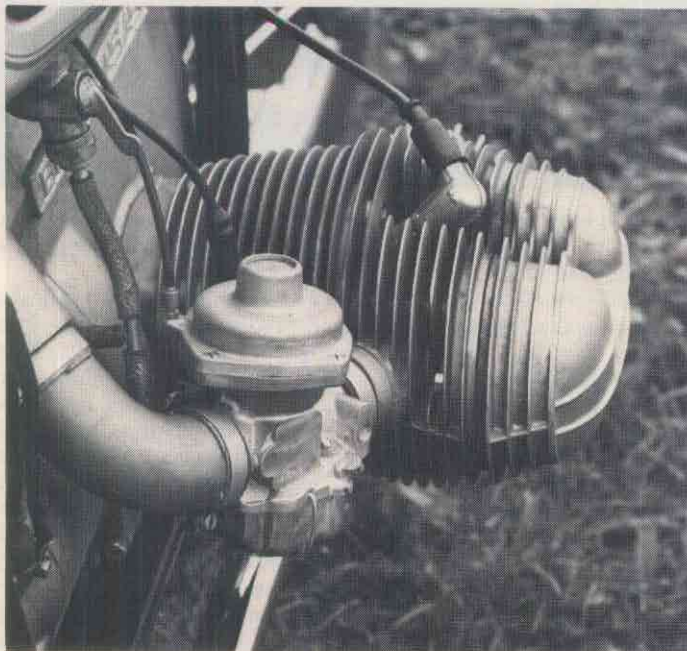
But first I got a thorough grounding at the factory on the nitty-gritty of design. This R75 engine is a remarkable piece of work. Perhaps the best way to see what BMW's engineers have done is to start with air intake and follow all the way through combustion and power transmission to final delivery of drive to the rear wheel.

In the manner of an enduro bike, the R75 gets its air high and dry through an intake located well up under the gastank. The air intake grill faces rearward in a pocket of relatively still air. Intake air gets no ram effect from the velocity of the machine, but this would be cancelled by the elaborate filtering system anyway and at least the air is cool and relatively dense. Gross impurities (birds, twigs, etc.) are blocked by the grill before the air swirls in and around the starter motor and then into a gigantic paper-element filter. This filter (disposable) has 60% greater area than the filter used on BMW's R69s. A small amount of air in traditional BMW fashion is taken in through orifices in the electrics housing at the front of the engine to cool these heat sensitive elements before it also enters the main filter.

From a common chamber under the air-filter element, air is drawn individually through ducts into each carburetor. I asked BMW's engineers why they had created such an elaborate intake path. Every time air changes direction on its way to a carburetor and every time it passes through a filter some energy is lost. That is, the engine has to suck a little harder to get the same amount of air. The answer I got was noise. A 750 turning six grand sucks a lot of air, enough to raise an ear-rending howl unless it is muffled by the same filters that extract dust and-grit. Part of the reason that the new engine housing is so large is that it must provide sufficient flow for all the air a hungry 750 on full song needs. In any case, the BMW's intake muffling system works splendidly. It filters splendidly. You



Not much has changed in the final drive department: an enclosed, rubber-bushed shaft takes the place of the more prosaic motorcycle's chain.



Long through-studs hold rocker gear, cylinder-head and cylinder—minimize heat distortion. As usual, rocker covers are very strong.

might get five easy horsepower simply by venting those carburetors directly—but you'd get a lot of noise and you'd reduce engine life by at least two-thirds.

The carburetors on the R75 are wholly new products from Bing, though they look suspiciously like the constant-vacuum carbs on Honda's 450. (Actually, CV carbs have been around for some time in the automotive world: England's SU firm had them before Keihin.) Their operation is simple in principle though complex in execution. Twisting the R75's throttle-grip doesn't

lift a slide as in most motorcycle carburetors. It rotates a butterfly valve in the tract leading directly to the cylinder intake valve. For this carburetor, full throttle means minimum interference with all the vacuum (or suction) that the cylinder can draw. A tube from the same valve-side tract leads to chamber above the carb slide so that both have equal pressure (equal vacuum). Mixture rushing under the slide provides a positive pressure, lifting the slide until the pressure over it and under it are the same. In the new Bing,

pressure masses above and below the slide are kept separate by a flexible rubber diaphragm. Honda's Keihins count on the slide working as a piston with close fit provided the seal. In any case, the big advantage of a CV carburetor is that it delivers only as much mixture as the cylinder can draw. Whacking open the throttle won't flood or starve the engine: it just allows the carburetor to adjust itself to maximum draw. Result: very progressive power transitions and very efficient carburetion (good mileage).



The R75 is, above all, technically contemporary.

**It incorporates a one-piece forged crankshaft,
an alternator good for 180 watts—and more.**

Only the R75 has CV carburetors; the other models (R50/s and R60/5) have new Bing concentric floatbowl models with cable actuated slides. Concentric floatbowls with nylon floats on all three bikes keep the fuel level constant no matter what the cornering angle or how steep the grade. Provision has also been made to prevent carburetion irregularities from fuel surging during hard braking or acceleration. The R75's carburetors have also been isolated from the cylinders by a short rubber sleeve to prevent vibration interference with carburetion. A rich cold-starting mixture is produced by an independent mixing system similar to that on most Japanese carburetors. Rotating a choke lever on the side of the engine housing opens this system by cables to both carburetors. I found this location easy to get at, yet out of the way—unlike the handlebar mounted chokes that clutter up the control layout on so many British bikes.

Mixture rushes into the combustion chamber through an enormous 42mm intake valve. There are 88° of valve overlap (both intake and exhaust open) so that intake mixture is drawn along by departing exhaust gases. Momentum acquired by the mixture stream tends to stuff additional mixture into the cylinder when the exhaust valve closes. Just eyeballing that cylinder head tells you that considerable thought has been given to gas flow. With the valves removed you can look through the inlet port straight out the exhaust port. An oversquare bore-stroke ratio of 82mm x 70.6mm provides plenty of room for valves. BMW's designers chose a very flat combustion chamber with an included angle between valve stems of 65° (versus 80° in the R69s). Compression ratio is a relatively mild 9:1. Perhaps the best indication of the efficiency of this cylinderhead design is the fact that maximum horsepower (57 SAE) is produced at a relatively slow 6400 rpm.

After combustion, the exhaust gasses depart through a 38mm exhaust valve into an exhaust plumbing system of enormous volume. A crossover pipe just below the front of the engine lets each cylinder exhaust into the whole system including both mufflers. The system isn't "tuned" for wave-type gas extraction at the exhaust valve, but it is designed to minimize backpressure at all operating rpm. Sound muffling in traditional BMW fashion (because of strict noise-control laws in Germany) is superb. This big bike whispers along so rapidly and so silently that a good horn is absolutely necessary. Unfortunately, the bike doesn't come with one.

The R75's large, flat pistons require only the slightest valve cutaways. Working through such a short stroke, they should last a long time. Each piston has three rings: a chrome-plated compression ring, an "L"-shaped compression ring (Dykes pattern), and an oil-scraper ring. The top compression ring is very thin, specially designed to avoid flutter and thus loss of compression at high operating rpm. The R75's cylinder consists of a cast iron sleeve molecularly bonded by the "Alfin" process to an aluminum-alloy fin casting. This combination, along with the horizontal positioning of the cylinders directly in the airstream, provides excellent cooling. Operating oil temperature of the R75 engine under full load in the 4th gear is between 175°F and 195°F, which compares with, say, a 270° oil temperature for a Porsche engine under load.

Oil temperature is particularly critical because of BMW's radical conversion to the use of plain bearings in the crankcase. Fifteen years ago, BMW set a kind of milestone by producing a street motorcycle whose running parts turned exclusively in ball and roller bearings. Roller bearings are expensive, but they don't generate much heat. That early, pressed-together (or built-up) crankshaft acquired a much celebrated reputation for longevity—so long as maximum power was kept under 50 bhp. More power tended to flex the crank excessively and roller bearings don't respond at all well to flexing. When BMW chose to stick with the flat twin as a solo engine, they also chose to live with an inherent weakness in its design: no center mainbearing. To include a center mainbearing would mean to offset the cylinders even further (as seen from above) and such an engine would generate a rocking couple large enough to effectively cancel its chief virtue—perfect primary balance. An alternative solution to the demand for more power was to make a stronger, more rigid crank. For BMW that meant a one-piece forging with considerably increased bearing diameters.

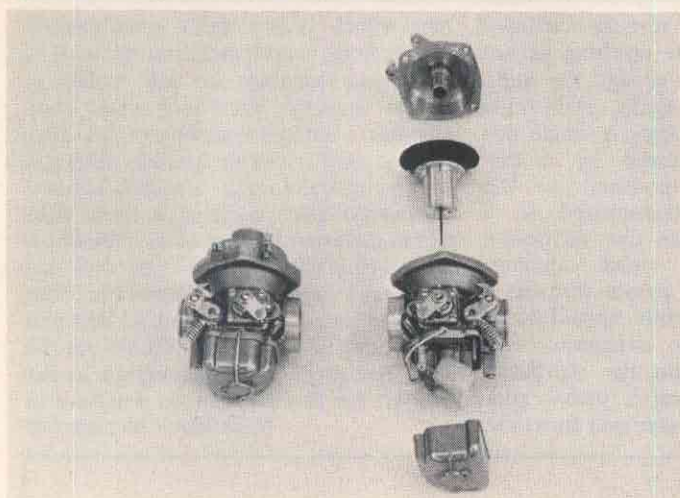
The new crank got rigidity with a vengeance. A 5000-lb sideload or the center will deform this crank less than half as much as the pressed-together R69s crank. Where the R69's had mainshaft diameters of 35mm and 36mm, the new crank measures 60mm and 48mm. Rod journals are up to 22mm from 15.2mm. Plainbearing materials have been lifted right out of BMW's cars (trimetal-bronze, tin and indium). The new crank will live

comfortably with 80 bhp and thus is considerably understressed in the 57 bhp model R75. R75's short, forged connecting rods look as if they had been lifted right out of a Porsche, as indeed have many parts on this machine. (eg—the bonded brake and clutch linings).

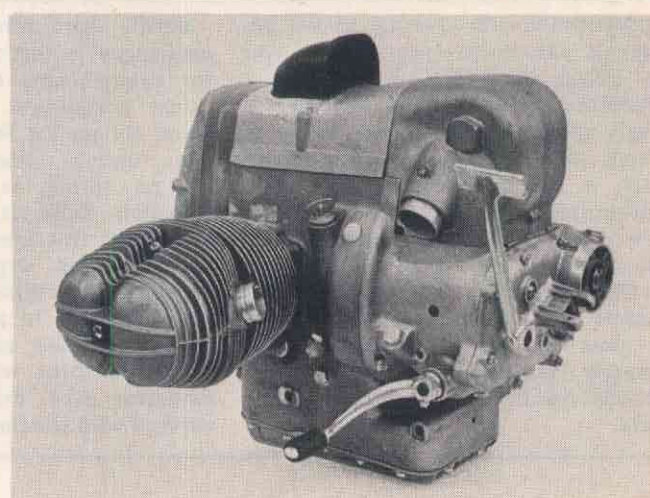
To solve the cornering interference problem of a flat twin, BMW's engineers decided to get the cylinders higher off the ground. To do this and still keep the center of gravity low, they moved the camshaft from directly above the crank to directly below. Instead of a geared cam drive, the R75 now uses a duplex chain with automatic tensioning—vast as in the BMW overhead-cam auto engines. Mounted on the rear of this camshafted is the rotor of an Eaton (trochoidal) oil pump, very similar to the one used in Honda's 750. The life of a plainbearing engine can be credited directly to this device and BMW's does its job well. At 6000 rpm it will circulate over 800 quarts an hour. That means the entire oil capacity of this engine (2.4 quarts) gets circulated 355 times in an hour of hard riding. Oil is pressure fed to the mainbearings, lower end bearings, camshaft bearings and rocker arm bearings. The pump draws its oil from the sump through a disposable, automotive-type oil filter.

At the extreme forward end of the camshaft, past its driving sprocket and into the dry electrics housing, sits a new Bosch centrifugal ignition advance unit. This is only one element of a completely redesigned electrical system common to all models. The primary power source is an automotive-type 12-volt alternator located on the end of the crankshaft. Rated at 180-200 watts, this new unit was designed at the BMW factory and then given to Bosch to manufacture. In automotive fashion voltage is regulated by varying the current in the rotor—some DC current is always needed for starting. According to BMW engineers, the engine will fire up even if the 12-volt battery has decayed to 7 volts. If it has gone lower than that, you have to spin the rotor at 2000 rpm to get enough primary juice for a spark. That's one helluva bump start for a 435-lb motorcycle. But the generous capacity of the alternator should keep the battery charged even if the bike is only used occasionally. Obviously there is wattage to spare—enough to power flood lights, radios, compressor horns, police transmitters or whatever other accessories amuse you.

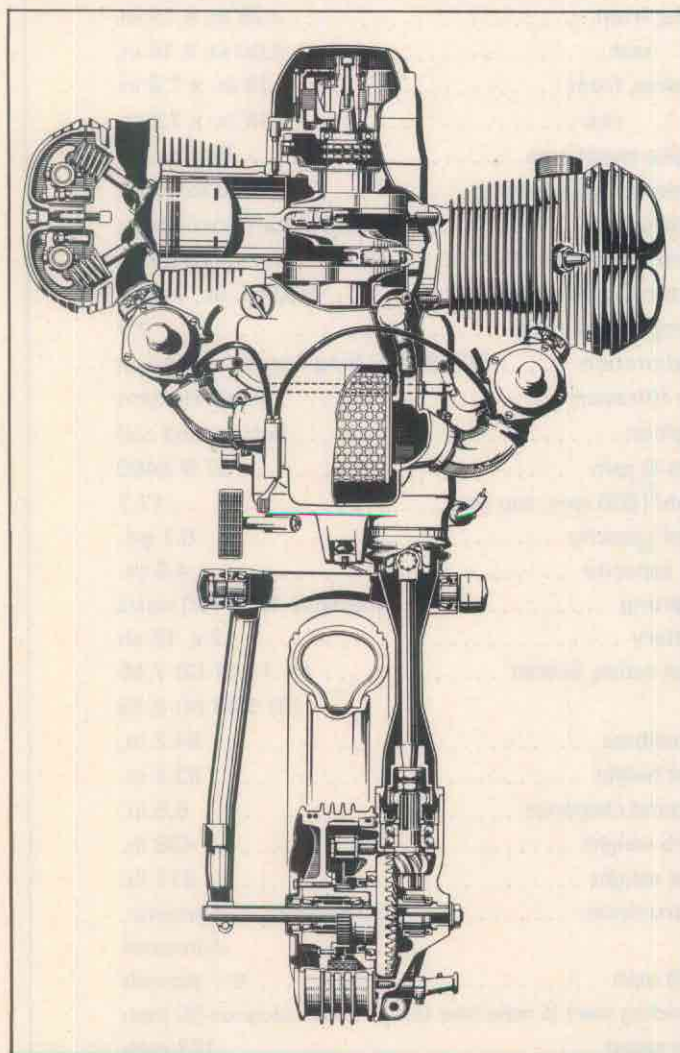
Above the crankshaft, situated where BMW's camshaft used to be, sits a



Big 32mm constant-vacuum carburetor is similar to Honda's, but uses neoprene diaphragm to separate pressure masses. Throttle actuation turns butterfly in valve-side throat; mixture velocity adjusts the slide to engine's needs. The float bowl is concentric; the float is made of nylon.



Massive engine housing includes most of the electrics and other hardware usually left flapping in the wind. Camshaft now rides below crank with the starter motor above (making for a lower center of gravity). Massive housing shown at top rear contains a large air filter.



Symmetry of flat twin dramatically emphasizes cooling virtues. With camshaft under crank, the cylinders are raised, providing greater cornering angles. Nose casting covers automatic ignition advance unit, alternator, and rectifier, and permits air entry for cooling of electrics.



Three-phase 180-watt alternator gets magnetization current for rotor from the battery. Alternator has advantages of compactness, efficiency, and no rubbing connections (brushes) for high currents. The alternator output will fire plugs—even if battery fades to seven volts.



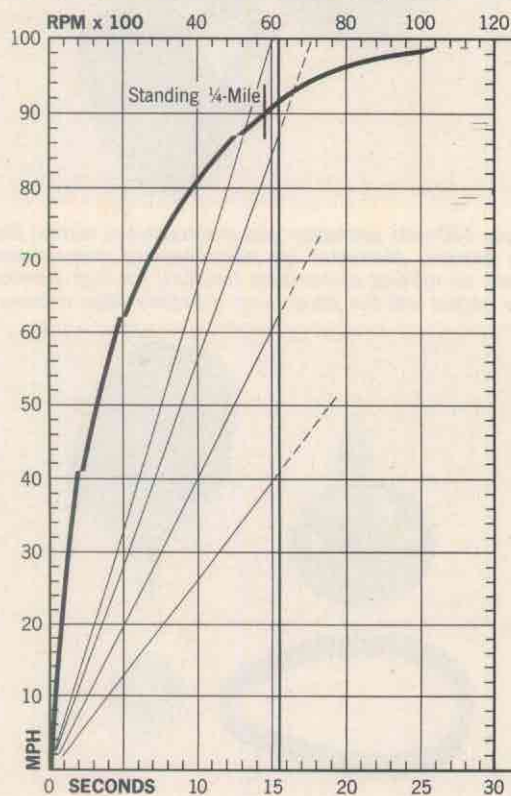
Camshaft drive by automatically tensioned duplex chain comes straight out of BMW's rally-winning sports sedans. Valve timing affords a generous 88 degrees of overlap, which makes for good combustion chamber filling, easier starting, higher midrange torque.

It may be disappointing at the top end, but the BMW has splendid midrange acceleration and an operating smoothness that's yet unequalled by any of the multis.

starter motor with capacity of 0.7 hp. With its automotive-type flywheel and dry clutch, the BMW has long been a natural for this addition. A ring gear was simply added to the flywheel, driven by a tiny throw-out gear on the starter shaft. A quick punch at the starter button fired up our test bike every time, even in some very cold, damp weather. The system was designed to work down to 15°F, yet it isn't burdened with the gigantic 32 amp-hour battery common to some electric-start bikes. A new, remotely vented battery of 15 ah capacity handles the job quite satisfactorily.

BMW's drive train remains virtually unchanged in the new machine except for strengthening to accept the additional horsepower. Again, everything seems set up for 80 bhp. A single dry plate clutch, compressed by a diaphragm spring, is mounted to the flywheel. Drive is transmitted to a three-shaft transmission that includes a spring-and-cam type shock damper. Transmission output passes through a universal joint to permit up-and-down motion at the rear swingarm. The driveshaft turns within the righthand swingarm tube, driving a piston gear engaged with the ring gear that turns the

rear wheel. It is a quiet, maintenance-free system, everything running in an oil bath and turning on ball, roller or needle bearings. That rear wheel actually has a splined coupling to the drive unit so that it can be quickly detached for tire or brake work—a useful feature I discovered after sparring a horse shoe nail in Bavarian farm country. Somehow the engineers' ingenuity ran out just short of completion, however. The lefthand muffler is notched so that you don't have to remove it to draw out the axle. But there is no flat wrench in the tool kit for the axle nut, so you have to
(Continued on page 64)



BMW R75/5 750 cc Sports

Price, suggested retail	East Coast, POE	\$1696
Tire, front		3.25 in. x 19 in.
rear		4.00 in. x 18 in.
Brakes, front		1.18 in. x 7.8 in.
rear		1.18 in. x 7.8 in.
Brake swept area		58.6 sq. in.
Specific brake loading		10.8 lb/sq. in.
Engine type		Electric-start boxer twin.
Bore and stroke		3.23 in. x 2.78 in., 82 mm x 70.6 mm
Piston displacement		45.0 cu. in., 745 cc
Compression ratio		9:1
Carburetion		(2) 32 mm, Bing Constant Vacuum
Air filtration		Paper element
Ignition		Battery and coil
Bhp @ rpm		57 @ 6400
Mph/1000 rpm, top gear		17.7
Fuel capacity		6.1 gal.
Oil capacity		4.9 pt.
Lighting		Alternator 12 v, 180 watts
Battery		12 v, 15 ah
Gear ratios, overall		(1) 11.31 (2) 7.49 (3) 5.48 (4) 4.35
Wheelbase		54.7 in.
Seat height		33.4 in.
Ground clearance		6.5 in.
Curb weight		436 lb.
Test weight		611 lb.
Instruments		Speedometer, tachometer, odometer
0-60 mph		6.1 seconds
Standing start 1/4 mile (see text)		14.5 seconds-90 mph
Top speed		103 mph