

Cycle Test

• At a time when everything costs more and nothing costs less we expect new motorcycle prices to rise. But an over thirty-four hundred dollar production machine? That's almost inconceivable. Yet, here it is: the BMW R90S—made of steel, priced like gold. The BMW Sport has been designed and built to extraordinary standards of quality and therefore may be worth every penny its makers are asking. Still, we wonder if the day of the \$3000-plus motorcycle is here. Obviously the Bavarians' marketing staff has studied the feasibility of selling such an expensive over-the-counter road machine. Their decision to proceed may have been based on the fact that there are over 200,000 millionaires in the United States.

There's absolutely no doubt that the R90S is a remarkable motorcycle. It does, or can be made to do, almost everything as well and possibly better than any other

road machine you can buy. The Sport is exceptional in numerous areas: speed, acceleration, comfort, cleanliness, operating economy, smoothness, quietness, braking, reliability and convenience.

The R90S delivers tremendous performance in a most pleasant manner. There isn't one motion or operation performed by the Sport that is in any way harsh. The engine develops enough honest horsepower to get the bike moving in excess of 120 mph, yet feels very mild. Veteran BMW riders recognize the engine's character but are astonished at the acceleration rate it produces. Those unfamiliar with BMW's flat-twin sense luxury but not much speed until they see the speedometer needle winding around like the dial on a Toledo scale. It's a sleeper.

As with any BMW, the Sport stands out in a crowd. The all-aluminum engine has its cylinders jutting like finned wings into

BMW R90S

3000 MILES ON BMW'S BIGGEST, FASTEST AND MOST EXPENSIVE SPORT ROADSTER PROVE THAT POSH LUXURY CAN BLEND WITH SUPERBIKE PERFORMANCE.



an unobstructed airstream. The cylinder, head and valve cover assembly is long (11 inches) and the total engine width is broad at 29 inches, about 5 inches wider than a Kawasaki Z-1. The unitized design of BMW's engine keeps all auxiliary components in one weatherproof housing. The only exposed components are the carburetors. BMW's unique crankcase hump hides and protects the air cleaner while eliminating intake drone and other normal running noises that contribute to the high sound levels associated with most big road machines. BMW first used the flat-twin in 1923 and have moved it ahead of all others in quietness and drive-line cleanliness.

Engine construction is simple and sound. The crankshaft is of drop-forged steel and rides in three large plain bearings. The same crankshaft is used in all three engines—the 600cc, 750cc and 900cc engine (actual displacement 898cc). But the new Sport has huge 90mm (3.54-inch) pistons riding on die-forged I-beam rods. These pistons are bigger in diameter than

prisingly minor. The only internal engine difference is compression ratio—9:1 for the R90/6, 9.5:1 for the Sport. Carburetors on the Sport are large 38mm Dell'Orto slide mixers with accelerator pumps; they offer outside float ticklers but no choke system. The roadster has 32mm Bing constant velocity (vacuum slide) butterfly-throttle carburetors. The only other variation, mechanically, is in rear axle gear ratios—3.09:1 for the R90/6; 3.00:1 for the Sport. Equally amazing is that the cylinder head castings for the 900cc engine (both models) are the same as on the 750, with the exception of exhaust valves 2mm bigger. With the Sport going only three-tenths of a second quicker and four miles an hour faster in the quarter mile than the R90/6, the minor mechanical differences deliver equally minor performance gains.

There are a lot of firsts BMW has built into and on the R90S, many of them long overdue. With the bigger engines has come a five-speed transmission to replace the old four-cog box. The five-speed clus-

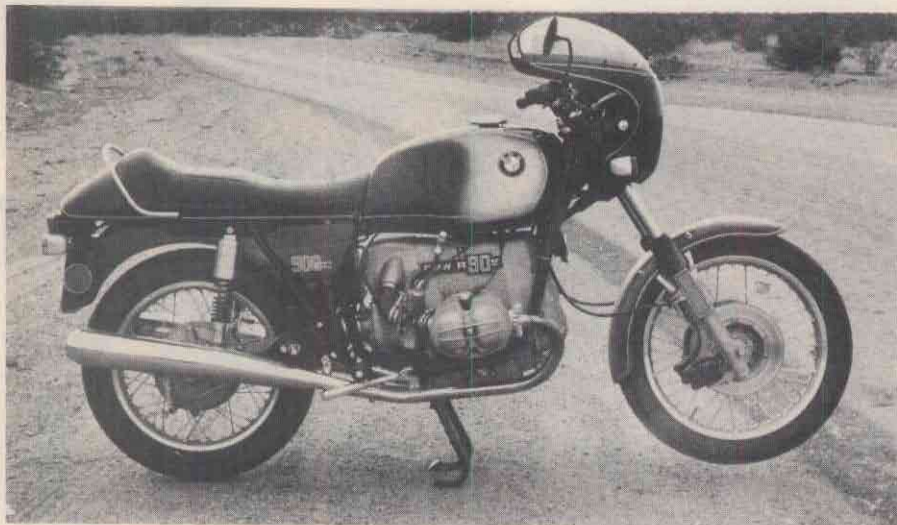
sticky drag of those bathed in oil.

Power is transmitted to the gearbox from the clutch *via* an interesting transmission input shaft. It's supported on each end by caged ball bearings and is in constant mesh with the helical driven gear on the transmission layshaft. Also included on the slender input shaft are a manual kick start engagement gear and spring-loaded shock absorber cam. This shock absorber acts as a drive cushion between engine and ring-and-pinion gears.

The object of mounting the engine longitudinally is to provide a direct line of power transmission to the shaft-driven rear wheel. Conventional mounting of the engine would be impractical from an efficiency and cost standpoint because of the need for an extra right-angle gear unit in the driveshaft system. Shaft drive is not as efficient as a properly maintained chain but it is immeasurably cleaner, quieter and more reliable, particularly on large displacement machines. With the spiral-bevel gears sealed in their own housing and bathed in oil the secondary drive system requires no adjustment or cleaning and only an occasional change of lubricant. The system is straightforward and after 50 years of production, very well proven.

Starting isn't always instantaneous, but the powerful electric starter keeps it from being laborious. Because the carburetors are not equipped with chokes of any type, the outside ticklers must be held down to flood the float bowl and enrich the mixture when the engine is cold. The engine demands a lot of gas with its air to get the pistons traveling up and down under their own power. A brief warming period is required to get the engine to readily come off idle. The engine isn't cold-blooded—not when compared with any of the four-stroke multis. Most of the cold staggers of the R90S are due to those big, high-volume carburetors. Once up to operating temperature the engine runs willingly, although it remains unhappy about accelerating at speeds under 3000 rpm. Starting when warm is aided by a couple of full turns of the throttle grip before the starter button is pressed; this causes the accelerator pumps to squirt fuel into the venturis.

At slow engine speeds the Sport stammers and is rough; it's uncomfortable below 3500 rpm. It acts cammy but actually isn't equipped with the high lift, long duration lobes it seems to have. Getting away from a stop requires a substantial amount of throttle opening before you engage the clutch. The big carburetors and tall secondary gearing cause this un-gainly low-speed performance. In-town riding isn't the Sport's forte. Home for the



The big 6.4 gallon tank assures long distance travel. We averaged 45.6 mpg.

those in the Harley 74 and the biggest in any four-stroke motorcycle engine.

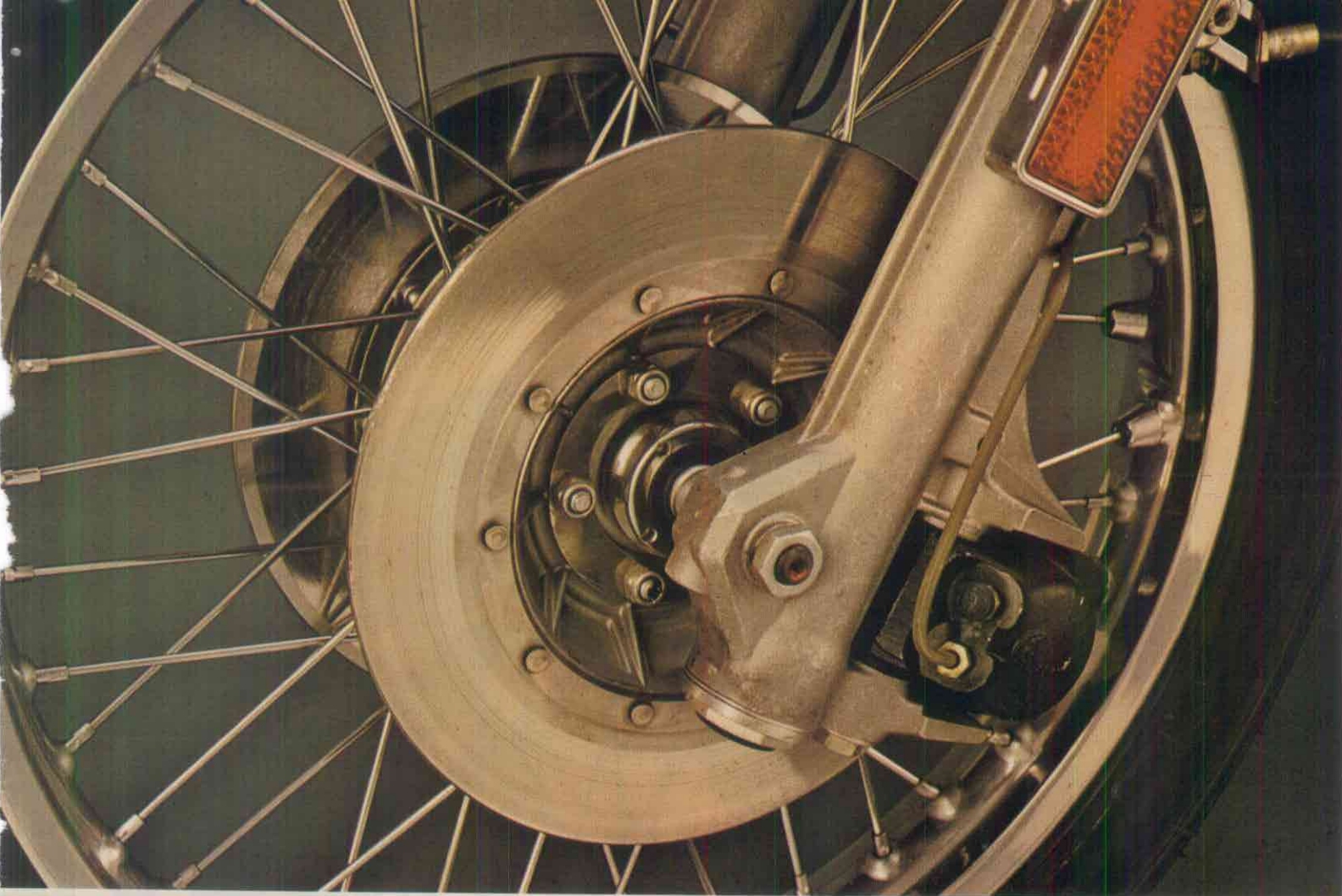
The crankshaft has the rod journals located 180 degrees apart. In this manner the pistons are made to reach TDC and BDC simultaneously. An interesting problem that occurs with this design is exaggerated vacuum and pressure cycles in the crankcase. When the pistons move apart they form a vacuum; as they come together pressure is developed. To control these fluctuations and keep oil from being thrown everywhere a one-way flapper valve is attached to the crankcase, venting first into the air cleaner cavity then back to the carburetors. As the pistons retract to BDC and pressure is developed the flapper opens; during the outward stroke the flapper closes and a depression is formed. This vacuum reduces the tendency for the crankcase to leak oil.

The differences between the R90S Sport and R90/6 roadster engines are sur-

ter of gears and shafts is made to fit into a common cavity and all three engines have the same transmission. The internal ratios are also the same for all models, making for pleasant parts interchangeability and availability. Shifting is accomplished internally by two cam plates that rotate when the gear lever is moved. One cam plate slides two shift forks that move a pair of gears on the mainshaft. The other cam slides one shift fork and one gear on the layshaft.

The clutch and flywheel are automotive-type components necessitated by the use of longitudinal engine mounting and shaft drive. The large eight-pound flywheel has a toothed ring gear on the outside that provides a purchase for the .56-horsepower electric starter motor. The outside surface of the flywheel bears ignition firing marks for simple external timing checks with a strobe light. The clutch is a dry, single-plate unit that lacks the

The powerful stainless steel dual discs bring the R90S to a halt from 60 mph in just 130 feet. Full instrumentation, including electric clock, is a first for BMW.



Sport is the open highway, snaky mountain roads and fast stretches of Interstate. The R90S longs for the no-speed-limit Autobahn.

The Sport is by far the strongest production motorcycle BMW has ever made. Given a handful of throttle, the Dell'Ortos inject fuel into the engine to balance the inrushing air and the Sport responds smartly, accelerates away strongly without a trace of stumbling. The healthiest part of the power range is from 5000 to 7500 rpm. Unlike most other Superbikes the R90S is free of harsh engine reaction when the trigger is pulled. There's no wailing intake drone, sharp exhaust growl, handgrips vibrating out to the size of baseball bats or trembling foot pegs. The R90S is to other Superbikes what a Boeing 747 is to an unlimited-class racing plane. The power is there, but only the muted sensation of speed is revealed.

Regrettably, we have no actual rear wheel horsepower and torque figures on the R90S. It's not possible to attach a shaft-driven machine to Webco's dynamometer. Performance stated in the form of numbers comes from the lights in the traps of the quarter mile. Side-by-side comparison road evaluations are equally important but lack the clocks' precision.

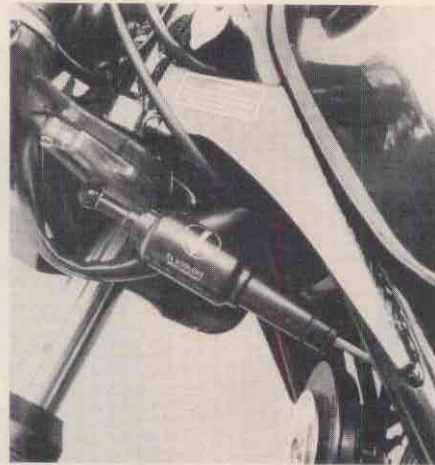
And the clocks said, precisely, fast. The Sport handled the drag strip well, acting unusually only when a hard shift to second gear caused it to lever its front wheel off the ground and cock to one side as it reacted to the twisting force generated by its in-line engine. With best times of 13.07 and 102.15 mph the Sport is unequivocally a Superbike; too, there is no doubt that on the right day and on the right strip it could hunker right down there in the magical twelves. But the right strip would have to offer more starting line traction than either of the two we tried—the R90S produces so much torque that wheelspin is almost impossible to avoid, and a lot of tire-smoke and rubber-squalling is not the quick way down the strip. Too, the Sport suffers a gearing disadvantage; fourth gear was engaged just before the finish line. When R60 gearing was installed the bike's elapsed times dropped more than two tenths of a second and its speed increased a couple of miles per hour.

The acceleration tests proved that the BMW Sport isn't the quickest or fastest motorcycle in the quarter-mile. This should be reflected in its performance on the road, side-by-side with other Superbikes. The Kawasaki 900cc Z-1 and 750cc two-stroke triple, Norton's 850 Commando and the Triumph Trident have all recorded 12-second quarter-mile times and speeds higher than the R90S. They were all stock and, except for gearing changes, in standard trim. The Z-1 went .69-second quicker and eight mph faster. Yet, to our bewilderment, the BMW Sport pulled away from an accompanying Kawasaki Z-1 during open road tests. The Sport

would do it every and any time in any gear; both bikes were loaded equally and in good running order. The comparison roll-ons were repeated often and the results were always the same, with the BMW nosing ahead.

The Sport frame is the same as last year's 750 with the two-inch longer swing arm. The R90S chassis has some additional gussets, but the geometry is unchanged. BMW uses large 1-5/16-inch OD tubing for most of the frame. Ugly brackets and tabs are almost non-existent, because the engine's crankcase hump contains most auxiliary components. The chassis design offers little rigidity from triangulation; it relies on large tubing for strength. The right swing-arm tube doubles as drive-shaft housing and structural member, not only enclosing the drive shaft but also locating the rear wheel. The swing arm pivots on tapered Timken bearings rather than the usual bushed shaft. Tension on the bearings can be adjusted externally to eliminate play at the pivot point.

The front forks are the same internally as those on last year's 750. They have soft springing for maximum comfort and deliver a whopping eight inches of travel. These forks give the rider the most deeply

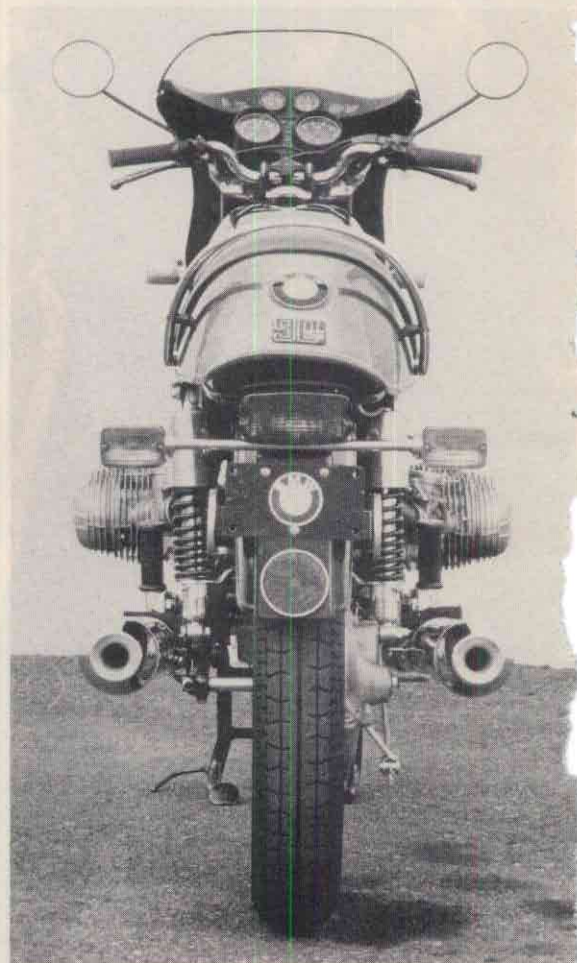


Adjustment of the steering damper occurs by moving the top end out from the frame head center. There are three adjustments.

cushioned ride of any road-bike front suspension units made. Every millimeter of surface roughness is absorbed by the forks, not the chassis or rider. They provide perfectly posh touring comfort, but in doing so fail to provide the steadiness needed for the exceptional handling that should be inherent in a sport motorcycle. The soft suspension and extra-long travel are at odds with the sporting concept of the R90S. The same condition exists at the rear. The shocks are also the same as on the 750, with slightly stronger springs; they still deliver a soft, spongy ride.

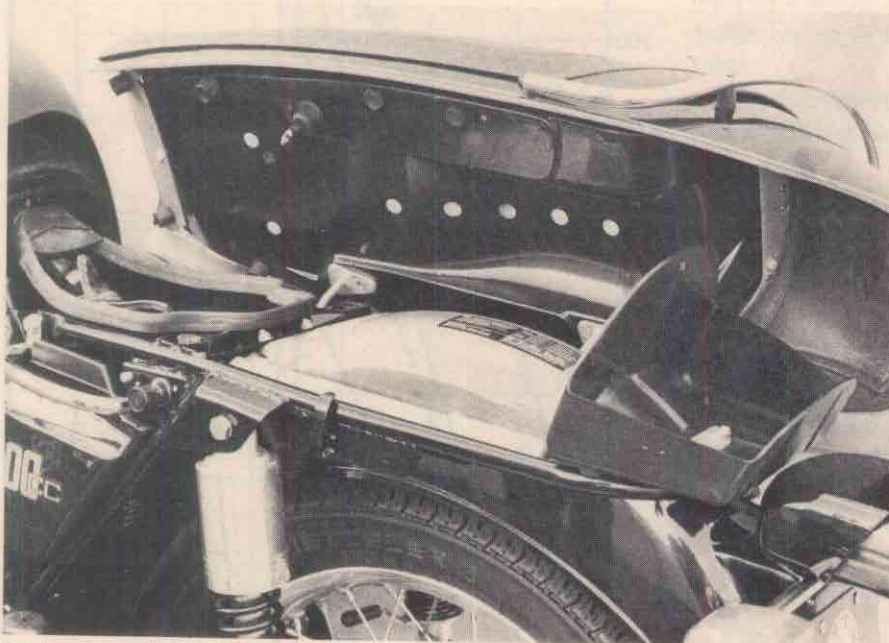
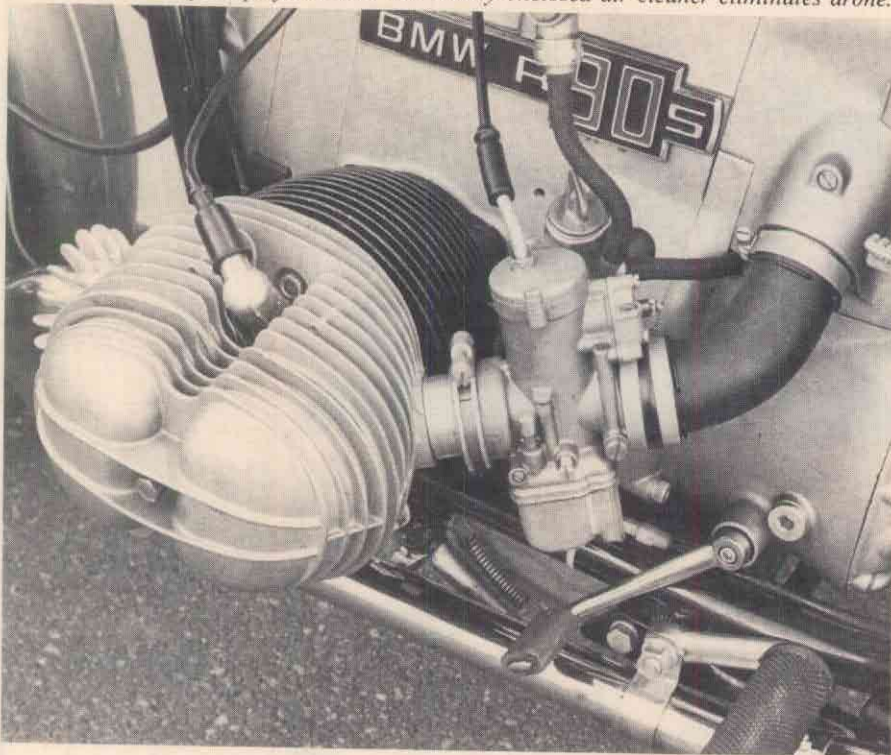
As a sport motorcycle, the R90S has one other prominent weakness—its tires. Both front and rear tires are nylon Metzeler touring specials. The rear has a

BMW thoughtfully provides a super-bright quartz iodyne headlight but the odd lens cut produces a poor light pattern.



Engine width is broad at 29 inches. Exhaust and engine noises are pleasantly minimal. Tire life is long, but the hard nylon skins provide poor traction.

Big Dell'Orto carburetors with accelerator pumps deliver good high speed mixtures but cause rough low speed performance. The totally enclosed air cleaner eliminates drone.



Under the locking seat are two large tool trays for spacious storage. The saddle design and construction appears conventional but gives rider and passenger a great ride.

cross-hatch tread pattern; the front is ribbed. These tires are just not suited for traction or stability at high lean angles. The nylon carcass is hard and does little to provide the stick-to-the-road qualities we expect in a motorcycle capable of near-12-second, ton-up quarter-mile acceleration and 120 mph plus speeds. The touring tread pattern and hard rubber compounds are good for wear resistance—that's their only advantage.

The suspension and tire shortcomings limit the handling tremendously. The

tires give slightly in hard, fast corners and let the bike crawl. On perfect dry asphalt the traction is good. But when the tires run over small gravel spots and smooth blobs of tar they slip enough to cause the rider seat-gripping concern. A single experience on wet roads with these tires gave us reason enough to avoid rainy-day rides.

Installing top-of-the-line road tires will certainly make a worthwhile improvement in cornering traction and overall riding security, but they would magnify

the effects of a supple suspension system. Cornering at anything above a brisk pace, particularly on a rifled surface, causes the suspension to work furiously. Too, the Sport wallows when forced into sharp lean angles. The enormous rise and drop of the front end (remember those eight inches of fork travel?) might give most riders some psychological alarm about the valve covers hitting the road. Fortunately, most riders won't lean the Sport that far.

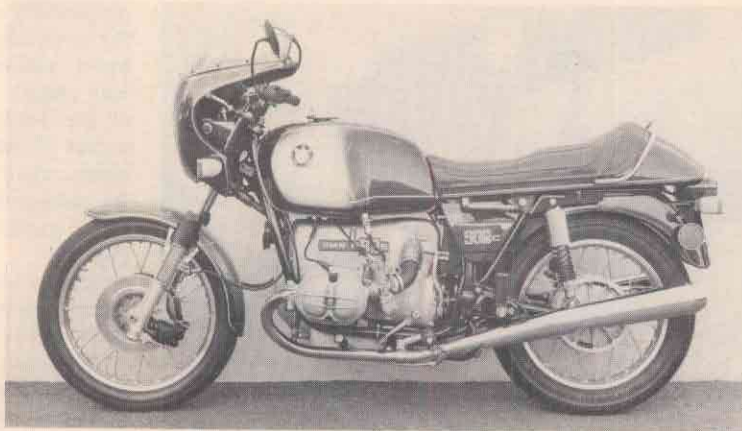
Setting aside the BMW's soft ride-induced limitations, we found handling to be excellent. Steering is secure and stable at all speeds on the open road. Steering head bearings are tapered Timken rollers (in place of plain ball bearings). The double-acting hydraulic steering damper uses a novel adjustment mechanism: one end of the damper is fixed to the chassis while the other end is located in a slotted channel under the bottom triple clamp. The steering damper knob turns a shaft going down to the channel and damper end. Three settings are available: the zero-stiffness adjustment places the damper end in the middle of the steering axis (no damping affect); number-one setting moves the end out $\frac{5}{8}$ -inch from center; number two position moves the end out $1\frac{1}{4}$ -inch for maximum travel and damping. Clever, and it works.

Comfort is supplied in abundance. There isn't another road machine we have ridden that matches, much less exceeds, the ride and seating comfort of the R90S. Though it is not as vibration-free as some, its riding position, handlebar shape and saddle design have been very well executed; they're not just afterthoughts. The attractive bikini fairing actually makes a larger contribution to comfort than to appearance. Un-faired machines don't offer any upper torso protection from wind buffeting. The R90S fairing eliminates all the buffeting and most cross-wind abuse absorbed from the waist to the neck. We were both surprised and pleased that the fairing worked so well. By deflecting the airflow off the rider's mid-section, longer sustained high-speed (above 70 mph) riding time is possible without rest stops.

The R90S isn't perfect. The Sport produces a gentle buzz at its foot pegs and the handlebars shudder slightly. Engine vibration is still below the levels of the Z-1, 850 Moto Guzzi or any Harley V-twin.

The gear-driven throttle assembly is smooth and easy to turn. It was designed to open the smaller carburetors by twisting $\frac{3}{8}$ of a turn. With the bigger carburetors on the Sport, the slides must be pulled up almost $\frac{1}{4}$ -inch farther. To get wide open throttle the Sport requires a full half-turn of the grip. Unless you have a double-jointed wrist, it's a two-twist operation.

Shifting isn't as smooth and quiet as we would expect from a \$3430 luxury speedster. Getting into first from neutral



BMW R90S

Price, approximate suggested retail \$3430

Tire, front 3.25 in x 19 in. Metzeler
 rear 4.00 in x 18 in. Metzeler

Brake, front . . . Dual hydraulic disc, 1.375 in. x 10.24 in.
 rear 7.87 in. x 1.18 in.

Brake swept area 116 sq. in.

Specific brake loading 6 lb./sq. in., at test weight

Engine type OHV opposed twin

Bore and stroke . . . 3.54 in. x 2.78 in., 90mm x 70.6mm

Piston displacement 54.78 cu. in., 898cc

Compression ratio 9.5:1

Carburetion 2; 38mm; Dell'Orto PHM with
 accelerator pumps

Air filtration Dry paper

Ignition Battery and coil

Bhp @ rpm NA

Rake/Trail NA

Mph/1000 rpm, top gear 16.9

Fuel capacity 6.4 gal.

Oil capacity 4.2 pts. (with filter 4.75 pts.)

Transmission oil capacity 900cc, .92 qt.

Electrical power 12V, 280 watt alternator

Battery 12V, 25 AH

Gear ratios, overall (1) 13.2 (2) 8.58 (3) 6.21
 (4) 5.01 (5) 4.5

Primary transmission Helical gear

Secondary transmission Drive shaft, 3.01

Wheelbase 57.5 in.

Seat height 30.5 in.

Ground clearance 8.5 in.

Curb weight 498 lbs., with full tank of gas

Test weight 698 lbs., with rider

Instruments Tachometer, speedometer
 w/reset tripmeter

Sound level (California Standard) 81 dB(A)

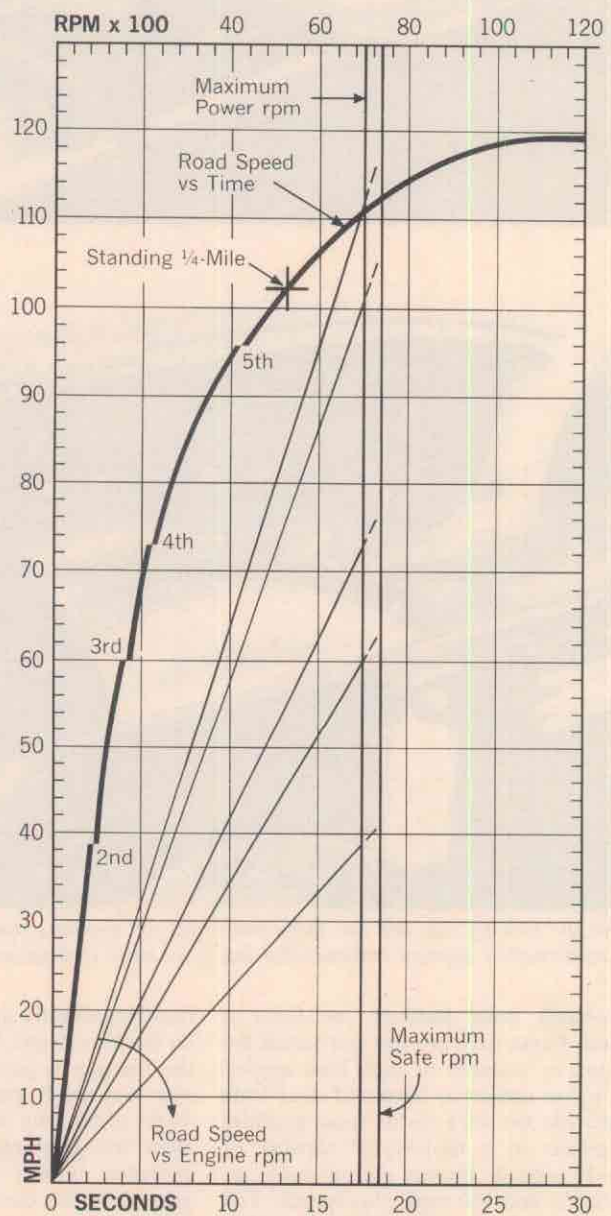
Standing start ¼-mile 13.07 seconds 102 mph

Top speed 126 mph (indicated)

Average fuel consumption 45.8 mpg

Speedometer error 60 mph actual 55.62,
 30 mph actual 27.91

Braking force924G



often requires engaging and disengaging the clutch while holding pressure on the shift lever with your foot until the dogs catch, the gears mesh and the bike moves forward. Shifting from first to second to third, and vice versa, generates a lot of clunking noises. Fourth and fifth gear shifting is, in contrast, smooth and quiet. The clutch lever pull is heavy enough to tire a rider's hand during normal in-town usage. Additionally, the engagement point is narrow and causes jumpy starts and grabby gear changes without special care. More cubic inches and more gears have meant more effort and more noise.

Conveniences? The BMW is loaded with them. The R90S is a rider's machine and is delivered to its owner equipped to handle just about any problem that might occur on the road. The tool kit is the best in motorcycling—many times better than any other. Included with the basic set of tools and special wrenches is a shop towel, tire patch kit and air pump. No one else does half that much. The wheels, front and rear, can be removed in less than three minutes each. The centerstand is pivoted on the bike's center of balance to facilitate front or rear wheel maintenance. The smallest rider can hoist the 498-pound R90S up on the centerstand without risking a hernia.

The instrument panel is loaded, with indicator lights for neutral, oil pressure, brake wear warning, generator and turn flasher. The 140-mph speedometer includes (for the first time on a BMW) a reset-to-zero tripmeter so the rider can see readily how much of his riding range he's used. Sadly, the expensive-appearing instrument is an optimistic 7 percent fast while the odometer is close (reading 4.9 at an actual 5.0 miles). The 8500-rpm tachometer is equally attractive and easy to read. Two additional instruments are inset in the fairing dash panel of the Sport. To assure the rider of sufficient charging current from the alternator, a voltmeter (one that reads a steady 13.5 to 14 volts at anything above idle) is placed on the left. Next to that is a handsome electric clock with sweeping second hand that keeps remarkably good time. Not since Ariel in the early Thirties included a wind-up eight-day clock on their Square Four has a clock been standard on a motorcycle. All of the instruments are nicely illuminated for night riding.

The 280-watt electrical generating system is abundantly able to power two additional quartz iodine lights. Standard on all the BMW's this year is a 55/60 watt quartz-halogen headlight that's the brightest we have yet seen on a stock motorcycle. It provides terrific illumination for fast, straight-line night riding. However, the beam appears to have been designed for automotive use—where the vehicle remains relatively level during cornering. Low beam is biased strongly toward the right side of the road with the left portion cut low and flat. High beam

is also rather flat on the upper half of the beam. Without the conventional oval shaped beam it's impossible to see as well into a turn, when the bike is leaned over, as with a standard motorcycle headlight.

The ignition key is now conventionally slotted and broached rather than the easy-to-pick nail of years past. It also serves to lock the under-seat storage area and fork head. Under the saddle are two large, out-of-the-weather trays for tools and sundry other items. The rear suspension units have permanent spring adjustment levers—no special tool needed. The GP-type gas cap pops open with the touch of a thumb and doesn't leak a drop when closed. The factory has thoughtfully included a kick pedal for auxiliary starting. It's only effective when the engine is hot; cold starts by foot power are virtually impossible.

BMW is one of the few manufacturers still retaining a throttle friction screw in the right-side lever casting. It's out of the way, but handy for those long, open road stretches.

Everyone notices the powerful double-disc front brake that looks, and is, capable of stopping the Sport from 60 mph in just over 130 feet (making the Sport the fifth-

hardest stopper ever tested by *Cycle*). But few people notice that there's no master cylinder on the handlebar. BMW has placed it under the gas tank, just behind the head stock. A cable from the right lever actuates the master cylinder which works the brake calipers. In this location it is hidden from sight as well as protected from damage, as is so common in the event of a spill. Since checking and filling the reservoir is seldom necessary, it's not really inconvenient to have it under the tank.

Operating economy makes long-distance, high-mileage running ability a welcome feature as we approach dollar-a-gallon gas prices and rationing. We averaged a solid 45.6 mpg with the Sport, with a high of 53 mpg and a low of 42.8 mpg. All of these figures were recorded at unusually fast riding speeds. Its cruising range is a convenient 250 miles per full tank which is over 100 miles beyond most roadsters. During our 3000 test miles the engine drank a quart of oil, most of it consumed during break-in. Never was it necessary to get into the tool kit. Not one nut or bolt fell off or loosened. The only adjustments made to the bike were

(Continued on page 106)

The R90S provides astonishing comfort while cruising at highway speeds.



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MARCH 1974

BMW R90S *Continued from page 41*
the mirrors and, on one occasion, the
clutch cable.

Very few motorcycles like the BMW
R90S exist today. A lot more could if
manufacturers were pressed, or enthused
enough about motorcycling, to develop
sport-type machines. But have we arrived
at the day of the \$3400 production motor-
cycle? We have to wonder. With the Moto
Guzzi and Ducati sport models available
at \$940 and \$1180 less, respectively, than
the R90S, the price of the BMW is hard
to justify. Then there's the Kawasaki Z-1,
able to do about 85 percent of what the
R90S does best and capable of some
things better; it's cheaper by a gaudy
\$1435.

Still, a high price carries with it its own
prestige. Expensive items reduce the
number of people capable of buying
them; it's the Law of Economic Selection.
And it must be borne in mind that, to
an extent, the R90 Sport is to BMW what
the Hurricane is to Triumph, the Corvette
to Chevrolet and the Avanti to poor de-
parted Studebaker—an attention-getter, a
flag-carrier and an image-enhancer. Peo-
ple will be drawn to BMW showrooms
to view the Sport and to buy an R75—so
goes the thinking. Except there is the pos-
sibility that BMW's American clientele is
so affluent and so horny for the Sport that
they will grit their teeth and shell out all
3430 green ones, reasoning that if it takes
that much money to buy such a superlat-
ive instrument, then that's what it takes,
period. Its astronomic price consequently
becomes, to some, a feature rather than
a blemish.

If that confuses you, join the crowd. Is
the bike worth \$1435 more than a Z-1
(which handles a little better at speed,
goes faster, accelerates harder and stops
quicker)? On an absolute, non-involved
basis, probably not. Is it worth \$940 more
than a Moto Guzzi Sport? Hard to say,
since the Guzzi is a *genuine* Sport ma-
chine (low handlebars, taut suspension,
somewhat uncomfortable ride) while the
BMW is a *sport-type* machine (head fair-
ing, lots of instrumentation, a hot engine
and steering accuracy sacrificed for riding
comfort). Which raises another point: did
BMW intend to build a real sport machine
and miss the mark, or does that company
know its market and potential market so
well that the machine they have offered
is exactly on the button? Odds are that
the latter premise is the correct one—and
the odds are that BMW will move as many
R90 Sports, cushy suspension, \$3430 price
tag and all, as it can possibly manufacture.
But despite the demand (which already
has been overwhelming), despite the ap-
peal a high price tag has for certain kinds
of buyers and despite the R90-S's opulent
comfort, swoopy styling and surprising
performance, the feeling here is that the
bike's price reflects cost-status more than
it reflects value; in short, a helluva motor-
cycle for too much money. ©

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