

FOR THE JOY OF RIDING

# MOTORCYCLE

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# For The Joy Of Riding

Not just for the money...

For BMW owners around the world too much of a good thing has not lately been the problem. That is, many have had to wait for their new BMW's simply because the factory could not build enough. Year after year full production has been sold out. In part this was owed to limited manufacturing facilities and skilled personnel, both of which had to be shared with the BMW automaking efforts. But now, as you will see in this issue, BMW is *doubling* its motorcycling capacity. This reinforcement of supply should reduce the waiting, but even then it may not catch the soaring demand for these luxury, high-quality, high-performance twins.

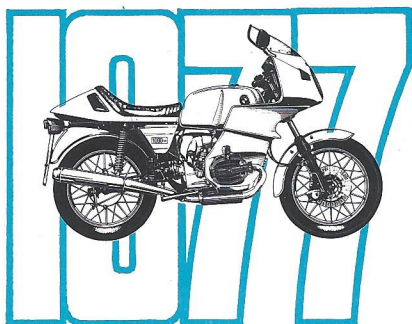
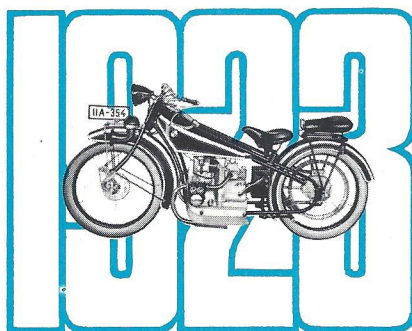
BMW owners have also lately shown an increasing tendency to back up their investment with premium-quality accessories. Today's long-distance rider wants to go equipped in style. And although there is plenty of good equipment around, there is also much that is at best marginal or impractical. Butler & Smith, U.S. distributors of BMW, has therefore expanded its offerings of quality accessories exclusively designed and matched to BMW motorcycles. These include not only fairings, but also safety bars, luggage racks, saddle- and tank bags and much more. A new four-color catalog is available at your BMW dealer. See him also to place an order.

Your dealer has another interesting item for BMW enthusiasts. A new tri-lingual book (German, English, and French) has been published on the technical development of BMW's from the first R32 model in 1923 to the present -/7 series. Specifications of each model are included, plus a summary of BMW manufacturing history and racing programs. Many technical drawings and illustrations add detail, plus photographs of the great solo and sidecar racers and racing teams. The

180-page book is entitled *BMW Motorr der: Typen und Technik* by Heinz Hartel.

Hartel's history includes mention of the fact BMW people even in top management have always been high-performance and racing enthusiasts. The designer of that very first R32, Max Friz, immediately began designing a racing engine after he had completed the first production engine. And he was successful: young Franz Bieber won the 1924 German championship on a BMW. After that came many solo and sidecar championships and many world motorcycle speed records. BMW's Ernst Henne set his first world record in 1929 at 216.050 km/hr and his last in 1937 at 279.502 km/hr, a record which stood unmatched until 1951.

BMW enthusiasm for speed and performance is not only a factory phenomenon, however. Many BMW distributors, such as Butler & Smith in the USA, have been active in racing. Even more so have been BMW dealers and private owners.



In addition to Johnny's Motorcycle Co. of Bakersfield, California, whose rider Ron Pierce recently won a National at Loudon, two U.S. dealers who have been particularly busy lately are Stan Meyers of Doylestown, Pennsylvania, and BMW DuPage Ltd. of Downers Grove, Illinois.

Stan Meyers is certainly not new to racing; he was quite successful racing BMW's himself back in the fifties. Recently he has provided support to Jesse Morris who holds the #2 plate in regional racing, riding a 1974 R90S in the Open Production class. Morris places at or near the top regularly, won a 200-miler at Poconos Raceway in 1976 and a 300-km endurance race at Danville in June of this year. And occasionally when Jesse comes in from an Open Production race, Stan Meyers takes it out for a go at the Open Cafe class. Stan Meyers has also been providing support to one of the new women riders on the scene, Liz Wemmett, who rides a BMW in the expert class and recently took a second at Loudon.

Rex Barrett, top rider and service chief at BMW DuPage, has a somewhat unique claim to fame: he says he hasn't been beaten since 1975. That is, in a race that he's completed. Barrett races an R75/6 (fitted into a -/5 frame) in the 750 class and occasionally in the Open Grand Prix class. He has won two major endurance races, one of six hours at Mid-America raceway in Missouri, another a 200-miler at Indianapolis. His co-riders at Mid-America were the dealership owner, Jim Woodring, and Jim's wife Laura (who rode some 50 miles). They completed 480 miles in six hours for a runaway victory.

And that's how it is with BMW people. They're not just motorcycle manufacturers, or motorcycle dealers, or motorcycle riders—they're motorcycle enthusiasts.

*John P. Conytor*



# New BMW Factory Prepares to Double Motorcycle Production

Confidence in the soundness of its design concept, in the quality of its product, and in continuing worldwide demand for large-displacement, high-performance motorcycles has lead BMW management to an energetic new program of motorcycle production. The BMW motorcycle manufacturing facility in Berlin is being enlarged and modernized to more than double recent output. BMW has committed almost \$100 million (DM 200,000,000) to plant and equipment that will soon raise motorcycle production to 60,000 units per year.

Last year, in recognition of the vastly improved economic status of motorcycle sales, BMW organized all motorcycle production and marketing under an independent company within the larger BMW organization, which is, of course, also a major European auto producer. The new company is called, simply enough, "BMW Motorrad GmbH," or BMW Motorcycles, Ltd.

Even in its first year of existence the new company performed impressively. Motorcycle production rose to 28,000 units. Of this production, some 70% was exported to markets outside Germany, with the U.S. as the largest single customer. Next in order came France, the United Kingdom, the Netherlands, and Belgium. Sales within Germany itself rose 50% over the previous year to 8,040 units.

Until recent years, BMW motorcycles were produced in Munich, from which the "Bavaria" of Bavarian Motor Works comes. But when the company's fortunes in the production of automobiles rose as well, there was much shuffling of plant and equipment. Eventually, motorcycle assembly was moved to a plant in Berlin, the engines and transmissions still manufactured in Munich. But now, with a modern foundry and machine shop in Berlin, all motorcycle production has been centralized at the new location. Only certain sales and research-



and-development programs remain in Munich.

The pictures on these pages illustrate work underway at the motorcycle production facility, work that is actually quite different in character from auto production. Auto building is largely an assembly-line activity, but motorcycle making at BMW is much less so. The BMW motorcycle plant is more closely a highly industrialized craftsmen's workshop. There is much more skilled handwork, much more detailed attention to such subassemblies as engines, transmissions, frames and wheels. Unlike automobile components, almost every single element in a motorcycle is vital to the functioning of the ve-

hicle. Each gets extraordinarily detailed attention.

Of the 1,600 employees at the Berlin factory, a full 118 are devoted entirely to quality control, to inspecting and testing the many elements that make up a motorcycle. Components that come in from outside manufacturers undergo extensive tests for physical and chemical integrity as well as dimensional accuracy.

Each factory-built subassembly is checked, such as the frame, which is welded together by four welding techniques including BMW's unique atomic hydrogen process. Once complete, each frame is mounted on a special optical sighting bench to check its *(continued overleaf)*



dimensions as well as the quality of the welds. More than a dozen gauges test the dimensional tolerances precisely and the telescopic sighting instrument can detect even the slightest misalignment between steering-head axis and swingarm pivoting axis. A strong, true frame is one of the most significant factors in good motorcycle handling.

Another "checking" activity in BMW motorcycle manufacture is that which involves certain vital nuts and bolts. Each of these is hand tightened to the "click" that indicates proper and safe torque. The bolt is then marked with a paint spot to indicate that it has been torqued correctly. Inspectors examine each machine for those paint spots, some 28 of them throughout the machine.

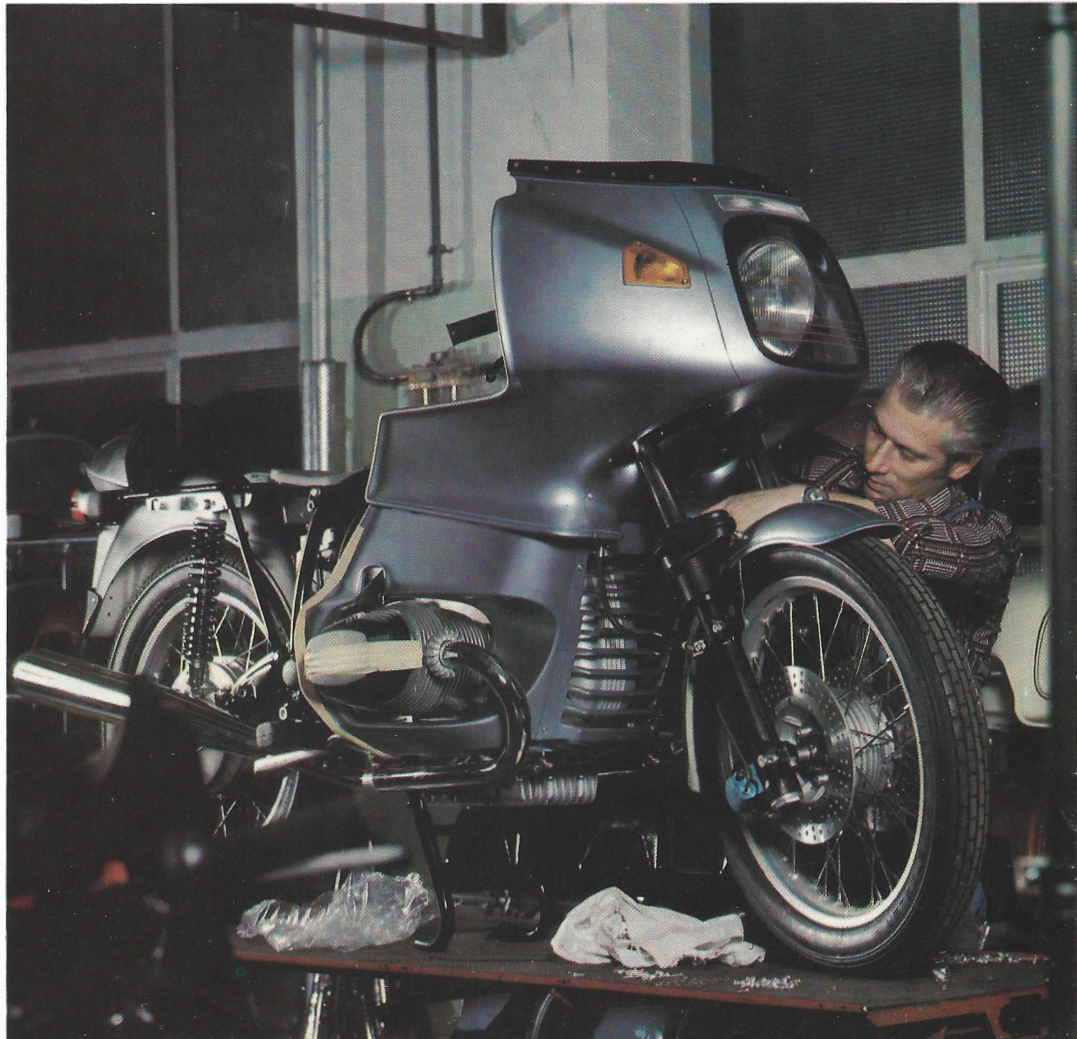
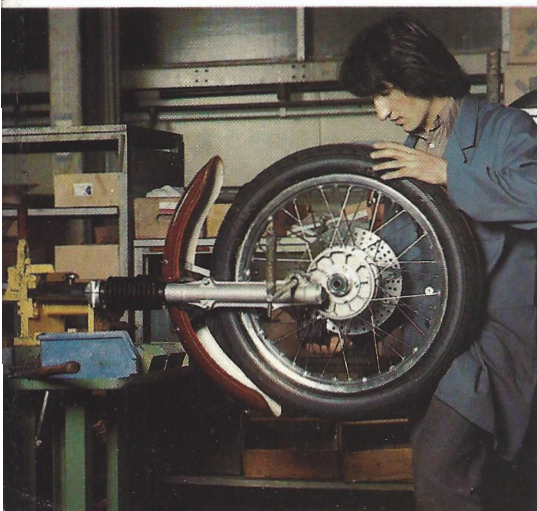
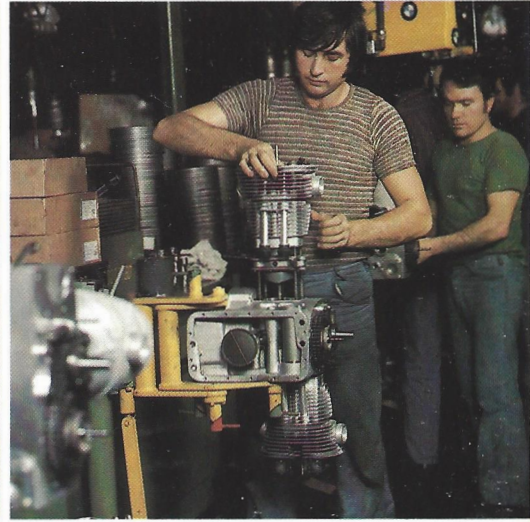
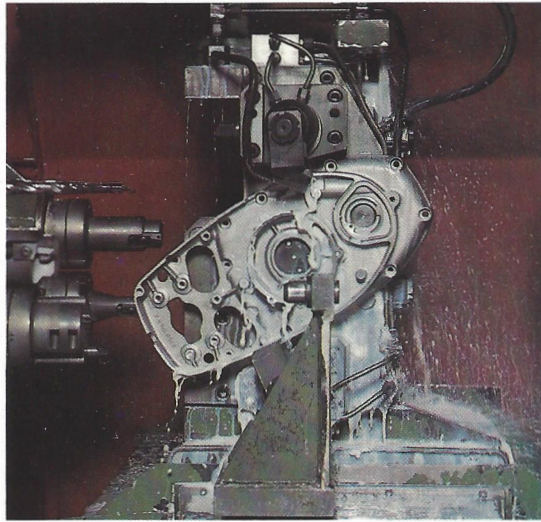
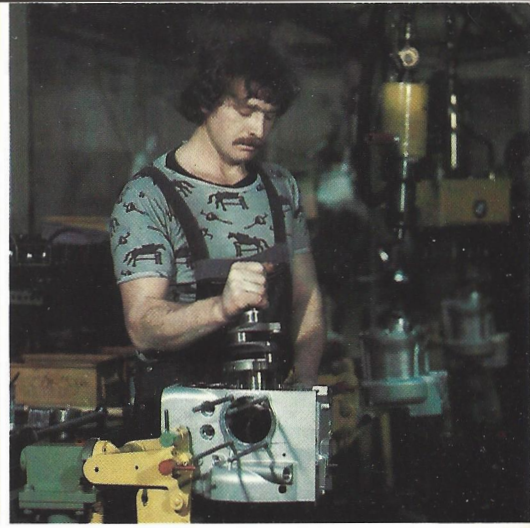
The craft-shop nature of motorcycle making means that workers are not faced with simple, repetitive, and monotonous tasks. Work stations are assigned varied operations, each of which involves a complex set of skills. Workers are highly trained and have a great deal of individual responsibility. They frequently switch from one complex operation to another. This "humanization" of high-volume work adds to the enthusiasm, pride, and dedication by individual workers and is strongly reflected in the quality of their product.

Upon completion of the expanded new plant, the number of BMW workers at Berlin will increase some 60% from the present 1,600 to about 2,600. Over 130,000 square meters of new plant floorspace will have been added. Indeed, the Berlin Senate even granted BMW permission to close a small portion of public road in order to consolidate the new site.

Before it leaves the plant, each BMW is thoroughly tested on a roller test stand and taken for a test ride by a factory rider. Ignition timing, power output, carburetor adjustment—all are checked and adjusted. Then, unlike almost every other motorcycle manufacturer, BMW packs the machine virtually fully assembled in a crate. A special envelope of shrink-on plastic sheeting is placed over the crate and a six-barrel hot air gun seals it off against dust and moisture. With this kind of attention to detail, it is little wonder that demand has been high for the "Bavarians from Berlin". And with doubled manufacturing capability, BMW will be more than prepared to meet that demand.









# Wind Tunnel Tests Refine the Shape of the "RS" Fairing

# Design and of BMW's Long-Travel

BMW designers had more in mind than just a slippery shape when they set out to design the dramatic new "RS" fairing. They weren't looking for a bullet-like top-speed projectile. They sought instead a configuration that would make the BMW motorcycle more rideable at all speeds. And that meant improved directional stability, increased front wheel pressure on the road at higher speeds, and rider protection from wind and weather, as well as reduced aerodynamic drag. They had also to meet various safety regulations for over-the-road vehicles set by different countries. Above all, they wanted the new fairing to improve the rider's relationship to his machine, to enhance his experience of the "hand-in-glove effect", to reinforce the man/machine symbiosis.

Fairing designs were first worked out on engineering drawing boards using established aerodynamic theory. Then a full-size clay model was built. BMW engineers loaded the model and a high-performance R100S for comparison on a truck and set out from Munich for Torino, Italy, the site of the famous Pininfarina wind tunnel. This is the test facility used to shape many of Europe's formula racing cars and high-speed sports sedans.

At the wind tunnel (which was shown on the rear cover of the Winter 76-77 issue of the BMW Journal), a special test stand was used to hold the motorcycle. This stand

could measure and record any lifting, twisting, or compression forces on the motorcycle. Cameras could record the position of the many aerodynamic "tell-tales" (strips of silk) which were taped to the test vehicle. And a computer measured the output of as many as 100 pressure sensors placed about the vehicle.

BMW's engineers quickly learned that their initial design of the "RS" fairing was good, but could be improved. Many modifications such as adding and altering spoilers were tried on the model by reshaping the soft clay. After four days of testing (up to 20 "runs" per day) they had refined the design to a shape that tested out just right. They then returned to Munich to transform that soft clay shape into a buildable motorcycle fairing.

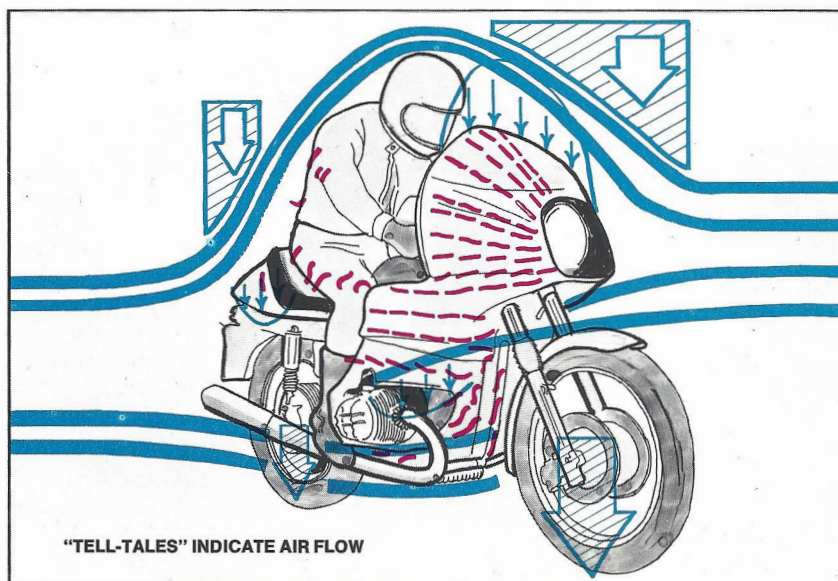
Return trips to Pininfarina retested the new fairing, but this time with real hardware in production form. High-speed tests were run with live riders and with dummies. Tests were conducted in a direct headwind as well as winds at many other "attack angles." Compared with the excellent-handling BMW "S" model, the "RS" showed 17.5% less wheel lift at high speeds and 64% less yaw moment (twisting force) in sidewinds. Compared with normal, unfaired motorcycles the percentages would be far better. In short, the wind testing worked, the design succeeded, and a new concept in motorcycle safety and rideability had come to life.

The telescopic forks that appear almost universally on motorcycles today actually exhibit a wide range of different design and operating characteristics. BMW's long-travel design has earned a reputation for being not only unique but also outstanding. So much so, in fact, that other manufacturers are beginning to imitate it. But imitation is not duplication: the BMW fork has complex construction features that take considerable skill and expense to manufacture. It is a strong, rugged design that provides maximum tire contact with the road and thus superior roadholding and handling characteristics.

Long-travel means that the motorcycle's front wheel can follow larger road irregularities without disturbing the line of motion of the bike or interrupting steering control. A short-travel fork must supply stiffer springing and damping to contain all loads within its movement range, and this makes for a harsher ride. What frequently happens is that short-travel forks are forced to work outside their range, which leads to wheel-hop, fork bottoming, instability, and reduced rider control.

The BMW fork consists of two primary elements: the fixed fork tubes and the sliders. The fixed fork tubes are made of heat-treated steel, hard-chrome plated and precision ground. The sliders consist of an aluminum-alloy casting, which slides outside the fixed tube, and a metering rod and piston, which slide inside the fixed tube. The fork spring, also inside the fixed tube, rests on top the piston and resists compression.

Without damping, the sliders would oscillate up and down excessively—like pogo sticks—once the wheel hits a bump. Damping slows down the motion of the slider, and it does this by squeezing oil through carefully selected orifices. Since the wheel must respond most to the initial impact, there is less damping on compression than extension. In ef-





# Maintenance Unique Front Fork

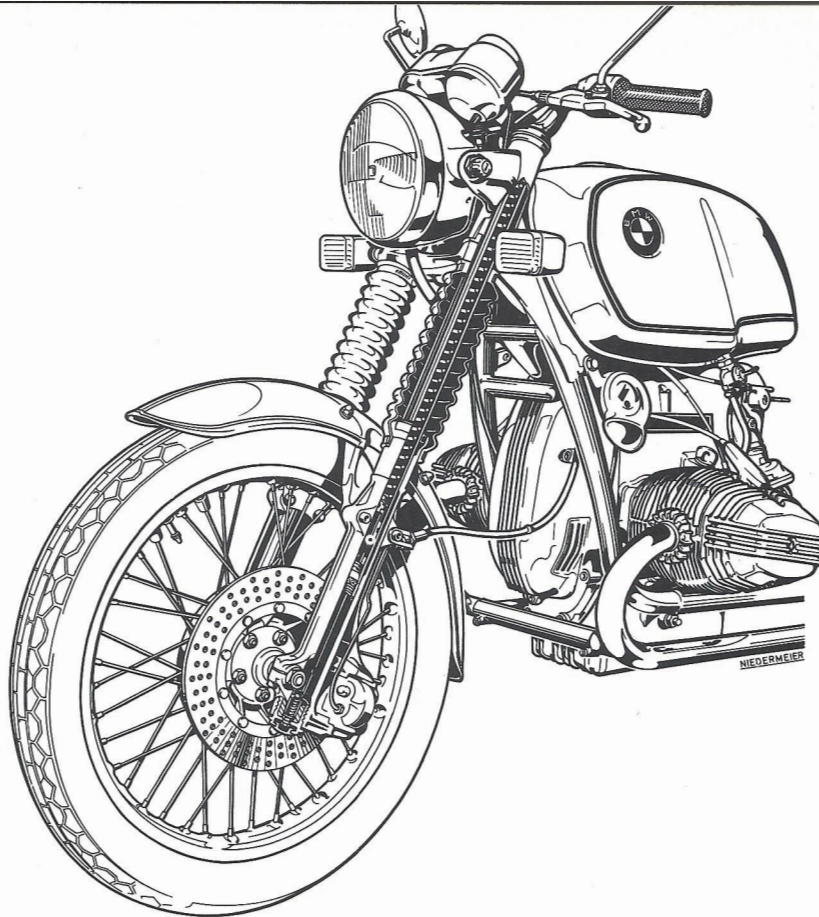
fect, there are more holes to squeeze through on compression, creating less resistance.

Thorough testing taught BMW engineers which spring rates and damping characteristics were best for good handling and hard riding as well as for comfortable cruising. These were then carefully built into the BMW fork. The main metering orifice is actually a hole in a disc at the bottom of the fixed fork tube through which the metering rod passes.

The metering rod is hollow and some fluid is also squeezed through holes in it (on compression). On extension, a valve in the piston at the top of the metering rod closes it to the passage of fluid, leaving only the annular ring at the bottom of the fixed tube for metering. In recent models (-/6 and -/7) this ring is designed to be self-centering on the metering rod. In effect, the disc "floats" in a horizontal plane and doesn't come into contact with the rod. Hence there is no mechanical wear, the size of the hole in the disc remains the same, and the damping characteristics don't change with use.

At the extremes of travel, the BMW fork reaches a condition known as "hydraulic lock" in which fluid is squeezed into a volume from which there is no escape. This does not happen abruptly but rather progressively so that mechanical shock to the system is minimized. A compressible neoprene bumper ring additionally cushions possible shock at extreme extension. At maximum compression a special ball-type check valve permits the fork to recover rapidly so that even under such extreme conditions as riding down a stairway a rider would not face the situation of a fully compressed fork without damping action.

Service and maintenance procedures for the BMW long-travel fork must take into account the unique features of its design. The following four specifics should be particularly useful to BMW owners:



First, alignment is very important to long-travel forks because of the "magnification" of extra length. Correct alignment can best be checked by a dealer with machinist's tools, but one practical indication of good alignment for owners is whether the axle turns freely when lined up in the axle holes (pinch-bolts and axle-nut loose). An indication of misalignment is "stiction" or an initial reluctance of the sliders to get moving on compression.

Another consequence of extra length is the tendency for long fork springs to take a "set" if held over-long in extreme compression. They last indefinitely under normal working conditions. Do not fully compress your BMW forks with tie-downs during storage or long trailer or van rides. If you must tie the bike down, place a styrofoam block under the engine and tie down both ends of the bike to maintain normal fork length.

Second: the major parts of these forks cannot be repaired after an accident. The sliders and the fixed tubes must *both* be replaced if the fork is bent. Also, if the chrome on the fixed tube is scratched through, or fractured, the tube must be replaced. A scratch in the chrome will

concentrate stresses at that point and eventually the fork tubes could fatigue.

Third: the recommended fork fluid in the correct amount is very important. Use only Shell Aero Fluid 4 or other recommended lubricant, 280cc in each leg if the fork has been completely disassembled, 265cc in each leg if the fork has only been drained (some remains inside). Since it is also important that each fork leg has exactly the same amount of fluid, both should be refilled at the same time.

Fourth: if you want to bring your -/5 model up to current specifications, or if you notice a change in its fork damping characteristics, have your dealer replace its fixed metering rings with "floating" rings and the extension neoprene bumpers with new ones. This is an inexpensive conversion involving very few parts. It does not even require removal of the front wheel.

By observing these few service and maintenance rules you can enjoy riding your BMW to the extent of its vehicle life without major fork service. And you will enjoy the unmatched handling, comfort and safety that only the BMW long-travel fork can deliver.

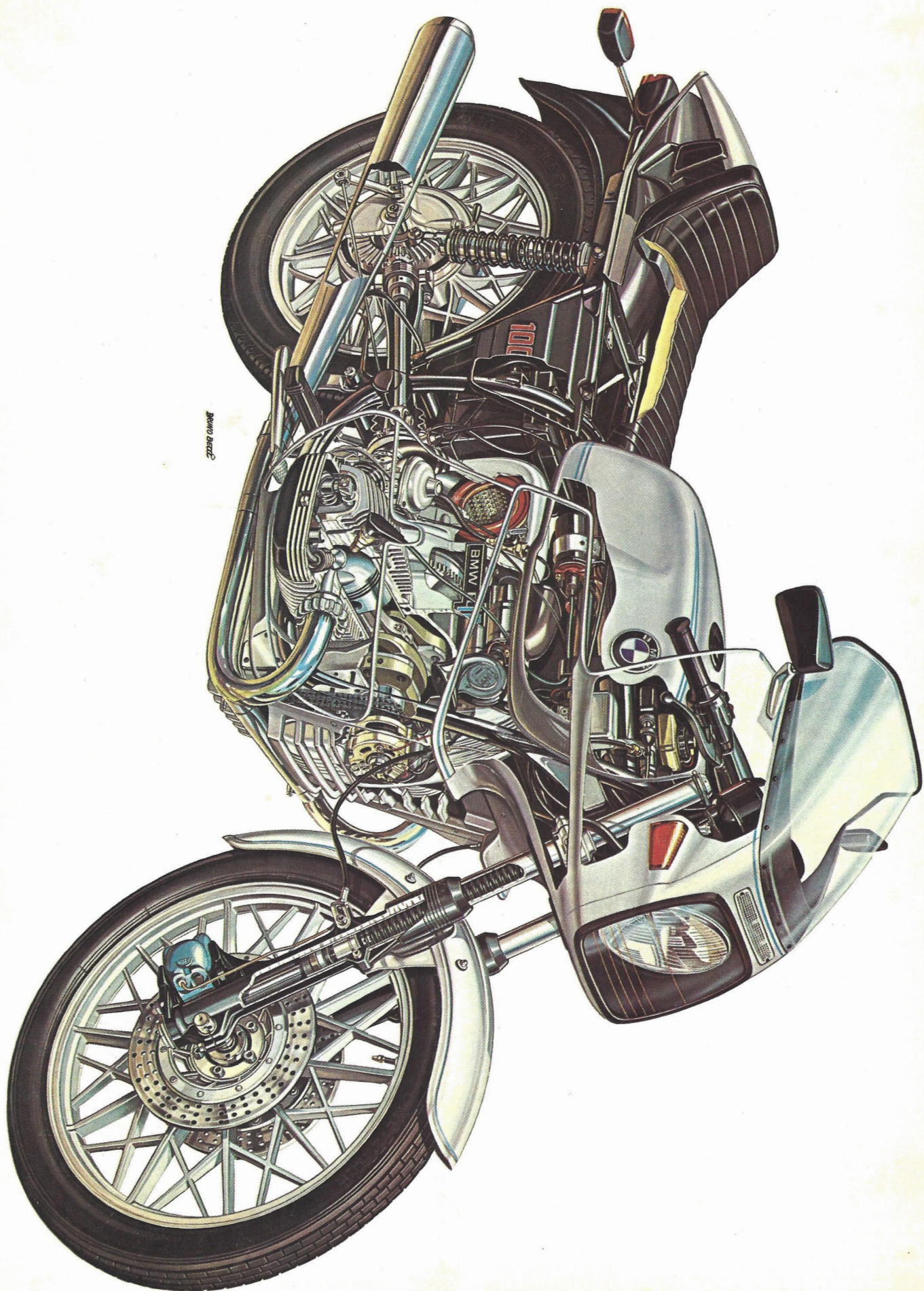


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fan Barbara Jordan  
supports BMW at Daytona  
Speed Week 1977.

Rear Cover: Cutaway  
view of BMW R100RS,  
reprinted courtesy of  
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BMW 1000