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Exclusive look inside
Suzuki's RG500 Gamma!

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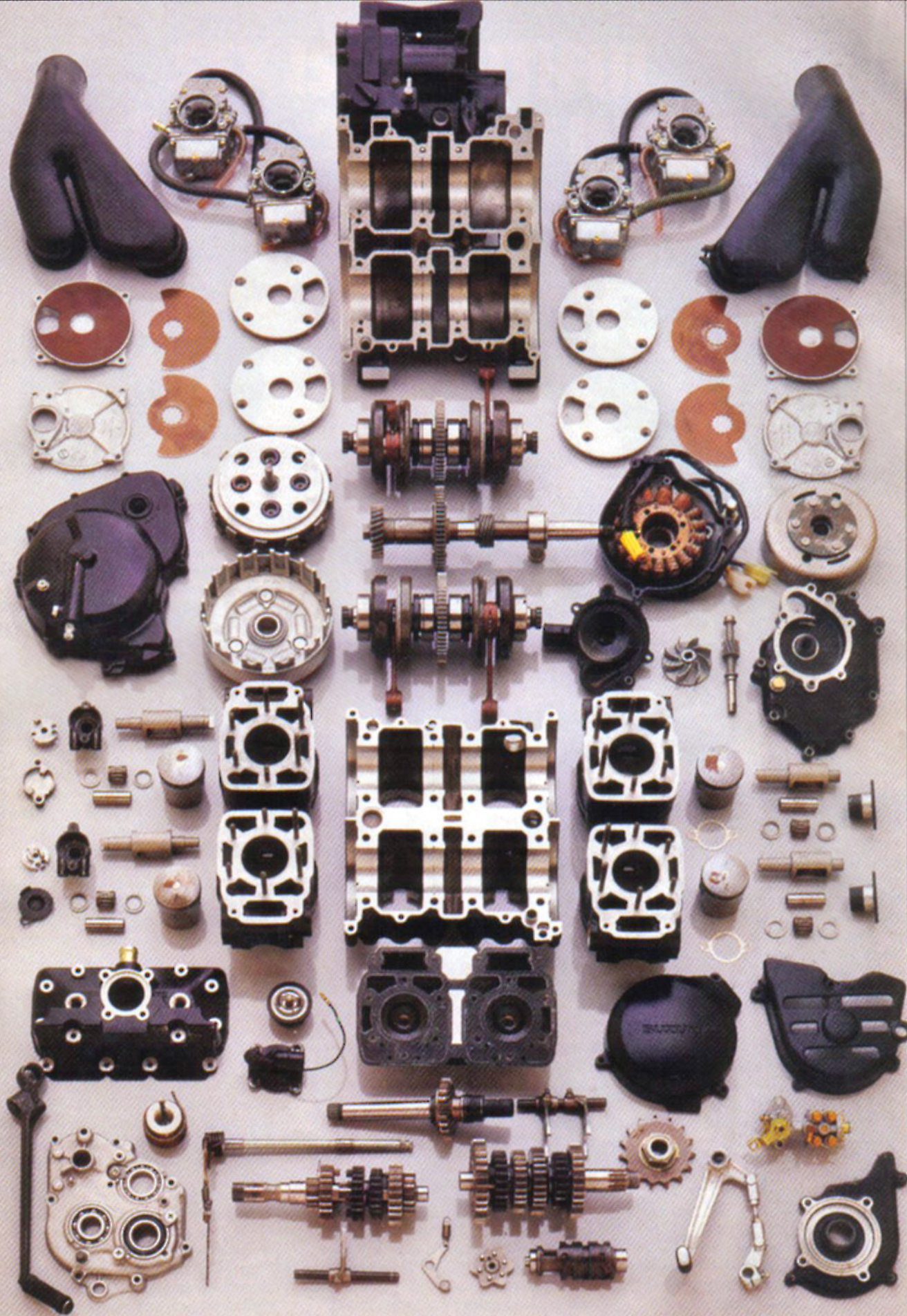
INSIDE THE GAMMA

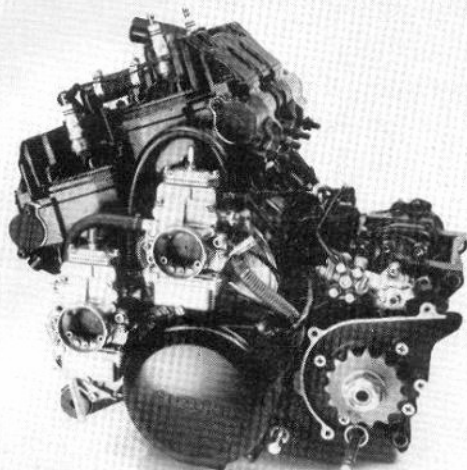
Take a Suzuki RG500 Gamma racer still hot from world grand prix competition, add lights and licence, kick it over and take the rest of the day off. Every rider's fantasy? Sport for the wealthy? Neither. The '85 Suzuki RG500 is real, and it's as close to an actual racer as the law will allow. Come, take a look.

By Chris Knowles

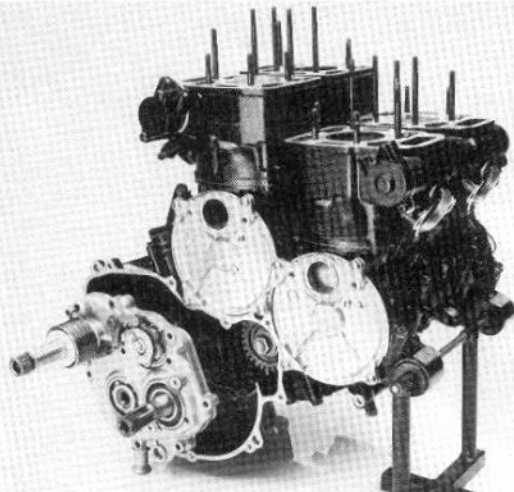
RG500

FULL FLOATER SUSPENSION

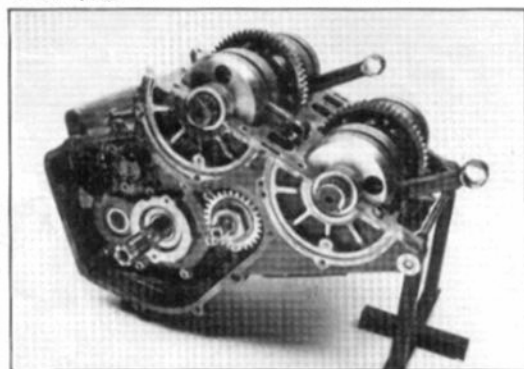




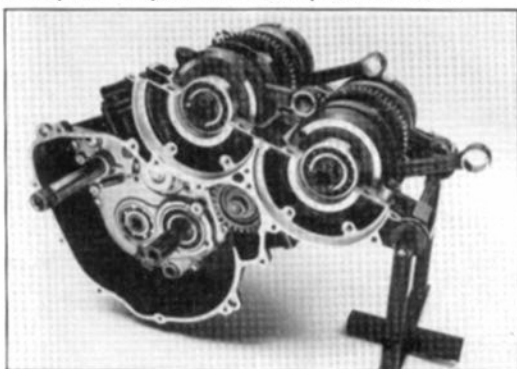
The stepped square-four engine is beautifully compact and simple. There are two carburetors on each side.



The transmission is removed in a cluster. Rotary valve on the rear cylinder is open, on the front cylinder it's closed.



Similarity is evident between crankcases of Steve Gervais's RG500 racer (above), and the production Gamma (right).



Shaft at the left is for the kickstarter. Notches in the left-side crank webs signal the sensors that control the AEC valves.

Racing purists often sneer when a production version of a competition machine is rewarded with the hallowed name and colors of the racer. Often the pseudo-racer mass-produced by the factory bears only passing resemblance to the machine painstakingly hand-wrought in the R&D department.

Notable exceptions have been popping up with some frequency in the last little while. Yamaha's 500 cc two-stroke was given the RZ prefix rather than the racer's OW, although in some respects it was a dead-ringer. Honda's VF750 Interceptor, we've been told, was produced first to work as a U.S. superbike-class racer and then rounded out into a viable street bike.

But no street-going motorcycle more deserves to inherit a famous racing designation than Suzuki's new RG500 Gamma.

We took our wrenches to the only RG500 in Canada, and one of only a handful of prototype versions in the world, to find out just how closely it mimics race design, and how it compares with its natural rival, the Yama-

ha RZ500. Handling the spanners was Wes Pratt, mechanic to Suzuki racers Tom Herron when he won the Isle of Man TT and Barry Sheene when he won his two world 500 cc championships. Wes is now technical training co-ordinator at Suzuki Canada in Toronto.

The Gamma we disassembled in fact had a 400 cc engine, which Suzuki says will be bored to about 500 cc for Canada and other markets. The prototype was rough in spots, but generally was far closer to a final production version than the RZ500 prototype we tore apart for the March '84 issue.

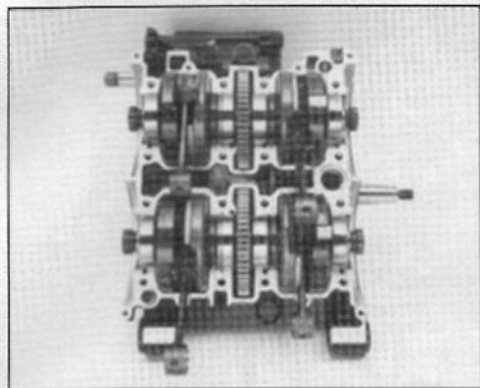
The Gamma uses a square-four, two-stroke, liquid-cooled engine with rotary-valve induction and Suzuki's own version of a variable-size exhaust chamber, called Automatic Exhaust Control. The cylinders are stepped — the rear two sitting higher than the front two — to allow the gear cluster to be moved forward for a more compact engine, and to expose the rear cylinder heads to some cooling air flow. Although the motor is liquid-cooled, the rear cylinders on the race

bike were prone to detonation until the stepped configuration was adopted in '78.

The Suzuki square-four design appeared in '74 as the RG500 (factory designation XR14) to replace the TR-500 parallel twin. Maximum horsepower was 100 at 11,200 rpm. The RGA500 with its stepped cylinders and square bore and stroke was unveiled in '78, producing 122 hp at 11,000 rpm. This stepped-four configuration can actually trace its roots back to the Czechoslovakian Jawa racer of the late '50s. The latest Suzuki racers still use a similar design, but now have AEC chambers and produce more than 140 hp.

This seven-year-old engine design is only now falling behind the Honda and Yamaha leaders on the GP circuit. As a de-tuned engine for a street bike it should be reliable, strong and easily coaxed to produce more power. The horsepower figure being mentioned is 96, compared with an alleged 85 for the RZ.

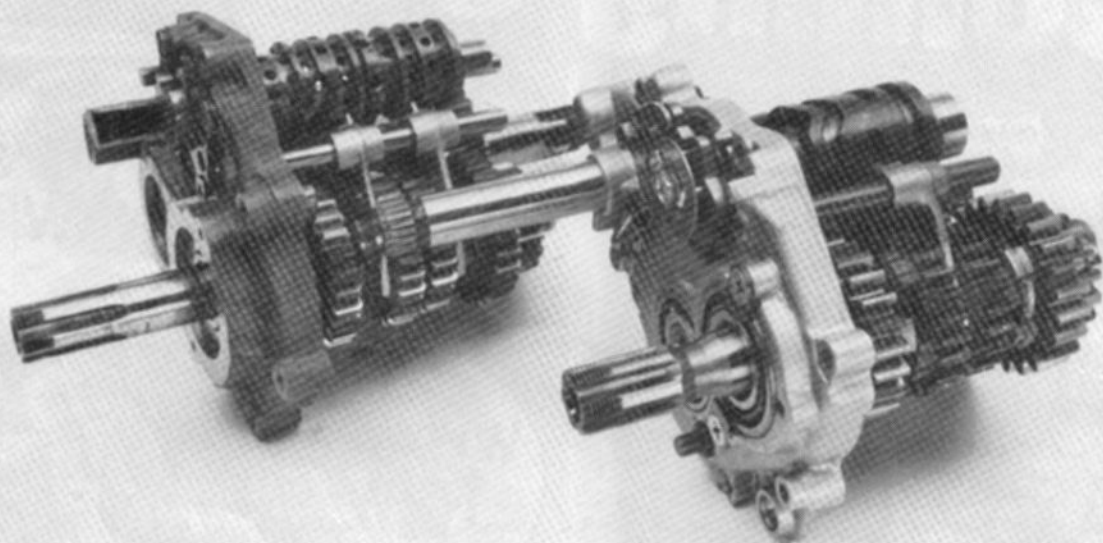
The Gamma engine is almost identical to the race engine in so many ways that it's possible some parts



Each pressed-together crank is geared to the main shaft.

Racer's piston (left) has opening for boost port, and single ring. Shims help centre connecting rod in cylinder bore.

Below: Race gearbox (left) has four shift forks for its variable-ratio tranny, while the street RG has the usual three. Racer's shift drum is drilled for lightness.



RG500 GAMMA

could be interchangeable. The crankcases on both motors split horizontally to expose the crankshafts, while the transmission and starter shaft detach in a cluster from the right side after removing the clutch cover and wet clutch. Getting at the transmission, then, involves only removing 10 bolts in the clutch cover, four bolts holding the clutch springs, the clutch nut and then seven screws holding the case plate that secures the countershaft, starter and main shafts. The primary shaft, located on the same plane as the countershaft and main shaft, is removed separately. All this can be done without removing the engine from the frame. Handy.

With the racer's dry clutch making disassembly even easier, GP mechanics can drain the oil, remove the transmission, change a gear in order to get the proper ratio for a particular track or just a particular corner, and be back on the grid in 20 minutes. It appears that fitting a race-spec dry clutch to the production RG will not be possible.

The clutch, with eight fibre and eight metal plates, is small for an engine of this horsepower (again, this is a prototype 400, and specs could change prior to production). The primary pinion and the clutch gear it mates to are helical, unlike the racer which uses straight-cut gears throughout. Helical gears lose a bit of power to friction, but run quieter. The clutch gear and the pinion on the primary shaft are both cushioned with integral springs.

By the nature of the compact layout of the transmission, gear loading is at a minimum, and thus the gears needn't be excessively beefy, despite the horsepower being handled. The race bike's transmission shafts are slightly sturdier than the production bike's, but the gears are about the same size.

Each bank of cylinders has its own crankshaft. The two cranks are geared to the main shaft and rotate clockwise, again like the works bike, with the diagonally opposed cylinders firing together. The main shaft also drives the water pump, located at the bottom of the engine, and the clutch gear on the right and the ignition on the left.

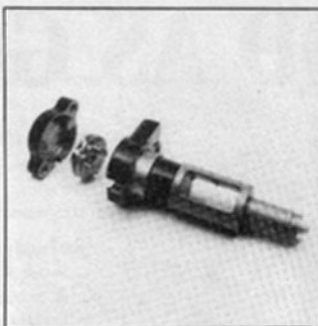
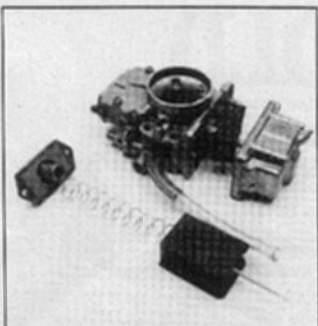
The original Suzuki square-four had a transmission oil pump, but it was deemed unnecessary and eliminated. There isn't one on the street RG either. Also not necessary because of the square configuration is a balancer shaft, as used on the RZ. Vibration is damped by rubber engine mounts.

The RG's connecting rods are thinner than the works units. Both engines use roller bearings, with the rod big end floating and the small end centred by shims. This allows the rod to centre itself in the cylinder rather than its position being dictated by big-end location after the crank is pressed together. There's also less rolling resistance because the big end isn't pressing against thrust washers, and there's more room between the rod and the crank webs for lubricant to reach the bearing.

At both ends of each crankshaft are disc, or rotary, valves to control mixture intake. Each valve exposes the intake port when the piston is on its compression stroke and then rotates to cover the port on the power stroke. The rotary-valve system is used on the Suzuki, Yamaha and Cagiva 500 GP

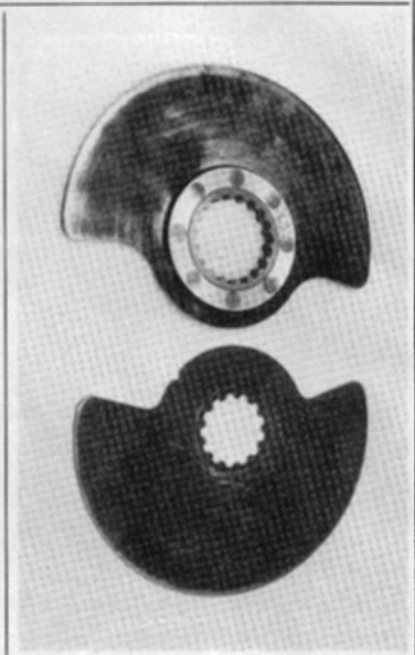
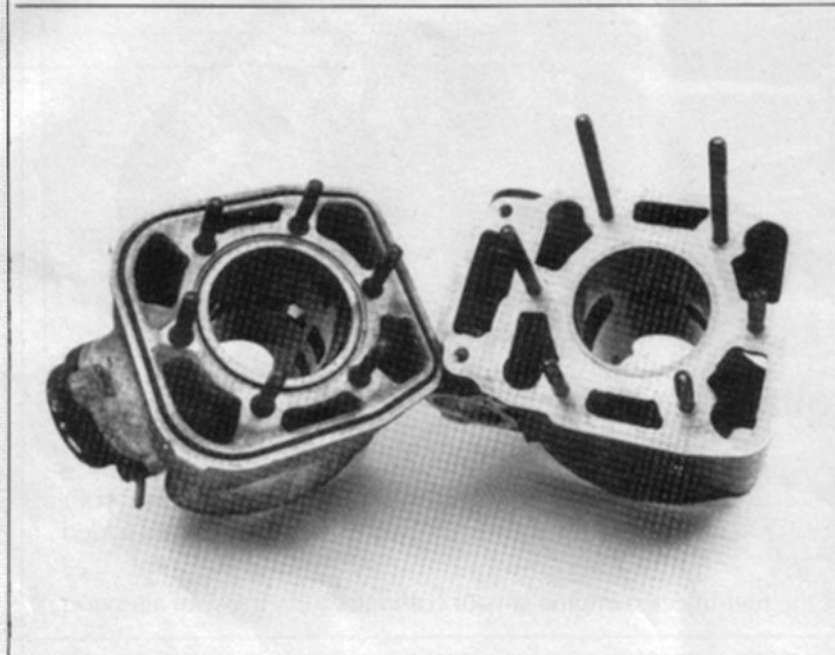
Flat-slide Mikuni carbs are compact and fit snugly against side of engine. On 400 cc prototype carb size is 28 mm.

Below: Race barrel (left) uses O-rings, while the street version has a head gasket. Passageway to the AEC chamber on the street RG can be clearly seen. Note differences in the size and number of transfer ports in the two barrels.



AEC valve rotates to expose opening, through which exhaust gases can reach chamber cast into head. Better midrange without sacrificing top-end power is the aim.

Below: Race rotary valve on the top has beefier teeth for meshing with drive gear on end of crankshaft. Race valve also has longer duration, opening earlier and closing later than on the street RG.



racers as well as on the successful Rotax 250 cc GP bike. Rotary valves allow more varied and precise intake timing than with other designs.

Flat-slide Mikuni carbs (28 mm on the 400 prototype) mount on either side of the engine and allow for a short intake tract. The carbs are so compact and so close to the engine that they don't protrude far past the protection of the aluminum frame members; the bike, like its racing cousin, should survive most slides on its side without major carb damage.

The production RG in 400 cc form has six ports per cylinder, compared with the racer's 10. The racer uses one ring per piston while the street RG has two.

Iron liners are used on the production Gamma, whereas present-day race RGs use alloy cylinders with a lining of Nikasil. The stroke of the 400 cc prototype was 54 mm, pointing to a square bore and stroke of 54 x 54 mm in final 500 cc production form. The

new race RGs use a 56 x 50 mm bore and stroke, and according to Barry Sheene, the latter configuration produces superior performance.

Each pair of cylinders is bridged by a one-piece head. Incorporated into the top end is Suzuki's Automatic Exhaust Control (AEC) system, which uses a rotating valve near the exhaust port, as with Yamaha's Power Valve design, but works in practice more like Honda's ATAC system.

The cylindrical valve sits in a chamber above the exhaust port and at middle rpm rotates to uncover a rectangular port through the middle of the valve. The port opens a passageway to a chamber that is cast into the cylinder head. The system effectively increases the volume of the expansion chamber and thereby increases mid-range horsepower.

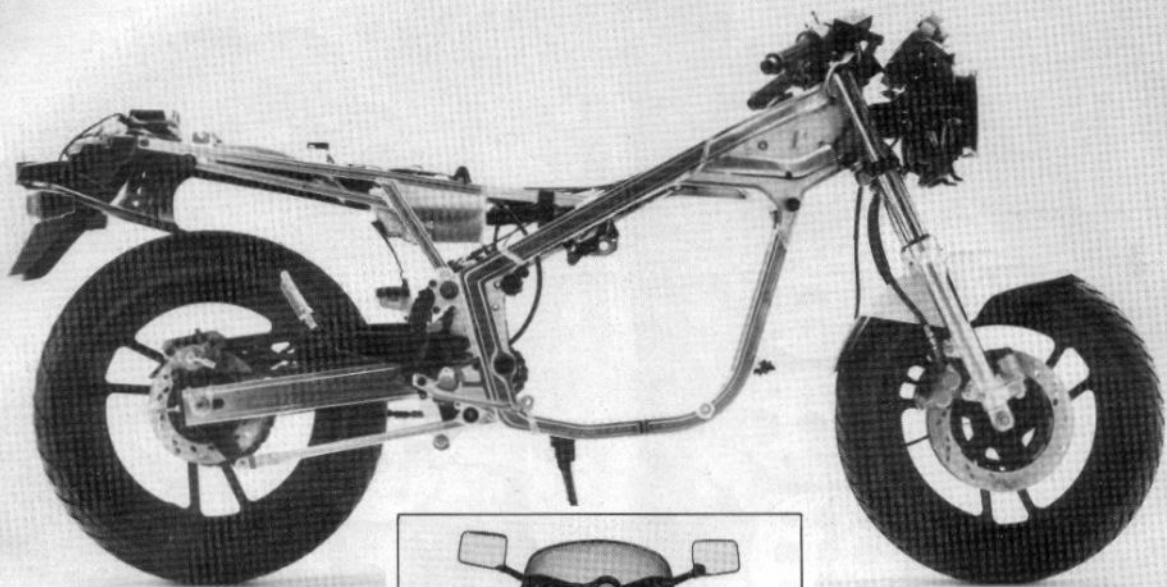
The AEC valves are rotated by bell-cranks that are cable operated by a servomotor located behind the steering head. The servomotor takes orders from sensors mounted in the crankcases. Notches in the left-front and left-rear crank webs signal the sens-

ors. The AEC valves are closed until 6,000 rpm, open fully until 8,000 rpm, and then close again.

Crankcase lubrication is provided by a pump located on top of the crankcase behind the cylinders, and driven by an idler gear on the starter shaft. The racer, of course, uses premix.

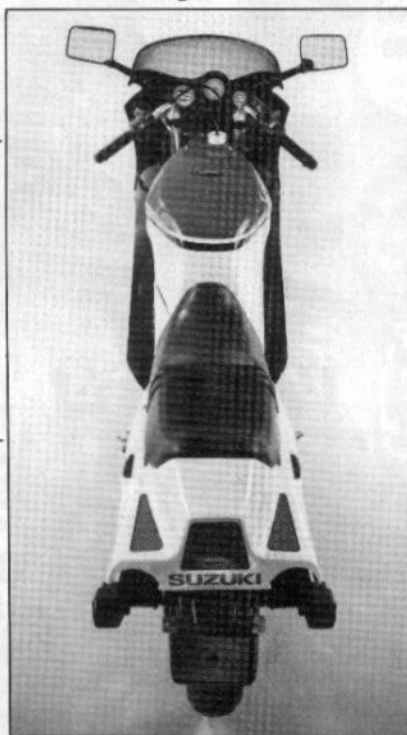
It's exciting to think just how closely the RG you'll be able to buy from your local dealer resembles the RG you could buy only by mortgaging your mansion. You won't find the lovely magnesium and titanium bits on the production version that abound on the racer, but the main components are just short of being identical. The RG is more of a true GP replica than last year's sensation, the RZ500. If it can match or exceed the RZ's performance — as technically it appears capable of — and if its chassis is up to the task, the Gamma will be the terror of production racing in '85. Too bad it's not scheduled to be available before the summer.

The RG uses an aluminum frame with a large forged section supporting the steering head that doubles as the



The Gamma is compact, but seating position is not as cramped as that of the RZ500. Note white faces on instruments.

Aluminum frame should help keep the RG light. We expect a dry weight of about 160 kg for final production version.



RG500 GAMMA

airbox. The foam filter slots in at the top of the forged chamber, and plastic extensions connect the carb mouths to the bottom of the airbox. It's a less convoluted path than the intake system used on the RZ.

A large, thin-wall radiator is rubber-mounted to the front of the frame and connected to the water pump at the bottom of the crankcase. Since coolant flows from the bottom of the engine to the cylinder heads rather than enveloping only the top end, it also helps to cool the crankcase. The same system is used on the RG racer. A thermostat on the street RG assists warm-up.

Expansion chambers from the front cylinders exit normally under the engine while the rear two shoot almost straight back under the seat and exit on either side of the taillight. There are fewer kinks and detours with the rear chambers than are necessary on the RZ. The pipes on this prototype RG were heavy gauge steel capped

with steel silencers, decorated with a sleeve of aluminum. They weighed a ton. We expect the production versions to be lighter, perhaps with aluminum silencers.

As with the RZ, the pipes and side panels are in places covered with insulating material. Racing RGs had a propensity to fry the rider; we hope the production version is less hostile.

Suzuki's road race bikes were the first to use the company's Full Floater rear suspension. The works bikes have a forked pivoting arm with two struts to the swingarm, as on the motocrossers. The RG uses a straight arm with a single strut to the box-

section aluminum swingarm. The shock features hydraulic preload adjustment but no damping adjustment.

The fork has 38 mm stanchions with both air assist and damping adjustment. The twin front brakes should be strong, what with four-piston calipers and 254 mm discs. The floating rear brake uses a twin-piston caliper and a 178 mm disc. New-design Bridgestone tires are fitted to an 18-inch rear wheel and a 16-incher at the front. An integral fork brace also supports the faired front fender.

The oil and coolant tanks, which on the RZ are located high in the fairing, are on the RG situated in more typical spots behind the engine. The battery sits under the rear of the gas tank in front of the oil tank, while the coolant reservoir is just above the swingarm pivot.

Suzuki took the simple approach to building its first street two-stroke since the GTs of the '70s, smoothing the rough edges off a works engine, adding a kickstart shaft, oil pump and alternator. Indeed, the RG500 should well deserve its racing prefix. □