

BRAND NEW 250 AND "KENNY HEAD 1981 YAMAHA



TZ250

For over a decade, the Yamaha 250 twin has been the backbone of lightweight class road racing, whether in local "club" racing or at full World Championship Grand Prix level.

Private Yamaha two-fifties have won World Championships and have even kept riders well in the hunt for titles against the pure "factory" machines of companies such as Kawasaki, who prefer to concentrate their entire race resources on a works effort rather than do anything for the private rider.

Yamaha's TZ250 and its predecessors have enabled privateer riders to make a successful profession out of International road racing and the latest version should give the "independents" an even better shot at Championship honours.

The TZ250 has been re-designed in response to pressure from various Rotax-engined machines which are now coming onto the road race scene. In general, the "old" TZ250 was still a match for the newcomers, but it is Yamaha's policy to provide production racers that give their riders a clear advantage over the opposition.

The 1981 version of the TZ250 should do just that! There's also good news for the Yamaha riders in the 500cc class.

This year's TZ500 is a true "Kenny Roberts Replica" with improved chassis and suspension components, re-designed exhaust system and special carburetors plus modifications to transmission and braking systems in the interests of quicker, easier servicing.

TZ250:

In both chassis design and engine configuration, the 1981 Yamaha TZ250 follows the successful pattern set by the TZ500, which has won World Championships for the past three years.

The new machine is not simply an updated, modified version of last year's model. Chassis and engine are completely new components.

The chassis is a complete double-loop, triangulated cradle with widely-spaced front downtubes, allowing the exhaust system to be routed between them and tucked close in underneath the engine for maximum ground clearance while cornering.

Full triangulation of the chassis tubes at steering head and rear suspension pick-up points means increased rigidity and even more predictable handling.

A slightly-reduced caster angle (from 26 to 24.5 degrees), plus increased weight bias towards the front end (from 51.2% to 53%) means more precise steering. Front fork stanchions are thicker for less front-end deflection and are constructed of special "Du-metal" which gives less friction between sliding and static parts.

The monoshock suspension unit retains all its previous features such as initial coil spring ratio adjustment, gas pressure adjustment and different temperature adjustments for the hydraulic valving. In addition, the unit now offers damping adjustment on both extension and compression strokes.

What all this means is that no other motorcycle suspension system can be so finely tuned to adapt to prevailing track conditions. The main body of the shock absorber is now constructed of special lightweight aluminum, with benefits in respect of both weight-saving and heat dissipation. Fitting length of the shock absorber is adjustable to allow

ROBERTS REPLICA" 500 ROAD RACE RANGE



TZ500

changes in seating position. The lightweight, but rigid, rear subframe is fabricated from light alloy sheet and pivots on needle roller bearings. The subframe carries a wider rear wheel (tyre size up from 3.50 x 18 to 3.75/500 x 18) to cope with the added horsepower of the new engine.

The engine unit is bolted into the chassis via floating rubber bushes to minimise vibration. In fact, the whole chassis was designed via a computer analysis which established the best combination of structural rigidity with light weight and low vibration. The new unit is no less than 3 kilograms lighter than the old TZ250 chassis, which, added to a 5kg reduction in engine weight, means a substantial overall weight loss.

As well as trimming the weight of the new TZ250, Yamaha has also slimmed down the machine's width by 30mm and lowered it 15mm. Finally, they have cloaked it in a new fairing with better aerodynamics and an 8% decrease in frontal area.

The totally new design of twin-cylinder power unit is also based very heavily on the successful TZ500 GP machine.

Bore to stroke ratio is "oversquare"

at 56 x 50.7mm and main technical features of the new motor are Yamaha's patented Power Valve System in the exhaust port and the new-for-1981 "zero cutaway" carburetors (also covered by a Yamaha patent). (See separate features on these items.)

Transfer ports are enlarged for more complete scavenging of the cylinder and crankcase, the CDI ignition has increased performance to deal with the higher-revving power unit and the six-speed transmission has a stronger, more precise shift mechanism.

One very important technical change to the new engine is the use of an oil pump for transmission lubrication instead of simply allowing the gears to run in an oilbath.

Because of this, the amount of transmission lubricant around the gears is reduced to one-third of that carried in the old power unit. Quantity is now just 500cc, which means that there is less resistance to the turning gearshafts and, consequently, more horsepower finds its way through from engine to rear wheel.

The new TZ250 engine is even more compact than its predecessor. It is 338mm long, 350mm wide and

175mm high . . . about 10% smaller than the 1980 model.

Great attention has been paid by Yamaha development engineers to ease of maintenance and the facility for quick repair work. Most important for harassed tuners working under pressure in the pits!

The twin cylinder motor is virtually two singles linked together. Breakage on one side of the engine does not necessitate the whole unit being stripped down . . . the mechanic can simply work upon the broken side while leaving the other completely intact.

Cylinders and cylinder heads are totally separate and the crankshaft is in two halves. Each shaft fits into a central gear, from which the power is picked up and passed into the transmission. The water pump is driven via an internal gear and idling shaft.

In addition, all of the ancillary items such as water pump, transmission oil pump, exhaust power valve governor, CDI ignition and carburation components are all separate, independent units which can be replaced with stripped the major part of the engine.

1981 YAMAHA ROAD RACE RANGE

TZ500:

For 1981, the Yamaha TZ500 is a true replica of the World Championship winner used by Kenny Roberts. What this means is that there are no changes to the basic TZ500 specification but a whole lot of detail improvements guaranteed to enhance both performance and handling.

Chassis design has not changed but attention has been paid to increasing rigidity at both steering head and swinging arm pivot via improved frame gusseting and needle roller pivot bearings.

New wheel rim designs add torsional strength in this area and front rim size has been increased from 2.15 to 2.50 inches, accommodating a 3.25 x 18 tyre.

The new shock absorber with two-way damping adjustment (see TZ250 text) is also fitted to the TZ500, as are the anti-friction "Du-metal" fork tubes. To enable the rider to easily tune his front suspension, the forks have an initial coil spring adjuster.

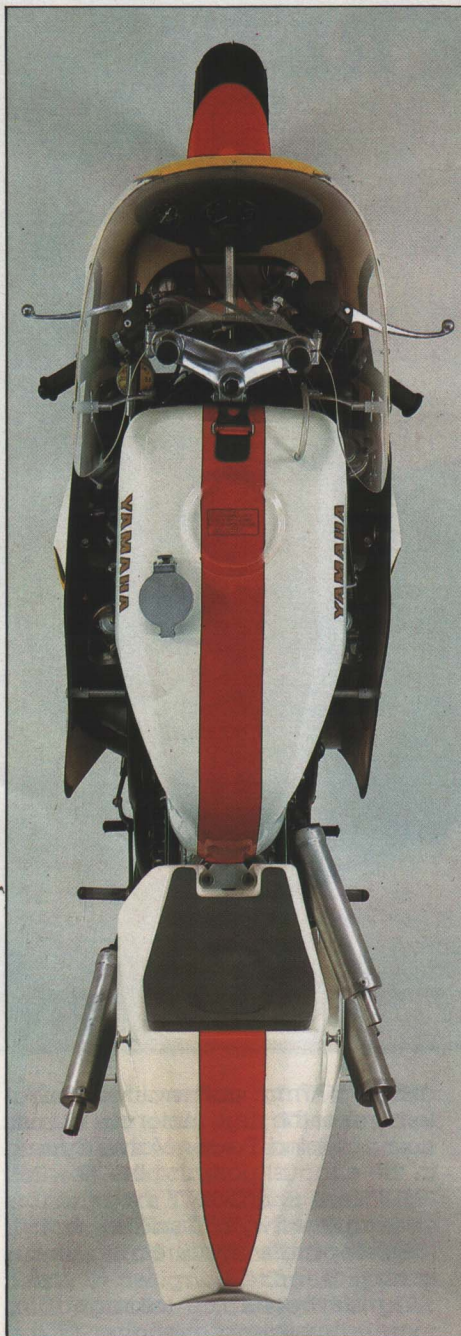
Rear wheel and brake assembly have now been made quickly-detachable so that experimenting with tyre rubber compounds now represents less of a chore for the mechanics.

The exhaust power valve is again fitted to the TZ500 and for 1981 it is complemented by the new "zero cutaway" carburettors. As a result, the water-cooled four-cylinder engine is highly responsive to throttle control.

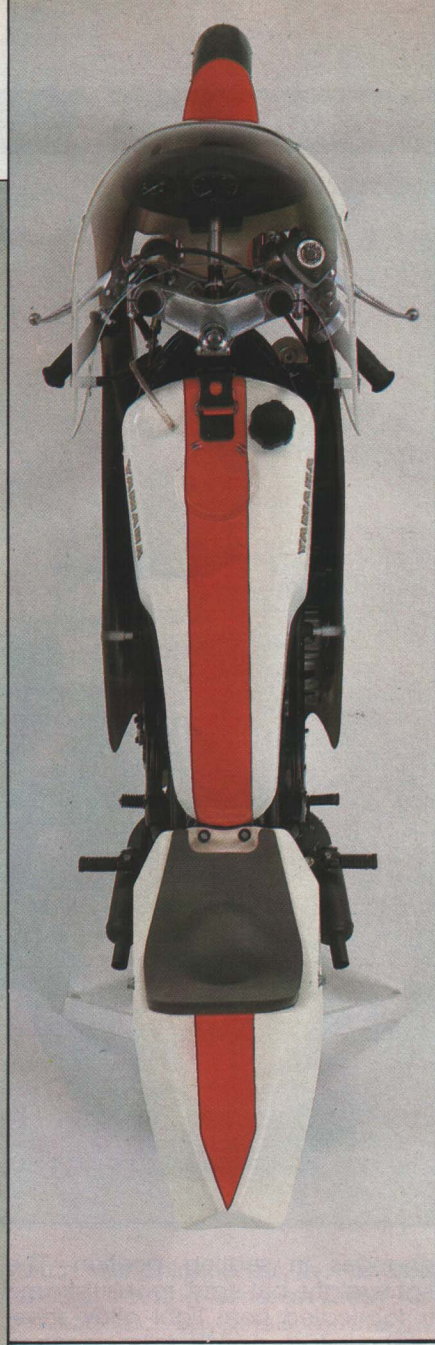
Tucking away the bulbous expansion chamber exhausts on any multi-cylinder two-stroke is always a problem and sometimes compromises have to be made in terms of power output just so that the bulky exhausts can be accommodated without hindering ground clearance or rider comfort.

This had been the case with the left-hand cylinder on the 1980 TZ500. Exhaust efficiency did not quite match that of the other cylinders, simply because the shape of the exhaust pipe was dictated by the space available.

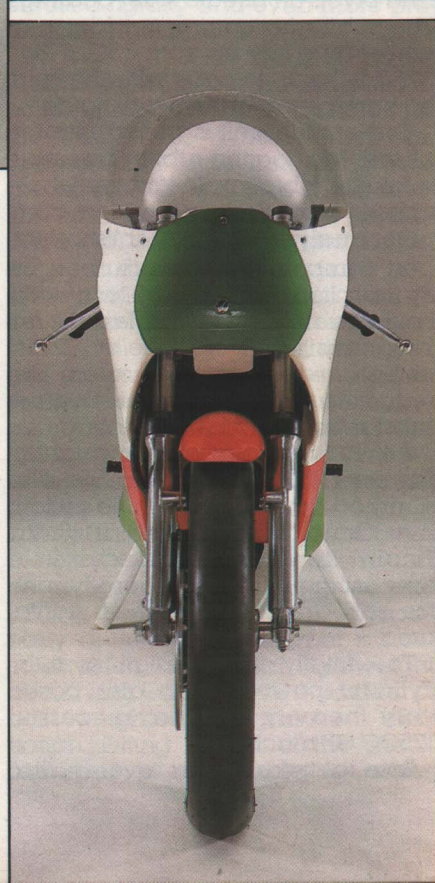
For 1981, Yamaha engineers were able to make some changes to the exhaust shape which allows it to provide efficiency on a level with the other three cylinders. The pipe turns across the top of the transmission and exhausts on the right side of the machine. The result of this im-



Centre: The compact bulk of the 1981 Yamaha TZ500



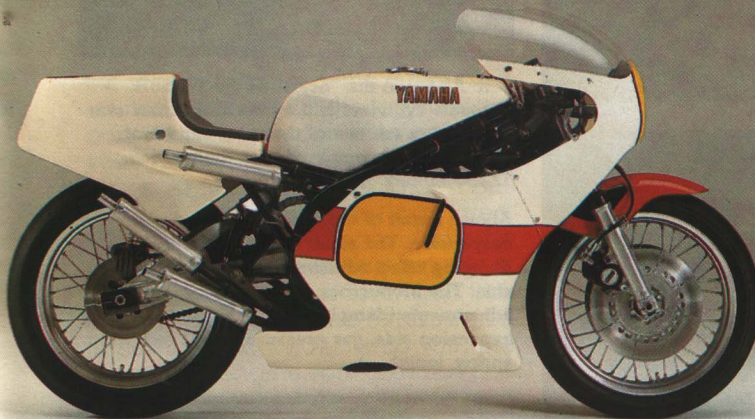
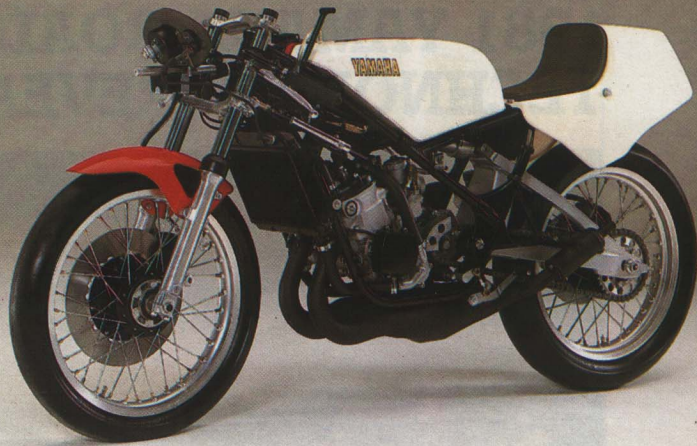
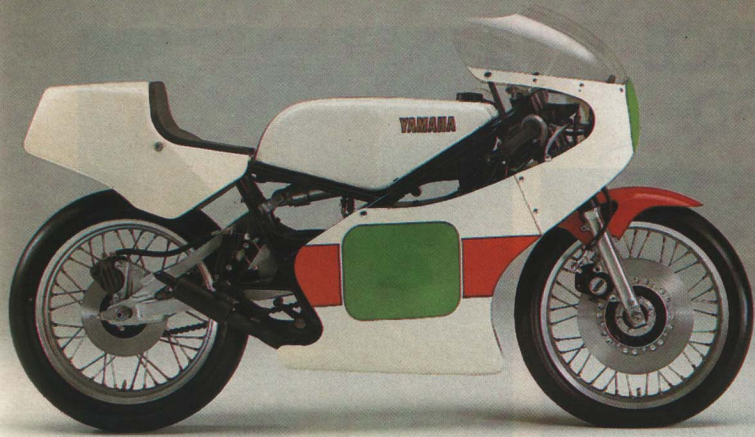
Right: The slim-line TZ250



proved exhaust efficiency is better torque and more power in the mid-range.

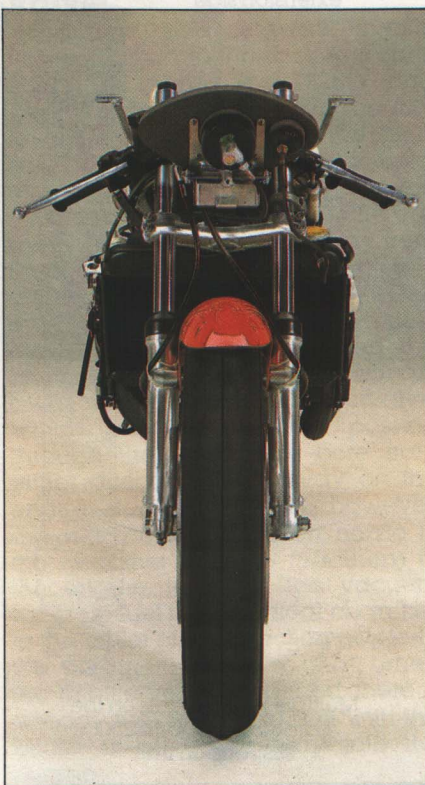
Finally, twin sealed-type bearings on the clutch assembly aid smoother operation and reliability in this area.

So... not a great many changes for the 1981 TZ500 but some very significant ones in making the bike a truly effective weapon for the privateer in the biggest class of championship racing.



Top: With or without fairing, the TZ250 looks light and lean.

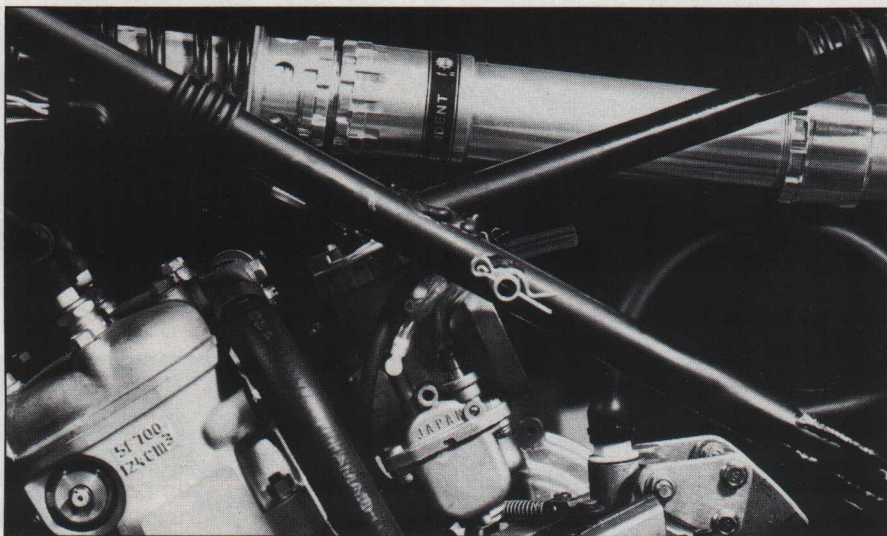
Centre and Below: The mass of machinery crammed into the compact TZ500 chassis emphasises its brute power.



SPECIFICATIONS

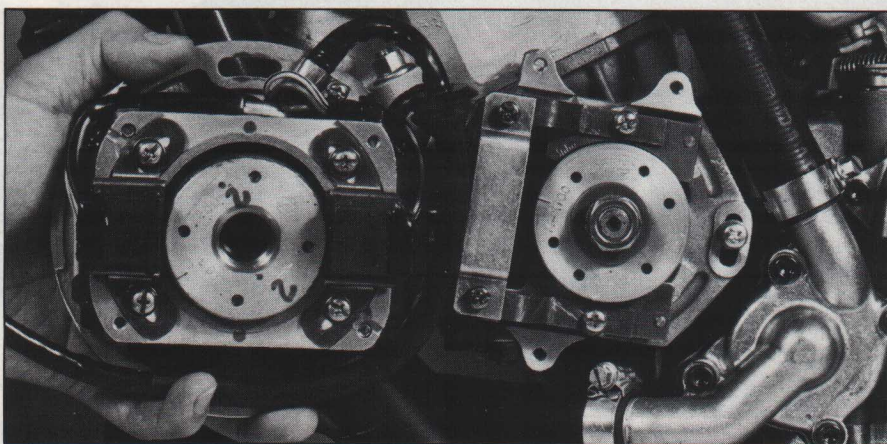
| ENGINE | TZ500 | TZ250 |
|-----------------------|---|---|
| Type | Water-cooled 2-stroke piston valve 4-cylinder with YPVS | Water-cooled 2-stroke piston valve twin with YPVS |
| Displacement | 499 cc | 249 cc |
| Bore x stroke | 56 x 50.7 mm | 56 x 50.7 mm |
| Compression ratio | 7.9 : 1 | 7.9 : 1 |
| Max. power output | Over 110 PS (10,500 rpm plus) | Over 55 PS (11,000 rpm) |
| Max. torque | 7.7 kg-m (10,250 rpm plus) | 3.6 kg-m plus (10,750 rpm) |
| Carburettor | 4-Mikuni VM34 | 2-Mikuni VM36 |
| Ignition | C.D.I. | C.D.I. |
| Lubrication | Pre-mix | Pre-mix |
| Radiator capacity | 2.3 lit. | 1.2 lit. |
| Transmission | 6-speed gearbox | 6-speed gearbox |
| CHASSIS | | |
| Overall length | 2,020 mm | 1,950 mm |
| Overall width | 500 mm | 615 mm |
| Overall height | 1,125 mm (with cowling) | 1,110 mm |
| Seat height | 780 mm | 750 mm |
| Wheelbase | 1,365 mm | 1,320 mm |
| Min. ground clearance | 120 mm | 150 mm |
| Dry weight | 138 kg (with cowling) | 106 kg (with cowling) |
| Frame | Double-cradle tubular type | Double-cradle tubular type |
| Caster | 27°30' | 24°30' |
| Trail | 108 mm | 87 mm |
| Front suspension | Telescopic fork | Telescopic fork |
| Wheel travel | 130 mm | 125 mm |
| Rear suspension | Mono-cross | Mono-cross |
| Wheel travel | 135 mm | 135 mm |
| Front tire | 3.25-18-4PR | 3.00/3.75-18-4PR |
| Rear tire | 4.00/5.75-18-4PR | 3.75/5.00-18-4PR |

1981 YAMAHA ROAD RACE TECHNOLOGY REVEALED:



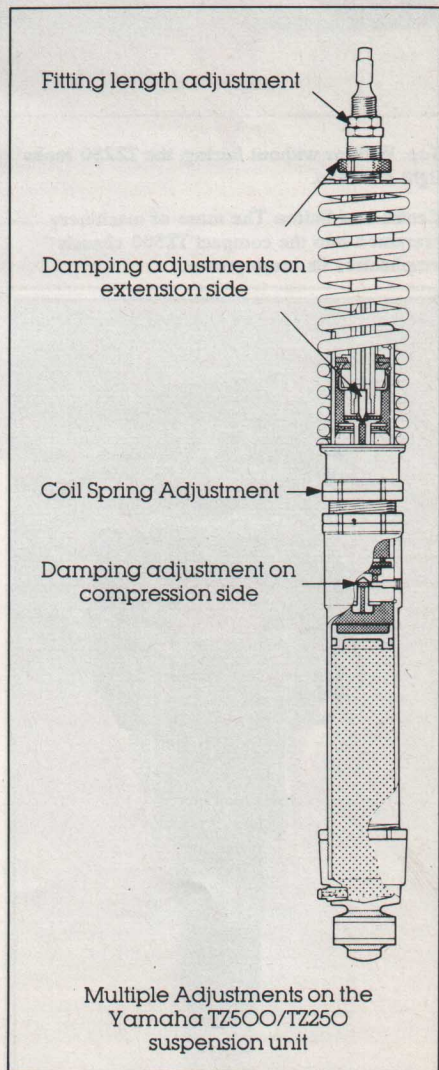
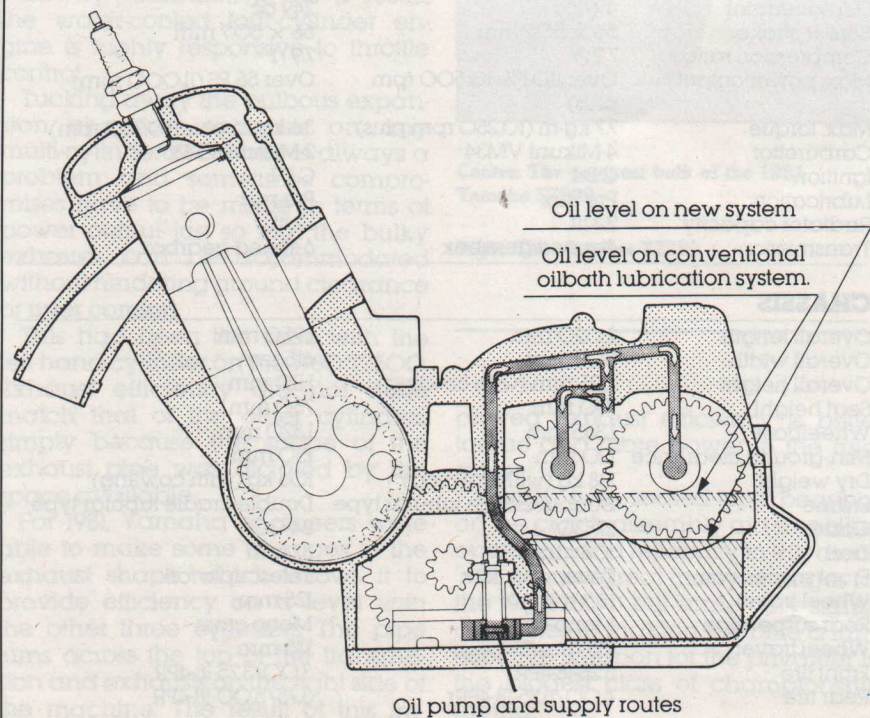
Left: A shot in the "heart" of the TZ250H. Separate cylinders and a new Monocross rear suspension are two of the most important modifications, compared with the previous TZ250 model.

Above: Detail of the Monocross rear suspension. The small screw allows the damping effect adjustment on the contraction side. The Monocross allows many other adjustments (damping effect on the expansion side, gas pressure, initial coil spring, length ...)



The new C.D. ignition unit is really small and compact, compared with the previous unit.

NEW TRANSMISSION LUBRICATION SYSTEM IS PRESSURE-FED ON THE TZ250

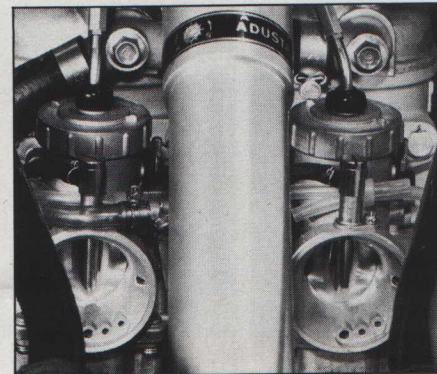
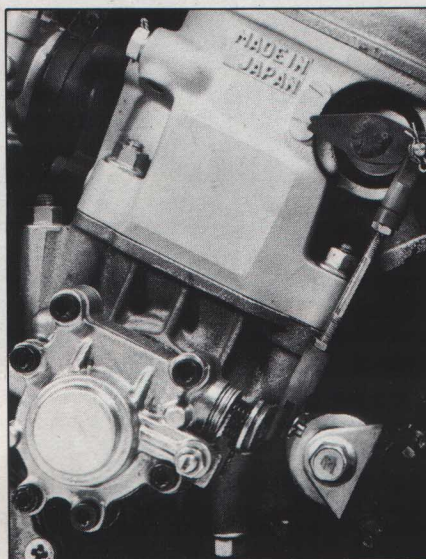
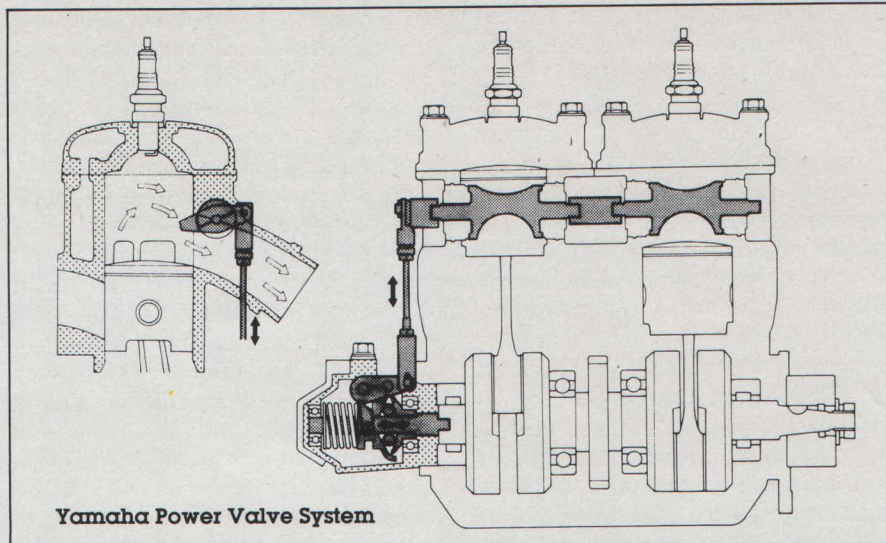


Yamaha Power Valve System:

The YPVS is a unique exhaust timing adjuster which helps maintain a smooth delivery of power at all engine speeds. Basically it is a cylindrical unit which mounts laterally across the top of the exhaust port. A cutaway portion of this cylinder varies from a shallow dish shape to semi-circular so that it can obstruct the full opening of the exhaust port by varying degrees.

The unit is connected via an exterior linkage to a special drive system off the right-hand end of the crankshaft. The faster the crankshaft spins, so centrifugal force forces this drive unit outward against its controlling coil spring. As the drive system is forced outward, it activates the linkage to the unit in the exhaust ports, rotating it in proportion to the changes in engine rpm. At low rpm, the shallow section of the cutaway is rotated into line with the top lip of the port. This reduces port area and provokes later discharge of the exhaust gases. At full throttle, the largest cutaway is rotated into the port area, which effectively means that the port is opened to its original maximum. The amount of restriction that the unit presents in the exhaust port varies in direct relationship with the amount of engine rpm. Exhaust timing is therefore totally variable and matched exactly to throttle opening.

The net result to the rider is an engine that has a turbine-smooth power delivery at all engine speeds, which is most important when your throttle hand is controlling the release of over 100 horsepower!



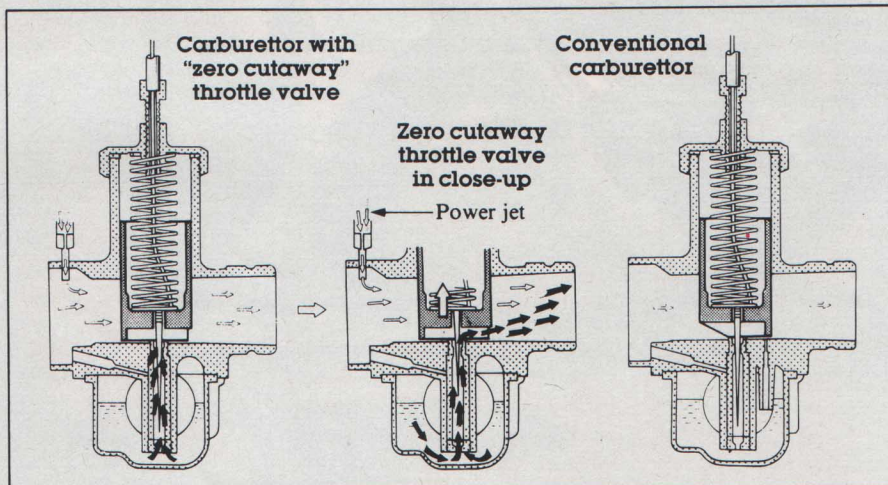
Top and left: The new TZ250H and the TZ500 engines are fitted with the Yamaha Power Valve System.

Above: The new TZ250 engine is fed by two Power-Jet Mikuni VM36 carburetors, equipped with a patented cutaway throttle valve.

Zero Cutaway Throttle Valve:

The new "zero cutaway" throttle valve, as fitted to the racing carburetors on Yamaha's TZ250 and TZ500, is designed to keep the fuel level raised to the level on the injection nozzle in the carburetor bore, even when the throttle is fully closed.

Normally a throttle valve has a cutaway on the side facing away from the engine. The valve completely closes off the carburetor bore on the engine side when the throttle is fully closed. Yamaha has reversed this arrangement. Now there is no cutaway on the outer side of the valve, which prevents air from passing through the carburetor bore from either direction. A cutaway on the engine side of the valve, however, exposes the fuel injection nozzle to the negative pressure (vacuum) in the engine. In effect, this vacuum sucks up fuel from the float chamber to the outlet of the injection nozzle in the carburetor bore so that, when the throttle valve is opened, there is already fuel waiting to mix with the inrush of air on its way into the engine.



Normally, it is that inrush of air across the injection nozzle which sucks fuel from the float chamber to create the fuel/air mix that eventually combusts in the cylinder.

We are talking of milli-seconds in relation to this "time lag" in the mixture of fuel and air via the conventional carburetor. Just the time that it takes for fuel to rise up the nozzle from float chamber to carburetor bore.

That time lag, however, still reduces carburation efficiency. The

advantage of using the engine vacuum to suck up fuel from the float chamber and have it "ready and waiting" to mix with the incoming airflow is that it makes the engine highly responsive at any throttle opening.

This sensitivity of response on the induction side combines ideally with that same advantage offered by the YPVS on the exhaust cycle to make the new Yamaha engines deliver their power in the smoothest way possible.