CIRCUIT

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FIRST IN-DEPTH COVERAGE OF ALL THE NEW 1982 YAMAHAS
PLUS - NEIL HUDSON'S CHAMPIONSHIP SEASON IN REVIEW

HIGH TECHNOLOGY COMES TO MOTORCYCLING!
Turbochargers, on-board computers and space-age engineering highlight Yamaha 1982 Streetbike range

The Yamaha XJ650T continues the company's theme for the nineteen-eighties of socially-responsible machines that combine horsepower with fuel economy and easy handling. And the combination is achieved by the first production line use of one of the biggest steps forward in motorcycle technology ... the turbocharger.

Yamaha built its first turbocharged engine almost a dozen years ago - a 500cc V8 for a Toyota racing car which debuted in July, 1970.

Then, in December last year, Yamaha released details of its first turbocharged motorcycle. It was an XS1100-based design exercise that featured a turbocharger in conjunction with computer-controlled fuel injection.

The XS1100, however, was hardly a power unit which needed turbocharging! Therefore, the lessons learned were applied to the world's first production 'Turbo' motorcycle ... the 1982 Yamaha XJ650T.

Basis of the XJ650T is the familiar XJ650 four-cylinder power unit, which

itself made history by being the lightest, most compact 'four' on the motorcycle market.

It is a well-proven and super-tough engine, well able to withstand the added stresses of forced induction.

The result of turbocharging the XJ650 is to produce a 650cc middleweight motorcycle with the horsepower and torque of an 1100! Light weight, easy-handling, good brakes, small and compact but with enough horsepower to deal with anything on the highway!

An added benefit of turbocharging is better fuel efficiency. At wide throttle openings, the engine performs like an 1100cc unit but at low engine speeds it operates like a normal 650. Truly the best of both worlds - superbike horsepower with middleweight fuel consumption.

As well as turbocharging, the new XJ650T incorporates a number of other distinctive features.

The engine utilises the Yamaha Induction Control System, already proven on certain of the normally-aspirated XJ-series, which gives another 10% increase in fuel efficiency. The transistorised ignition with its electronic governor has been modified to meet the particular demands of turbocharging, incorporating effective boost control and 'anti-knock' measures.

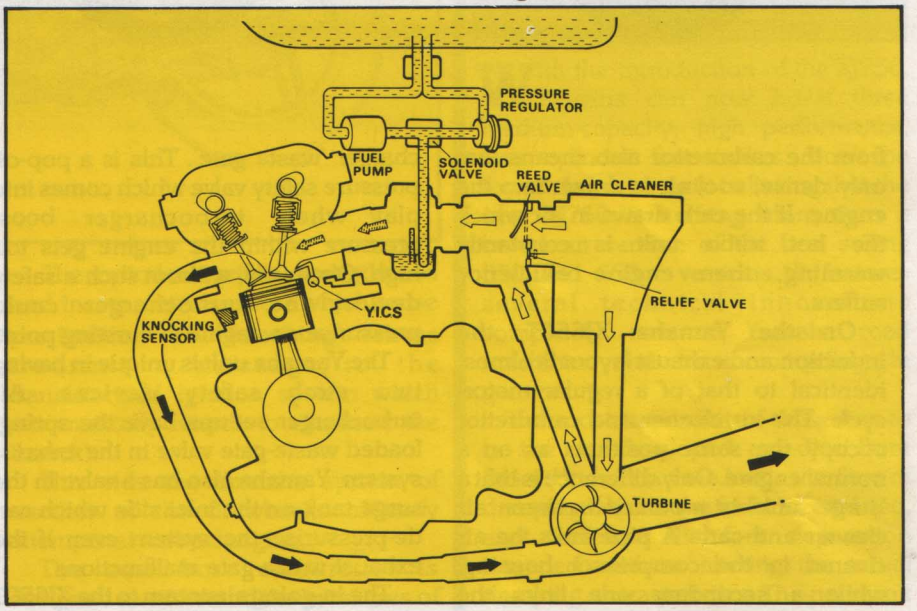
Finally, the XJ650T is styled on futuristic lines, with an integral aerodynamic fairing, moulded in fibreglass-reinforced plastics, blending with the chassis to emphasise the machine's high performance capabilities. Yamaha are one of the world's largest manufacturers of FRP-moulded boats and their experience with this material is second to none. The fairing has been subjected to repeated wind-tunnel tests to provide the optimum in high-speed stability and rider comfort.

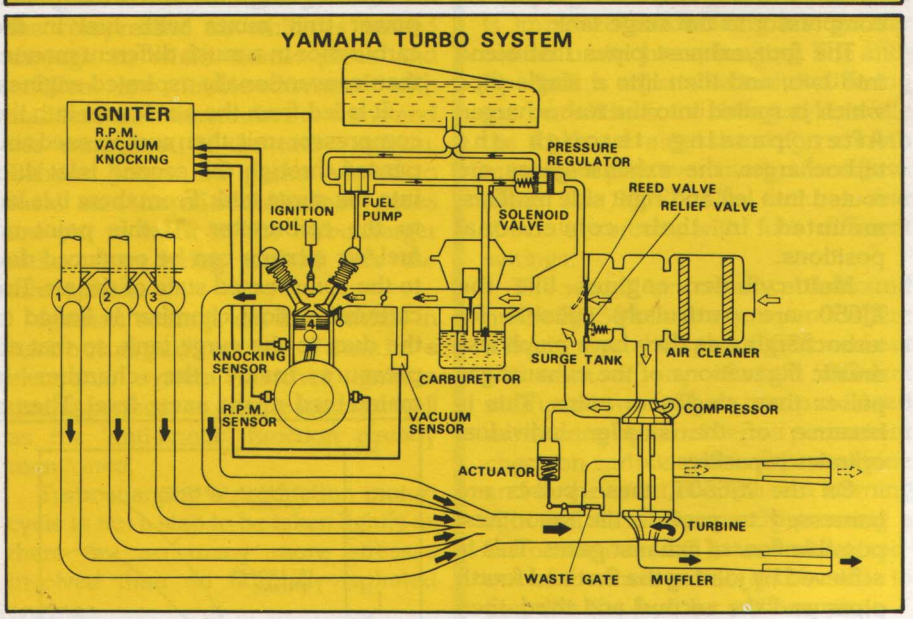
For the turbocharger system on the XJ650T, Yamaha have adhered to a normal carburettor for the initial mixing of fuel and air. This is a cost-saving measure over the obviously-expensive computer-controlled fuel injection and in practical applications the carburettor is perfectly adequate.

In the low to medium speed range, the XJ650T engine functions as a normally-aspirated motor, with the YICS system providing added fuel savings. In this system, the induction passages are linked by a secondary port so that the fuel headed for the cylinders not on the inlet stroke is diverted to the open inlet valve. This added volume of fuel speeds up the inlet charge and swirls it into the combustion chamber for better cylinder filling and more complete burning of the gasoline/air mixture.

As the revs rise, the volume of exhaust gas increases and the turbocharger comes into play.

The turbocharger is a sealed unit with a single shaft, mounted on heat-resistant, well-lubricated free-float bearings. On one side of the shaft is a turbine fan driven by the exhaust gases. This rotates the shaft and thereby turns a compressor fan on the inlet side. Naturally, these two fans are in separate sealed chambers within the turbo unit and the chambers are constructed of different metals. The exhaust side has to handle extremely high temperatures while the inlet side draws only cool air in through the carburettor.





The turbine wheel on the inlet side compresses the fuel/air mixture and packs it into the cylinder under pressure. A normal engine usually inhales about 80% of its theoretical cylinder capacity of combustible fuel. By compressing the fuel/air charge, the turbo unit forces in about 150% of the theoretical capacity. The advantages in power are, therefore, obvious!

Installation of the Yamaha turbo system shows evidence of common-sense thinking not displayed by other manufacturers who have experimented with turbocharging, or accessory companies who have offered 'turbo kits'.

For example, these people have universally mounted the turbo unit in the space behind the cylinder head normally occupied by the carburettors. With the turbocharger reaching very high temperatures, this can cause engine overheating problems on long runs, as well as acute rider discomfort.

Yamaha have mounted their turbocharger unit **below** and **behind** the engine crankcase, where the heat can be dissipated without interfering with engine or rider.

One reason that this is possible is that Yamaha and Mitsubishi have combined to produce the most compact turbocharger unit so far.

Keeping the turbo unit well apart

from the carburettor also means that only dense, cool air is drawn into the engine. If the carb draws in air which the hot turbo unit is constantly warming, then engine efficiency suffers.

On the Yamaha XJ650T, the induction and exhaust layout is almost identical to that of a regular motorcycle. The air cleaner and carburettor occupy the same positions as on a normal engine. Only difference is that a 'surge tank' is mounted between air cleaner and carb. A pipe links the air cleaner to the compressor housing, while a secondary one links the compressor to the surge tank.

The four exhaust pipes first blend into two, and then into a single pipe which is routed into the turbocharger. After passing through the turbocharger, the exhaust gases are routed into left and right side mufflers, mounted in their conventional positions.

Multi-cylinder engines like the XJ650 are particularly suitable for turbocharging as they have much less drastic fluctuations of the exhaust gas pulses than singles or twins. This is because of the smaller individual cylinder capacities.

On the XJ650T, these pulses are harnessed to provide the smoothest possible flow of exhaust gases. This is achieved by joining the first and fourth pipes and the second and third, then finally routing these twin pipes into a single collector duct for the turbocharger. Exhaust gases from the turbocharger are routed through the left muffler only, to further simplify the exhaust flow.

The right side muffler dispenses with exhaust gases from the turbocharger 'waste gate'. This is a pop-off pressure safety valve which comes into play when turbocharger boost pressure within the engine gets too high. Obviously, without such a safety device, the turbocharger could pressurise an engine to bursting point.

The Yamaha unit is unique in having two such safety devices. All turbocharger set-ups have the spring-loaded waste-gate valve in the exhaust system. Yamaha also has a valve in the surge tank on the inlet side which can de-pressurise the system even if the exhaust waste-gate malfunctions.

The in-going airstream to the XJ650T power unit mixes with fuel in the carburettor in a much different manner than conventionally-aspirated engines.

It is led from the air cleaner into the compressor unit, then compressed and passed through the second inlet duct into the surge tank. From there it is led to the carburettor. At this point no fuel/air mixture can be produced due to the compressed state of the air. The carburettor float chamber is linked to the duct to the surge tank, so that air pressure inside the chamber is maintained at the same level. Then a fuel pump forces fuel into the chamber under pressure so that it can mix with the compressed air in the normal manner.

The carburettor is, of course, specially pressure-sealed to cope with the compressed mixture.

The fuel pump is of the vane-type, driven by a rotating cable from the engine camshaft at one-fifth camshaft speed. The advantage of this mechanically-operated (rather than electrical) pump is that the pump ceases to work as soon as the engine is stalled. Which greatly aids restarting.

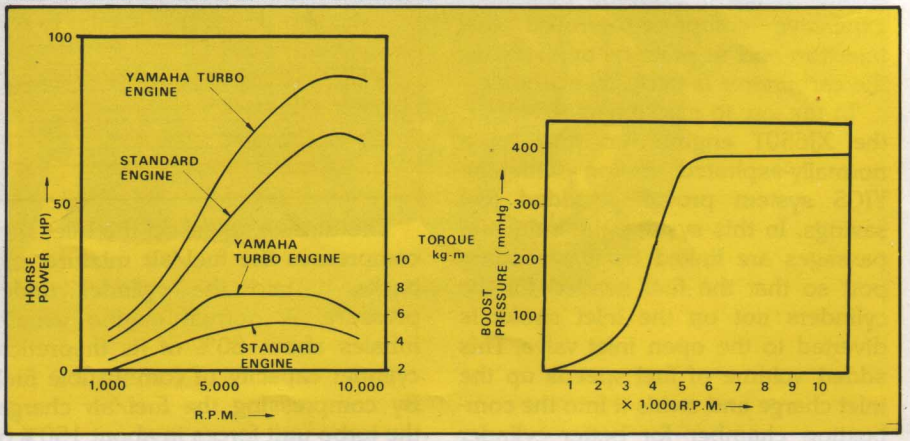
To ensure a constant head of fuel, there is a regulator between the fuel pump and carburettor controlled by the compressed air pressure with a fuel circuit between regulator and fuel tank as a relief measure.

One of the problems inherent in turbocharging is slow throttle response or 'turbo lag' as the condition has come to be known.

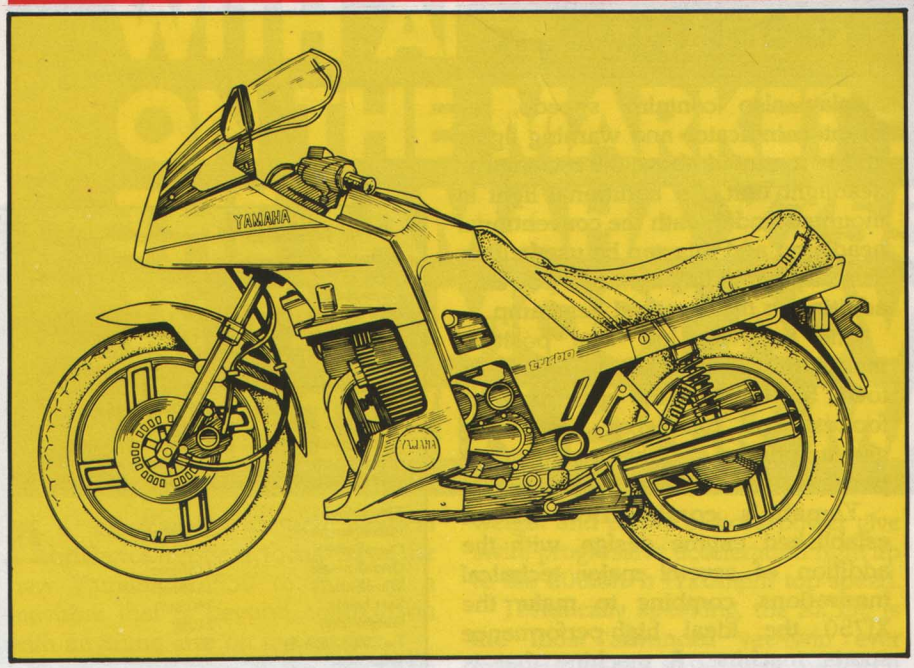
This happens when the throttle is opened quickly from low rpm and the exhaust gases do not have enough volume or velocity to get the turbine fan spinning fast enough to induce sufficient compressor speed. At this point, a reed valve located in the surge tank is opened. This component,

Yamaha XJ650T Specifications

Engine	
Type	4-stroke, DOHC, 4-cylinder, Turbo charged
Displacement	653cc
Bore & Stroke	63.0 x 52.4mm
Compression ratio	8.5 : 1
Maximum horsepower	85.0PS, 8.500rpm (62.5Kw, 8.500rpm)
Maximum torque	7-5kg-m, 5.000-8.000rpm (73.6Nm 8.000)
Lubrication system	Wet sump
Starting system	Electric
Ignition system	Transistor controlled
Transmission	5-speed
Dimensions	
Overall length	2170mm
Overall width	730mm
Overall height	1305mm
Wheelbase	1435mm
Seat height	780mm
Weight (dry)	225kg
Fuel tank capacity	18 lit
Tyres front	3.25 - 19
Tyres rear	120/90 - V 18
Brakes front	Dual disc
Brakes rear	Drum



... the Yamaha XJ650T sets the standard by which all future turbocharged production machines will be judged .....



totally-proved on Yamaha's World Championship-winning two strokes, reacts to the negative pressure caused by wide throttle opening. It opens up to allow more air directly into the engine without passing through the turbocharger. When the turbocharger blades get up to speed as engine rpm rises, pressures inside and outside the engine equalise, the reed valve closes and the engine gets the full turbo boost.

The use of the reed valve is exclusive to Yamaha and eliminates the hesitancy under heavy acceleration which is the result of turbo lag.

The reed valve and surge tank safety valve are compactly combined in a single unit. This surge tank and its attendant components are vital to the Yamah carbureted-turbo system as it monitors the flow of all compressed air for the best effective carburetion.

Utilising compressed air through the carburettor is much better than the 'old fashioned' way of first mixing unpressurised air and fuel and then feeding it from the carburettor to the turbocharger. The Yamaha way gets an even denser fuel charge into the engine for more efficient and complete combustion.

Everywhere you look on the XJ650T there is vital evidence that Yamaha have re-designed the engine to cope effectively with the added demands of fuel induction. They have not just bolted a 'turbo kit' to an existing engine.

The cylinder head is redesigned with larger fins and a bigger joint area with the cylinder.

The cylinder itself is strengthened and incorporates sensors which sense pre-ignition or 'knocking'. These transmit a message to the transistorised ignition system which automatically retards to eliminate the 'knock'.

This rids the Yamaha system of another of the drawbacks of early attempts at turbocharging.

The small-bore carburettor is designed to withstand the pressures of the compressed air which is passed through it, while exaust pipes and mufflers are double-structured with stainless steel inner tubes to withstand the extra heat of the turbo system. Exhaust joints are gasket sealed to make sure that all of the exhaust gases are put to work in the turbocharger rather than being wasted into the atmosphere.

Ignition settings are also critical in turbocharged units. Yamaha's electronic system matches ignition timing perfectly to engine loads as well as the 'anti-knock' function already mentioned.

Turbocharging a production motorcycle is not a step to be taken lightly as there are so many more stresses involved than on normally-aspirated engines.

Anyone examining the specifications of the Yamaha XJ650T can see that, without any doubt, Yamaha have left absolutely nothing to chance.

The Yamaha XJ650T is the world's first turbocharged production motorcycle. It sets the standard by which all others will be judged.

THE YAMAHA XJ750 BRISTLING WITH TECHNICAL INNOVATIONS

With the introduction of the XJ750, Yamaha can now boast three medium-capacity, high performance, four cylinder four-strokes. Don't be fooled, however, into believing that the new XJ750 is nothing more than a bored-out version of the best selling 550 and 650cc versions. It features several technical innovations completely new to Yamaha road machines and to motorcycling in general.

The most important of these has to be the race-developed 'anti-dive' front forks. Under extreme loads the flow of damping fluid in the forks is restricted, and therefore the fork depression lessened, without altering the actual damping characteristics. The net result is improved roadholding and greater control under heavy braking. The anti-dive unit is adjustable to suit differing road conditions and riding styles while the forks are air-assisted for smooth movement plus even more rider adjustment. The XJ750 also features rear shock absorbers with four different settings.

The second innovation can be found on the XJ750's instrument panel where a liquid crystal display (LCD) read-out will warn of any of eight different malfunctions. The computerised monitoring system keeps a permanent check on various parts of the machine and in the event of a failure a warning light will flash. By merely pressing a button the rider will get an instant read-out of the malfunction and be able to pinpoint the fault for swift repair.

The twin overhead-cam engine of the XJ750 also features the Yamaha YICS system which utilises a secondary inlet port to improve the fuel burning efficiency of the motor. This means that the fuel is used in the most efficient way and results in improved economy and better performance. The

... the XJ750 is capable of prolonged high-speed riding of the hardest type ...

engine is also one of the slimmest of the transverse fours available. This is achieved by placing the starter and alternator behind the crankshaft (as on the XJ650 and XJ550). Also taken from the 650 version is the shaft drive, an unusual feature on a high performance sports machine.

The overall appearance of the XJ750 is one of clean uncluttered lines. The fuel tank and side panels blend together to give the appearance of a single unit while the short megaphone silencers and italic wheels give more than a hint of the XJ750's performance. The neat lines of the machine are taken a stage further by the novel routing of clutch and brake cables. These are kept tucked away behind a compact handlebar cover that clamps around the bars and keeps all the cables and wiring tidily out of sight. The instrument panel that houses the LCD display also contains speedo, rev counter, indicator and warning lights and is mounted above the rectangular headlight unit. An additional light is mounted underneath the conventional headlamp and this can be used either as a daytime riding light or a powerful addition to the standard headlamp.

The relatively low seat position makes the XJ750 easy to handle in town, but once on the open road the footrest and handlebar positioning give a sporting slightly-forward riding position.

Yamaha's combination of an established engine design, with the addition of several major technical innovations, combine to make the XJ750 the ideal high-performance sports machine. A machine that is tractable and easy to handle at low speeds yet capable of prolonged high-speed riding of the hardest type.

Yamaha XJ750 Specifications

Engine	
Type	4-stroke, DOHC, 4 cylinder
Displacement	748cc
Bore & Stroke	65.0 x 56.4mm
Compression ratio	9.2 : 1
Maximum horsepower	81.0PS, 9.000rpm (59.6kw, 9.000rpm)
Maximum torque	6.7kg-m, 7.500rpm (65.7Nm, 7.500rpm)
Lubrication system	Wet sump
Starting system	Electric
Ignition system	Transistor controlled
Transmission	5-speed
Dimensions	
Overall length	2240mm
Overall width	860mm
Overall height	1130mm
Wheelbase	1445mm
Seat height	780mm
Weight (dry)	219kg
Fuel tank capacity	19 lit
Tyres front	3.25 H 19
Tyres rear	120/90-18 65H
Brakes front	Dual disc
Brakes rear	Drum

BEYOND COMPARISON WITH ANYTHING ELSE ON THE MARKET ... THE YAMAHA XZ550 IS THE MOST ADVANCED VEE-TWIN EVER MADE

All of Yamaha's technological brilliance has been focussed on the new Yamaha XZ550 to make it a machine that is beyond comparison with anything else on the market.

The XZ550 follows all the criteria by which the great motorcycles of the nineteen-eighties will be judged. It is low, compact and slim in profile. Light weight and plenty of horsepower give swift, progressive acceleration right up to the 200km/h (120mph) top speed.

Technically speaking, the XZ550 is the most advanced vee-twin ever released on the motorcycle market. It has a liquid-cooled engine with the two cylinders set at a 70-degree angle. The result is a short, compact power unit. A crankshaft balancer smooths out the uneven power impulses and allows the XZ550 to spin sweetly to 9,500rpm! Downdraught carburettors in the centre of the vee feed the four-valve cylinder heads. The valves are operated by double overhead camshafts. Twin exhaust ports are matched on the inlet side by the use of the patented Yamaha

Induction Control System to achieve better fuel consumption and a quieter exhaust note.

Total power output from the 552cc engine is 60hp - a staggering 108hp per litre!

The engine, integral with its five-speed, shaft-drive transmission, is housed in a new design of tubular monoshock chassis. The twin downtubes sweep along the upper part of the crankcase and the engine is suspended between them. This configuration is highlighted by styling that enhances the slim, sporting lines of the new vee twin.

The Yamaha XZ550 Engine:

The most obvious visual feature of the Yamaha XZ550 power unit is the fact that it is liquid-cooled. There are many advantages to this system, the main one being that engine temperatures are kept in a constant heat range regardless of changes in rpm or road speed. The liquid-cooling dissipates heat faster than air-cooled engines, an important factor on a vee-twin, especially one that will rev to 9,500rpm.

Additionally, each cylinder and head is considerably lighter than the equivalent air-cooled component, which has greatly reduced the total weight of the power unit, even with the added parts demanded by the use of double-overhead camshaft valve gear.

The radiator which helps cool the engine is constructed in lightweight aluminium. It incorporates a thermostatically-controlled electric fan which keeps coolant temperatures stable and aids quick warm-up from a cold start.

Each of the XZ550's two cylinders has two inlet and two exhaust valves. These are operated by double overhead camshafts, chain-driven from the crankshaft and running at half crankshaft speed. The 'silent', continuous-link chain has an automatic tensioner which ensures positive, quiet valve gear operation. The sprocket gear on the camshaft side is a two-piece unit with each segment spring-loaded in tension against one another to prevent backlash.

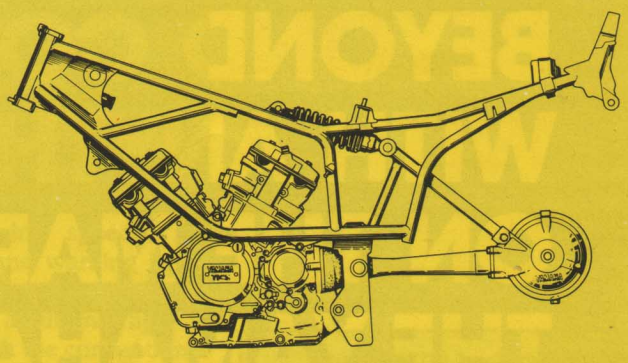
Each of the two camshafts per cylinder carries two cams which directly control valve operation via valve lifters, thus dispensing with the need for rocker arms.

One of the primary benefits of utilising four valves per cylinder is that the reciprocating weight of each valve is considerably reduced. Thus the valve springs are better able to do their job of controlling the valve's return to its seat, even at high rpm. Valve 'float' is eliminated, which used to be one of the restricting factors on attainable rpm in the four-stroke engine. On multi-cylinder motors this is not such a problem, as valve size is proportionate to that of the cylinders in which they operate. On large capacity single or twin cylinder machines, however, it has been a limiting factor. The use of four valves per cylinder raises that rpm limit considerably - as evidenced by the XZ550's capability to rev at 9,500rpm.

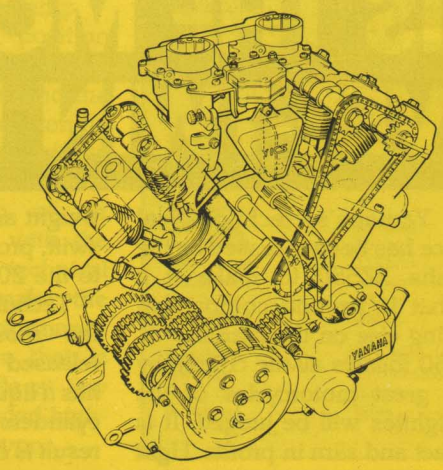
The use of smaller valves also allows a better combustion chamber shape. The XZ550 has valve angles of 18 degrees to give a 'pentroof shape combustion chamber. This gives a better 'squish' effect for more complete combustion of the fuel charge.

A new twin exhaust port increases the effect of the exhaust pulse on combustion chamber scavenging and two exhaust pipes from each cylinder take the gases into an expansion chamber behind the crankcase. From that chamber, pipes are routed into the twin mufflers. The utilisation of expansion chamber and twin mufflers results in the unique combination of high horsepower and a quiet exhaust note.

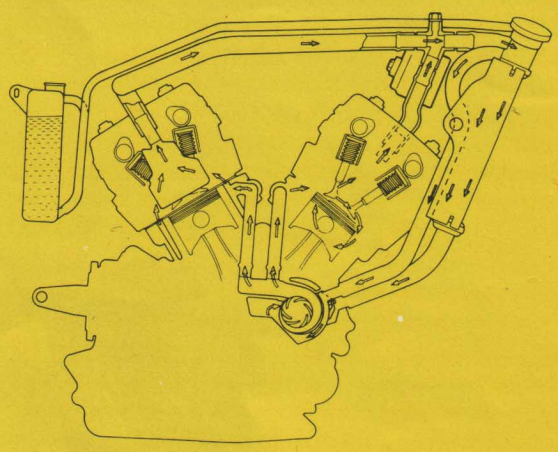
On the induction side of the engine, the XZ550 sees the first application of the patented Yamaha Induction Control System on an individual cylinder. This system gives a 10% increase in fuel efficiency and has proved its worth on the four-cylinder XJ-Series engines, where the incoming



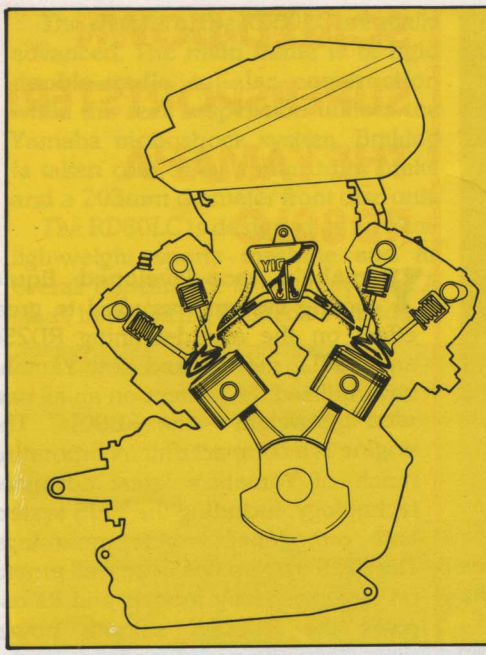
The unique 'space frame' chassis of the XZ550 features monoshock suspension. The engine is suspended between the two chassis rails and shaft drive housing is an integral part of the triangulated sub-frame.



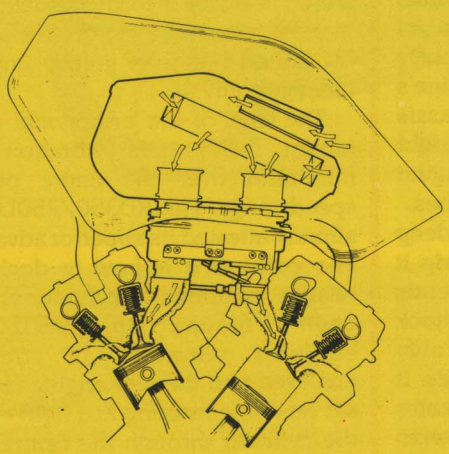
Exploded view of the liquid-cooled XZ550 engine and transmission, showing the chain-driven twin overhead camshafts, four valves per cylinder and downdraught carburettors.



The liquid-cooling of the XZ550 engine is a pressurised 'sealed' system. Cool air from the radiator is drawn by a crankshaft-driven water pump and circulated around the engine. Separate 'header' tank at rear copes with expansion of heated coolant as in modern automobile systems.



The Yamaha Induction Control System (YCIS) as fitted to the vee-twin. The small secondary air chamber between the cylinders stores air when inlet valve is closed. When the valve opens, the stored air rushes in to add volume and extra swirling impetus to the ingoing fuel/air charge.



The Yamaha XZ550 features twin downdraught carburettors, pulling air vertically down into the engine. This gives a straight, unimpeded entry into the combustion chamber for the ingoing fuel/air mixture.
The result is added performance. Intake noise is kept down by the use of a large capacity air filter and special silencer box.

fuel charge into one cylinder is given extra, swirling impetus by use of a secondary port drawing on the negative pressure of the three cylinders not involved in the induction process. The result is better combustion chamber filling and more complete explosion of the fuel charge.

To achieve this on a vee-twin (which is essentially two single-cylinder engines on a common crankcase) Yamaha have developed a variant of the YICS which incorporates a secondary air chamber independent of the cylinders (very similar to the Yamaha Energy Induction System used on the company's two-strokes).

This chamber takes in the incoming fuel charge when the engine is on its compression stroke and stores it until the inlet valve opens on the induction stroke. It then rushes out to join the normal fuel charge. The extra volume of fuel causes a strong, swirling effect, achieving the same complete filling of the combustion chamber as the linked-port system on the four-cylinder machines. The YICS system has another advantage in being virtually maintenance-free.

The XZ550 is fed by two 36mm constant velocity 'diaphragm' carburettors, controlled by a single throttle cable via a special linkage. Unlike the large XV750 and TR1 vee-twins, they are downdraught carburettors which combine with the 18-degree valve angle to direct a completely straight flow of air into the cylinder. This increases intake efficiency to the maximum.

A fuel pump ensures a constant level of fuel in the float chamber while the use of an accelerator pump in the carburettors gives quick throttle response. The large-capacity (6.4 litre) air cleaner matches the high performance engine while still reducing intake noise. Air filtration is through a paper element.

Ignition on the XZ550 is via the now-familiar transistorised method which does away with the need for contact-breaker points and is, therefore, maintenance-free.

The XZ550, however, has the added refinement of an electronic governor which controls ignition timing both in relationship to engine speed (as do conventional electric governors) **and** crankshaft position. As engine speed increases, ignition timing must be advanced and vice versa. The Yamaha system does this by means of an electro-magnetic pick-up coil which maintains exact ignition timing at any engine speed.

Yamaha XZ550 Specifications

Engine	
Type	4-stroke, 70°-V twin, DOHC (4-valve), Liquid cooled
Displacement	552cc
Bore & Stroke	80.0 x 55.0mm
Compression ratio	10.5 : 1
Maximum horsepower	64.4PS, 9.500rpm (47.4Kw, 6.500rpm)
Maximum torque	5.1kg-M, 6.000rpm (50.0Nm, 6.000rpm)
Lubrication system	Wet sump
Starting system	Electric
Ignition system	Transistor controlled
Transmission	5-speed
Dimensions	
Overall length	2200mm
Overall width	750mm
Overall height	1095mm
Wheelbase	1450mm
Seat height	775mm
Weight (dry)	196kg
Fuel tank capacity	17 lit
Tyres front	90/90 - 18 51H
Tyres rear	4-25/85 - H18
Brakes front	Dual disc
Brakes rear	Drum

In order to achieve a compact engine unit and shorter wheelbase for more sporting handling characteristics, Yamaha have set the angle of the XZ550 cylinders at 70 degrees, five degrees closer than the bigger XV750 and TR1. However, the further away from the 90-degree cylinder configuration on a vee-twin, the more pronounced is the vibration. On lower-revving engines, this is not so important but the XZ550 has been designed as a high rpm supersports bike. Therefore a crankshaft balancer is included in the engine design to eliminate low-down vibration. This is a triple weight balancer, gear driven from the crankshaft and it makes the XZ550 as smooth as a multi-cylinder machine right up to the higher rpm range, where a small but exciting 'vee-twin' sensation begins to come through.

The Yamaha XZ550 chassis

In common with the larger Yamaha vee-twins, the XZ550 utilises the well-proven monoshock chassis with the triangulated sub-frame constructed in square-section tubing. The lower left section of the sub-frame does double-duty as the casing for the final drive shaft ... a neat design feature already utilised on the XV750.

Movement of the rear sub-frame is controlled by a single gas/oil De Carbon damper with five stages of coil spring adjustment.

The use of an in-line vee-twin engine and monoshock suspension would seem to make it difficult to attain a short wheelbase for the sporting steering characteristics needed for a machine like the XZ550. Yamaha, however, have achieved this in a novel fashion. As well as shortening the actual engine unit by reduction of the cylinder angle to 70 degrees, the engineers have employed a trailing-axle front fork. This produces the comfortable ride of the longer chassis allied to the quick, precise steering of the shorter wheelbase. The unusual look of the trailing axle fork also blends well with the ultra-modern styling of the XZ550.

A tubular space-frame chassis sees a complete departure from normal road-machine styling. Twin downtubes sweep down and then horizontally along the upper part of the engine's crankcase to join the rear chassis member. This makes a compact, rigid main frame section with the engine suspended between the lower tubes.

The large-capacity fuel tank is deep and slim, to allow the rider to grip it with his knees, and the seat blends perfectly into the tank. The monoshock chassis allows a low seat height of only 770mm. This has three advantages: it helps towards the XZ550's low centre of gravity for better handling; it lowers the rider 'into' the machine for a more compact frontal area and better air penetration and it allows him to get both feet on the floor when the machine is stationary in traffic.

To make sure that the riding position is comfortable for any size rider, the machine features unique cast-alloy handlebars which are adjustable through three positions.

A large, square halogen headlamp matches lighting to the XZ550's speed capabilities while the sporting look is accentuated by the rear lamp being integral with the sleek tail cowling.

Enhancing the sporting image are the new-design cast alloy wheels that have straight double spokes, arranged in groups of four at an eccentric angle to the hub. Even with straight spokes, this achieves a feeling of constant forward motion.

To complete the 'supersports' package, the Yamaha XZ550 comes with an optional fairing that perfectly complements its aggressive, ultra-modern lines.

Without a doubt the XZ550 is the most sporting, technologically-complete middleweight vee-twin yet produced.

SCALED-DOWN SUPERSPORTSTER! THE YAMAHA RD80LC

Yamaha's race-developed liquid cooling system was used to great effect on the award-winning RD250 and 350LC models and now Yamaha have utilised the system on an all new ultra-lightweight - the RD80LC. The engine is a compact unit incorporating much of Yamaha's latest advanced technology, including the YEIS system and 'orthogonal' engine mountings. The YEIS system has been well proven on larger capacity models and its use gives the RD80LC smooth power throughout the speed range by eliminating the slump in torque usually found in small two-stroke motors. It also gives the added bonus of greatly improved fuel economy.

The aim of the orthogonal engine mount is to hold vibration to a minimum over the entire practical speed range. The RD350/250LC have already attested its superior advantage. The point of it is how to decide the relative positions of cylinder and rear engine mount. On RD80LC, the engine's vibration is computer analysed and the rear engine mount is set on a line running at a right engle to the cylinder through the centre of the engine. The engine is mounted by means of ball bearings. By this method, the engine shakes on the pivot of its rear mount.

A rubber front mount absorbs both shaking and vibration of the engine to form a kind of vibration unit which rotates at a certain resonance speed.

This resonance speed can be set freely by selecting the spring rate on the rubber mount. By setting this resonance speed to the practical speed range, the engine's vibration can be reduced greatly over that speed range so that riding comfort is increased. If vibration is reduced, the durability of the frame and other components are also greatly increased.

The liquid-cooling system is operated by a water pump driven from the crankshaft. This pump forces 20 litres of coolant around the engine every minute and ensures that none of the small engine's performance is lost through overheating. The aluminium radiator is protected from stones and mud by a louvred cover and the system also includes a temperature gauge so that the rider can see at a glance whether the engine is operating at the optimum temperature.

The chassis of the RD80LC is equally advanced. The main frame is of rigid double-cradle tubular construction while the rear suspension utilises the Yamaha monoshock system. Braking is taken care of by a rear drum brake and a 203mm diameter front disc unit.

The RD80LC is designed as an ultra-lightweight sports machine and its overall appearance is certainly racy. A small head fairing is fitted as standard, as is a radiator and engine cowl. Both these items were specially designed to cut down wind resistance and produce extra cooling to the engine and radiator unit. The tank curves steeply at the rear to join the matching side panels. The rear cowling incorporates the rear lamp and a small tool compartment. A further touch of sportiness is added by the use of italic wheels and racing style expansion silencer.

This latest addition to the Yamaha ultra-lightweight range features many items usually associated with bigger models and the RD80LC will certainly appeal to sports-minded youngsters restricted by law to smaller capacity machines.

Yamaha RD80LC Specifications

Engine	
Type	2-stroke, liquid cooled, single
Displacement	79cc
Bore & Stroke	49.0 x 42.0mm
Compression ratio	7.1 : 1
Maximum horsepower	8.7PS, 6,500rpm (6.4kw, 6.500rpm)
Maximum torque	0.99kg-m, 6.500rpm (9.7Nm, 6.500rpm)
Lubrication system	Autolube
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	6-speed
Dimensions	
Overall length	1910mm
Overall width	685mm
Overall height	1120mm
Wheelbase	1230mm
Seat height	765mm
Weight (dry)	78kg
Fuel tank capacity	10 lit
Tyres front	2-50 - 18
Tyres rear	2-75 - 18
Brakes front	Disc
Brakes rear	Drum

FOR COMMUTERS AND NEW RIDERS - THE STYLISH SR125

Following the immense popularity of the commuter-oriented SR250, Yamaha have taken the concept of a stylish, reliable and, above all, economical four-stroke one stage further. The SR125 retains all the good looks of its larger-capacity stablemate while increasing economy and handleability by using a smaller motor. The engine is an all-new four-stroke unit designed to give ample torque at low rev speeds while still retaining smooth power delivery at all speeds. The excessive vibration often associated with this type of engine has been eliminated by the use of a crankshaft balancer.

Other technical features include transistor-controlled ignition and electric start. The starting system also includes a unique safety device that prevents the rider from using the starter unless the gearbox is in neutral, or the clutch disengaged.

The SR125 is primarily a commuter bike and everything possible has been done to aid rider comfort. The low seat height makes for easy in-town riding and the handlebars are designed to combine with the seat position for maximum comfort. This combination also results in light, easy handling and a high degree of maneouvrability.

Rider safety is looked after by reliable waterproof drum brakes and a powerful lighting system. Potential parking accident damage is minimised by the use of flexibly-mounted indicators - if the bike should get knocked over they bend, rather than break.

Although the SR125 is intended as a commuter bike its neat, modern styling will make it equally popular with younger, first-time buyers. The steeply-sloped tank and stepped seat give it the appearance of a 'custom' model, while the unique cluster-spoked wire wheels and short megaphone silencer add a touch of sportiness.

Yamaha SR125 Specifications

Engine	
Type	SOHC, 4-stroke, Air-cooled, single
Displacement	124cm³
Bore & Stroke	57.0 x 48.8mm
Compression ratio	10.0 : 1
Maximum horsepower	12.0PS, 8.500rpm (8.8kw, 8.500rpm)
Maximum torque	1.0kg-m, 8.000rpm (9.8Nm, 8.000rpm)
Lubrication system	Wet sump
Starting system	Electric
Ignition system	Transistor controlled
Transmission	5-speed
Dimensions	
Overall length	1915mm
Overall width	785mm
Overall height	1105mm
Wheelbase	1280mm
Seat height	740mm
Weight (dry)	104kg
Fuel tank capacity	10.0 lit
Tyres front	3.00 - 17
Tyres rear	3-50 - 16
Brakes front	Drum
Brakes rear	Drum

YAMAHA'S XT550 - new king of the thumpers!

It was five years ago that Yamaha brought back 'the big single' when they introduced the XT500 ... a dual-purpose 'enduro' machine which featured a lusty 500cc four-stroke power unit. This style of engine had gone out of favour with the world's motorcyclists but the XT500 put the 'thumper' firmly back on the map. So much so that it spawned a host of imitators from rival manufacturers.

Despite the opposition, the Yamaha XT500 and its running mate, the SR500, have continued to lead the field in this category but this doesn't mean that Yamaha are content to leave things just the way they are.

Now they have taken a further step ahead of their rivals by an all-new entry in the big single-cylinder, four-stroke category.

Titled the XT550J, the new machine is bristling with innovations. The bigger 558cc machine has a four valve cylinder head, the valves being actuated by a single overhead camshaft. Twin exhausts are complemented by the all-new Yamaha Duo-Intake System (YDIS), a unique form of dual carburetion that allows performance and economy to be obtained from the same engine.

The engine also features CDI ignition with new electronic governor, an automatic decompressor for easy starting and a crankshaft balancer for super-smooth running.

An all-new chassis features monoshock suspension and a 'diamond-type' main frame which utilises the engine as a stressed member. Air-assisted front forks are fitted along with a 12 volt, quartz halogen headlight. The petrol tank has eye-catching styling based on the special XT500 which twice won the 17,000km Paris-Dakar race and it holds a useful 12 litres.

The new XT550J engine produces far more torque than any other machine that has so far contested this class. Previously, not one thumper had managed to achieve a torque to weight ratio of 20kg/kg-m. The XT550J manages an incredible 29.4kg/kg-m ratio!

To cope with this pulling power, the bike is fitted with a 4.60 x 18 rear tyre for maximum traction.

Finally, the XT550J is lighter than its predecessor as well as being more powerful. It weighs only 130kg (8kg lighter than the XT500) and puts out

36hp at 6,500rpm as compared to the 30hp at 5,800rpm of the original XT. Maximum torque is increased from 3.9kg-m at 5,400rpm to 4.5kg-m at 5,000rpm. Even more pulling power at even lower rpm!

The XT550J is very definitely a superior dual-purpose machine with specific attention having been paid to its off-road handling and performance characteristics. Its styling, however, is such that its technical excellence is magnified to make it an eye-catching street machine in any company. In addition, the unique new YDIS system guarantees it good road performance and high cruising speed as well as superb off-road capabilities.

The Yamaha XT550J Engine:
The reason for using four valves in the XT550J cylinder head instead of the more conventional single inlet and exhaust is to maximise the port area within the available space. By using twin exhaust and inlet valves, the diameter of each individual port can be reduced to fit into the combustion chamber area but the **total** port area can be up to 25% more than that allowed by two large diameter valves.

The valve operation on the XT550J is via rocker arms and a single overhead camshaft. The camshaft is driven from the crank by a 'silent' continuous-link chain with automatic tensioner.

Bore and stroke of the new 558cc engine is an 'oversquare' 92 x 84mm. The crankshaft balancer greatly reduces the inherent vibration of the single cylinder machine. As well as being an aid to riding comfort, the elimination of major vibration means that less stresses are placed on the chassis. This means that the main frame unit can be made lighter to trim overall weight.

The balancer shaft is gear-driven from the crank and is positioned behind it, supported by roller bearings for complete rigidity.

Obviously the big talking point about the new XT550J will be the unique YDIS dual intake system. It uses two separate carburettors linked in such a way that the secondary one does not begin to operate until the first is already 50% open. This progressive linkage system means that on slow-speed running the XT550J gets the incredible economy associated with a single small-bore carburettor. But when both are wide open, the machine goes through a transformation and gets supersports performance!

Even more unusual than the progressive linkage is the fact that the YDIS uses **two different types** of carburettor! The primary carb is the VM type with cable-operated throttle valve. This type of carburettor reacts quickly to the twistgrip .... which makes it ideal for off-road riding.

The secondary carburettor is of the BS or 'constant vacuum' type. This has a butterfly valve throttle to allow optimum air flow at higher speeds, thus dealing better with the top end of the XT550J performance range.

The total area of the twin carburettor venturis is 20% higher than that which would be possible with a single carburettor. Reason for this is that too large a carburettor venturi causes faulty carburetion and loss of power at low speeds.

The YDIS system allows a single small-bore carb to provide perfect low speed carburetion and the combination of the twin carburettors to deliver maximum airflow at high rpm.

The secondary carburettor is linked to begin working when the XT550J comes into the 90/100km/h (55 to 60mph) speed range. Below this speed the machine has the economy of a commuter bike but when the second carb comes into play .... hang on!!!

One of the drawbacks of big single cylinder machines over the years has been difficult starting.

The Yamaha XT550J draws on modern technology to overcome this. The CDI ignition system is fitted with an electronic governor system using sensors that match ignition timing directly to engine rpm. At the very low engine turnover speeds generated by kickstarting attempts, the electronic governor retards the ignition spark to the maximum. Then it automatically advances the spark as the revs rise!

In addition, there is an automatic decompressor which is linked to the kickstart crank inside the engine. As the kick starter is depressed, so the decompressor comes automatically into play to allow the engine to be easily kicked over.

The dual exhaust ports of the XT550J dictate a 2 into 1 exhaust system. The twin pipes from the cylinder head merge just above the crankcase and the high-level 'enduro' system ends in a large-capacity, highly effective muffler tucked close in to the right side of the chassis.

A final point on the engine shows just what attention to weight-saving the Yamaha engineers have paid on the XT550J. The right crankcase cover is made of magnesium alloy to substantially reduce the overall weight of the power unit.

The Yamaha XT550J Chassis:
All dimensions on the XT550J chassis have been increased in relationship to the XT500 ... proof that it is intended as a totally-effective off-road machine.

Wheelbase has been increased by 25mm for more predictable handling at higher off-road speeds and ground clearance has been increased by 35mm to a rock-dodging 260mm!

The front-end rigidity has been increased by the use of bigger, 38mm fork tubes and the action of the leading axle front fork has been improved by the use of a compressed air 'spring cushion'. This handles low and medium fork loads, while the conventional coil spring deals with the heavier shocks. The air cushion also acts in unison with the coil springs to prevent fork bottoming under the heaviest impacts.

A similar gas/oil De Carbon damper controls the movement of the sub-frame on the monoshock chassis,

incorporating a tapered-wind spring for more progressive resistance to increasing shocks.

The triangulated rear sub-frame of the monoshock chassis is constructed in square-section tubing, a design based on Yamaha's World Championship-winning motocross machines.

The pivot point of the sub-frame is also used as an engine-mount location, thus giving more constant chain tension. As a guarantee of maintaining that tension, the sub-frame pivots on needle roller bearings on the drive chain side but oil impregnated bushes on the opposite one.

Both front and rear suspension systems are designed with tough, off-road conditions in mind. Front wheel travel is 220mm and rear wheel movement, 200mm.

Just as much attention has been paid to the detail fittings on the XT550J: special tyres with a new tread pattern designed for great off-road traction in conjunction with hard-surface stability, 12-volt electrics for safety and reliability, competition-type chain tensioner and fixed roller guide, snail-cam chain adjustment, rubber-mounted handlebars, toolbag at the rear of the seat, louvred front mudguard for increased engine cooling, folding gearshift and brake pedals ...

Wherever you look on the XT550J there is evidence that Yamaha mean to continue their leadership in a segment of the market that they did so much to re-create.

FOR TRAILING OR TRAINING - THE YAMAHA XT125

Latest addition to the Yamaha four-stroke range is an exciting dual-purpose lightweight, the XT125. Styled on similar lines to the new XT550, it will be ideal for novice riders who will soon be restricted to smaller machines by new British 'learner laws'. The enduro type styling will also appeal to more serious trail riders who will find that despite it's smaller engine the XT125 will still give a high degree of performance on the rough.

The lightweight, high-performance four-stroke motor delivers plenty of torque for smooth delivery at all speeds. Vibration, the most common complaint of four stroke single cylinder motors, has been virtually eliminated by the use of a single-shaft gear-driven crankshaft balancer. The power is transmitted to the rear wheel through a five speed gearbox and the rear wheel sprocket has a built-in damper unit designed to cope with the extra stresses of off-road riding. Ignition is by CDI which is virtually maintenance free, while an electronic governer system ensures a positive accurate spark at all times.

The lightweight frame incorporates monoshock rear suspension with a de Carbon-type damper. Front forks are leading axle giving increased travel and the inevitable dirt and dust are kept out by the use of rubber boots. The front drum brake is 130mm in diameter while the rear is 110mm. The waterproof brakes coupled with a wide-section rear tyre give safe braking even under the most severe conditions.

Although the XT125 is designed as a trail bike it is equally at home on the streets and it includes as standard a range of fittings designed to make road riding that much easier. Full-instrumentation includes warning lights, rubber-mounted turn indicators and rear-view mirror.

Detailed technical refinements are typified by such developments as circuit breakers in place of conventional fuses and chain adjustment is made easy by the use of snail-cam adjusters. Rear wheel removal is also made simpler by slotting the rear brake torque arrester into the swinging arm.

The XT125, with it's enduro style tank and high level exhaust may look and perform like an out-and-out dirt bike but even the most inexperienced rider will find that it is also a tractable, well-handling street machine ideal for a first-time mount.

THE DT125LC - THE FIRST LIQUID-COOLED ENDURO BIKE

Ever since it was first introduced, the two-stroke DT125 has been the trail bike that incorporates all that is new from Yamaha and this year is certainly no exception. The 1982 version of this lightweight trail bike - the DT125LC - is packed with technical innovations and new design features.

The liquid-cooled motor is a direct descendant of the YZ125 motocross engine and also features the Yamaha Energy Induction System and CDI ignition. The cooling system uses an aluminium radiator situated on the front downtubes and the coolant is circulated around the new lightweight engine by water pump.

Other new features include the partial use of nylon for such things as crankcase and water pump covers. A contributory factor in making the new liquid-cooled unit 1kg lighter than the air-cooled version. The slim, double-tube, semi-cradle frame is light but extremely rigid, while all the cycle parts are designed with weight-saving in mind. The engine guard, front and rear mudguards, side-panels and chain case are all manufactured from lightweight synthetic plastics.

The dual seat has been extended forwards over the steeply-sloped fuel tank resulting in an overall appearance that owes much to this year's works motocross machines.

Rear suspension uses the new monoshock system to give 200mm of rear wheel travel - an increase of 50mm over last year's model - and the de Carbon-type damper utilises a progressively-tapered coil spring. The low-friction front forks are of the leading-axle type and have a travel of 230mm. Front and rear brakes are water and dustproof drum units.

As the DT125LC is a true dual-purpose machine it includes as standard a complete range of fittings including indicators, rear footrests and a new square headlamp unit. The overall styling of the machine is an eye-catching mixture of enduro and motocross and whether the DT125LC is intended for use on or off the road its looks are certain to make it the number one trail bike for yet another year.

RISING RATE MONOSHOCK ON THE IT175

For the competitive enduro rider, Yamaha offer their IT models, machines that are fully capable of Gold Medal performance in the toughest enduro of them all, the International Six Days.

In 1982, there are four IT models available, from 125 to 465cc. The 125cc, 250cc and 465cc models are all basically unchanged for 1982, with detail improvements making them even more effective. For example the IT250 and IT465 feature a sealed chain to reduce both chain and sprocket wear. And for 1982 the IT465 joins the 250 in being fitted with the Yamaha Energy Induction system to gain torque in the mid-range and smoother power delivery.

The IT175, however, represents a completely new direction for Yamaha enduro bikes. It is actually based on the YZ100 motocross machine, featuring a 175cc version of that air-cooled engine in an enduro version of Yamaha's new rising rate monoshock suspension system. An alloy swinging arm keeps total machine weight down and rear wheel travel with the new system increases by 20mm to 270mm. The front forks give the same amount of travel as the rear suspension and are strengthened by the use of 38mm diameter fork tubes (2mm up on previous models).

Ground clearance is up by 45mm to no less than 335mm and if this is not enough to dodge the rocks, then there is a tubular sumpguard to protect the crankcases!

Representing the next step forward in Yamaha enduro design, the IT175 can be termed 'the state of the art' off-road machine.

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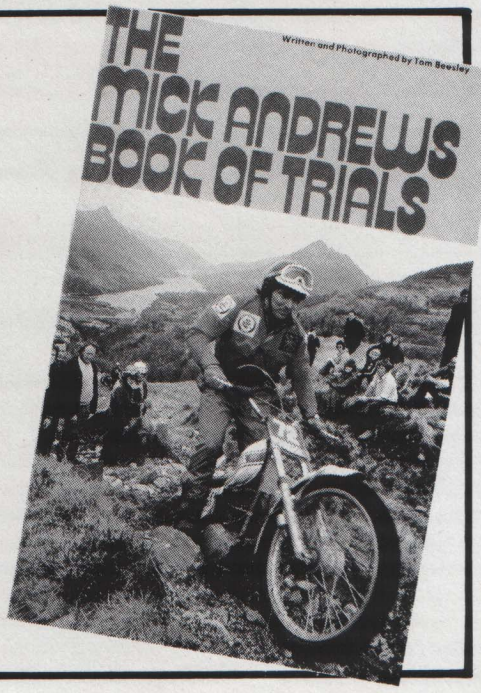


FROM THE COUR

RTROOM TO THE CHAMPIONSHIP

The ambition of every young motocrosser must be to win a world title, but for Yamaha's newest team member Neil Hudson that ambition became an absolute necessity. At the beginning of this season Neil was faced with a massive legal bill amounting to £30,000 so it was no wonder that this quietly-spoken 24-year old from Pensford in Somerset told the motorcycling press that he **had** to win the World Championship just to settle his debts.

Neil's legal problems began at the start of the 1980 season when he first wanted to join Yamaha. He had finished a close second to Hakan Carlqvist in the 1979 World 250 Championship and felt that a move to Yamaha could take him to the title in 1980. According to him, his contract with Maico allowed him to move on but the Maico factory insisted that he must ride for them for a further year. Neil and Maico were unable to settle the issue amicably so the courts were left to decide. While awaiting their decision, Neil entered and won several early-season meetings on a privately-sponsored 'BTB Yamaha'. The courts however, eventually found in favour of Maico so Neil had to revert to one of their machines for the World Championship season. As it turned out the 1980 season was destined to be a very short one indeed for Hudson. In the opening Grand Prix in Germany he crashed heavily and spent the remainder of the year recovering from a broken leg.

By the time he was fully fit, Neil's Maico contract had expired and he was free to join Yamaha in 1981 as their number one rider in the 250cc World Championship.

The season opened with the French GP in Cognac and everyone in the Yamaha camp was confident that the new water-cooled bikes would be a match for any of the other works machinery. Unfortunately this confidence was quickly drowned in a sea of mud. Neil's radiator became clogged and he was forced to retire from both races with an overheated engine. After this disastrous start it was decided that the works riders would revert to air-cooled mounts for the remainder of the season but even this switch did not help Neil in the following round in Spain. In the first race one rider failed to negotiate a steep, heavily-watered hill and the following bunch of riders, including Hudson, came to a chaotic standstill. It took Neil three attempts to get through the traffic jam on the hill. By this time he was in last place and although he gradually clawed his way through the field he could not get into the points with a top ten effort. The second race saw the Hudson/Yamaha combination show its true potential with second place and twelve valuable Championship points.

The first half of the season followed a similar pattern with Hudson taking points in Austria (where he scored the overall win), Italy, Switzerland and Bulgaria. While he was steadily piling up points, however, Georges Jobe - his main rival and favourite for the title - was pulling out an impressive lead. The Belgian's aggressive style was bringing him good results in all the Grands Prix so by the time the British round at Hawkestone Park arrived Neil was trailing by some 60 points. Hawkestone was to mark the turning point of his season. For the first time he used special barrels developed by his American mechanic Bill Buchka and the results were remarkable to say the least. Neil reckoned that it was more like riding a 500 and the extra power paid dividends with a valuable 25 points from the British Grand Prix. More importantly, Jobe failed to finish in one race so Hudson climbed back into the reckoning.

The new-found confidence of the Yamaha team was dented a little in the following West German round where

Hudson could only manage 17 points to Jobe's 27. By now Neil was 53 points adrift of Jobe and it looked as if the Suzuki rider would clinch the title at the US Grand Prix in upstate New York. Unfortunately for Jobe his aggressive will to win cost him dear. In a Belgian Championship meeting he crashed heavily and spent three days in hospital with concussion, cuts and bruises. Ironically, there was no need for him to win the event as he had already clinched the national championship. As it turned out, Jobe's crash sidelined him for the US Grand Prix and eventually cost him the championship. Hudson quickly saw the chance of gaining points and he took full advantage of the unfortunate Belgian's absence. Riding at his absolute best he returned from America as the first European to win a 250cc US Grand Prix - more importantly, he was only 29 points away from the Championship lead.

Two weeks later in Russia, a maximum 30 points closed the gap even further. Jobe had managed a second place in the first race but once again that will to win cost him invaluable championship points. Not content with holding second place in the second race he went all out for a win and in doing so fell heavily, injuring his already-damaged elbow in the process. So the man who had at one time led Hudson by 60 points went into the final round in Holland only eleven points ahead and handicapped by an injured arm.

The Dutch Grand Prix finally brought that coveted title to Britain for the first time but Hudson's last gasp effort was not without drama. In the first leg he notched up a relatively easy eight points and, with Jobe unable to finish, this put him just three points away from the championship. In the second leg disaster nearly struck Hudson when he was involved in a first lap pile up that pushed him down the field third from last. In the ride of a lifetime Hudson worked his way relentlessly through the field until by the end of the eighth lap he was on the leader board in tenth place. Despite some hard delaying tactics by Jobe - who was by this time a whole lap adrift - nothing could stop Hudson and by the halfway stage he was in eighth place and equal on points. Three laps later he swept past the Husqvarna of Bergren to take that all-important seventh place.

Neil's win in the 250cc Championship was the first ever by a Briton (apart from Dave Bickers European Championship for Greeves in 1960/61) and makes him only the third Englishman, along with Graham Noyce and Jeff Smith, to hold a World Motocross title.

John Draper (BSA) and Les Archer (Norton) won European Championships in 1955 and 1956. Neil's victory means that he is able to settle his legal debts and relax to enjoy a home life with his wife Dawn and their newly-arrived daughter, Jessica, free from outside pressures.

Next year Neil stays with Yamaha and joins Hakan Carlqvist to form a two-pronged spearhead in the 500cc class. His ambition is to emulate Rolf Tibblin and Heikki Mikkola and become one of the only men to take both 500 and 250cc titles.

The 1981 World 250cc Championship - Round by Round

	March 29 France	April 5 Spain	May 3 Austria	May 17 Italy	May 24 Czech	May 31 Bulgaria	June 14 Switz	June 21 GB	July 5 WG	July 26 USA	Aug 9 Russia	Aug 16 Holland	TOTAL
N.Hudson (GB)	0 + 0	0 + 12	15 + 12	0 + 12	12 + 12	15 + 12	12 + 12	10 + 15	5 + 12	12 + 12	15 + 15	8 + 5	235
G.Jobe (Belg)	6 + 12	15 + 15	8 + 15	15 + 15	15 + 15	6 + 15	15 + 15	12 + 0	12 + 15	0 + 0	12 + 0	0 + 0	233

A legend and a half.

XT 500 250

Hardened bikers have been known to burst into song at the mere mention of the XT 500.

A big, rugged single in the classic British tradition, the 500 is as at home on the range as it is on the road.

A large flywheel magneto lends its powerful 4-stroke engine a hefty jolt of low-speed torque. Guaranteed zip at the lights, grip in the mud.

The lightweight parts, high-level exhaust, braced bars, crankcase shield and long-travel suspension have all contributed to the legendary, 'anything goes' reputation of the 500.

Small wonder, then, that we've translated this legend into a 250cc machine.

The XT 250 boasts the same on/off road capability as its big brother.

An overhead-cam, 4-stroke engine generates formidable torque at low revs.

And long-travel Monoshock suspension, tough plastic mudguards, lightweight chassis and rubber-mounted indicators give it the grit to slip straight from High Street to dirt track at the drop of a gear.

There you have it. The hard facts behind the XT legend.

We bet you didn't know the half of it.

YAMAHA

Yamaha's latest YZ production motocross racers feature ....

LIQUID COOLING, EXHAUST POWER VALVES AND RISING-RATE MONO—SHOCK SUSPENSION - new for '82!

Ever since Hakan Andersson brought Yamaha its first World Motocross Championship (the 250cc class) in 1973, the factory has made sure that all the lessons learned in the heat of Grand Prix competition are quickly incorporated in its production racers. Since that time, Yamaha have won numerous Grands Prix in all three motocross categories (125, 250 and 500cc). They have also captured the 500cc title twice for Heikki Mikkola in 1977 and 1978 and taken Neil Hudson to this year's World 250cc Championship.

The evidence of all that winning experience is obvious in the 1982 Yamaha YZ motocross range - possibly the most sophisticated machines ever offered to the private rider.

From 50 to 500cc, the range covers no less than seven separate capacity classes! Whether a rider is just beginning his racing in the schoolboy classes, or chasing Grand Prix points, there's a Yamaha YZ to give him the best possible chance of success.

The Yamaha YZ50:
Total weight of the YZ50 has been reduced for 1982 to assist its young riders. The seat, fuel tank and fenders have all been re-styled to mirror the design of the bigger YZ machines. Technically, the YZ50 remains basically unchanged, using the well-proven monoshock chassis and reed valve engine that has established it as a top competitor in the class.

The Yamaha YZ80:
The Yamaha YZ80 is sensationally-redesigned for 1982 to keep the bike at the head of its class. The 49 x 42mm power unit of the 1981 model has now been replaced by a longer stroke version (47x45.6mm) which gives more torque in the low and mid-speed range. This added pulling power is also enhanced by the use of the Yamaha Energy Induction System. This is a small reservoir tank connected to the induction port by a hose. When the engine is on its firing stroke and the reed induction valve is closed, incoming fuel fills this reservoir. As the reed valve opens on the engine's induction stroke, the head of fuel 'stored' in the reservoir rushes out to join the main fuel charge. The impetus provided by this added volume of fuel gives a swirl effect into the combustion chamber, resulting in better cylinder filling and combustion. The final result is more power, particularly in the low speed range to improve the engine's torque.

Biggest news of all for the 80cc class racers is that the YZ80 is now liquid-cooled, just like the 125cc GP machines. The coolant radiator is located in front of the steering head and connected by hoses to the power unit.

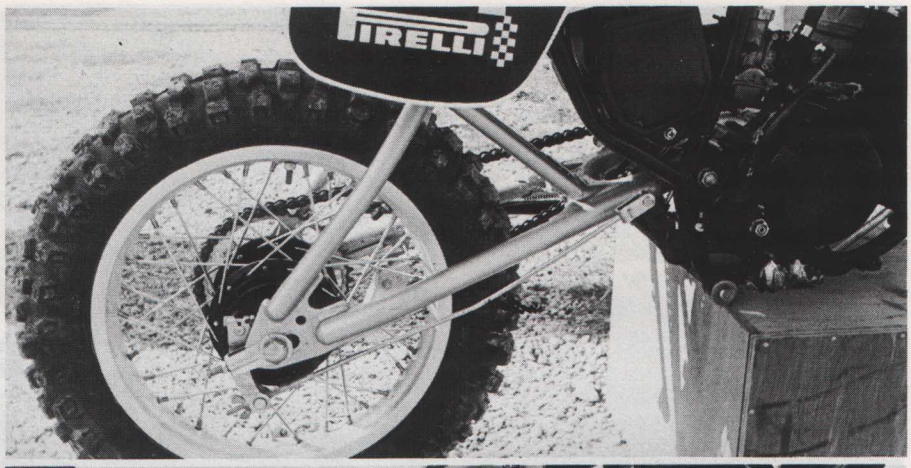
To counteract the added weight of

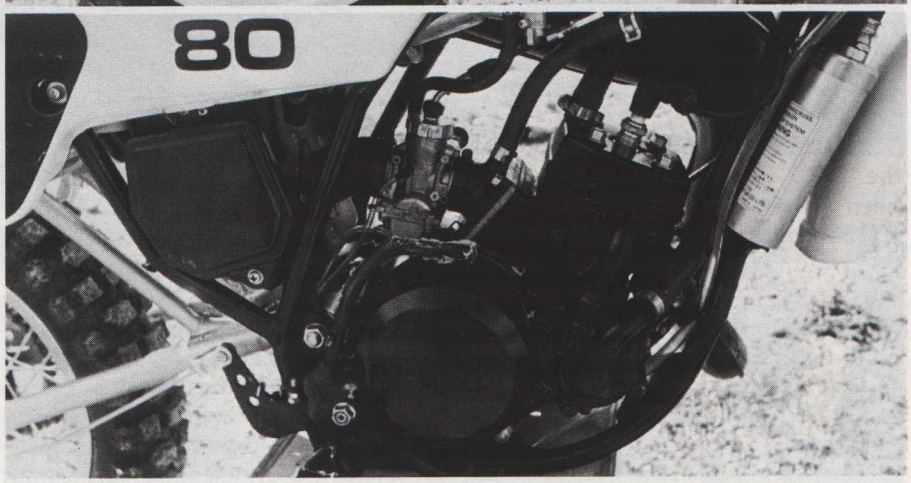
the liquid-cooling system, Yamaha have trimmed off the poundage in other areas of the machine, particularly the new high-tensile steel chassis.

Great attention has been paid to obtaining a low centre of gravity and the best possible weight distribution and the steering caster angle has been increased to give smoother steering despite the location of the radiator high up on the front forks. In this position, of course, the radiator is less likely to suffer damage from flying rocks and other on-track hazards.

The familiar Yamaha monoshock suspension now uses a separate tank for the damper fluid, which increases fluid capacity and gives smoother action. A progressive-wind spring is used on the monoshock damper which acts in concert with an internal gas cell to prevent suspension bottoming. Front wheel travel has been increased by 10mm to 225mm while rear wheel movement is now 230mm - a 25mm increase over the 1981 model. The rear axle has been strengthened to cope with the extra power of the new unit by a 3mm increase in diameter, to 15mm.

In common with its smaller brethren, the YZ80 has redesigned styling of tank, seat and fenders.





The Yamaha YZ100:
The 100cc competitor in the Yamaha 'junior' range has undergone a radical design change for 1982, the most obvious feature being the move to a rising rate version of the monoshock suspension system. This puts the YZ100 right in line with the bigger GP models in the YZ range.

The result of the new chassis is to increase the YZ100 rear wheel travel by a huge 50mm ... to 250mm of movement!

To keep front suspension on a par with the rear, new GP-type front forks are used (also giving 250mm of travel). The fork tubes have been strengthened by a 1mm increase in diameter (to 36mm) and an air cushion spring prevents front-end bottoming.

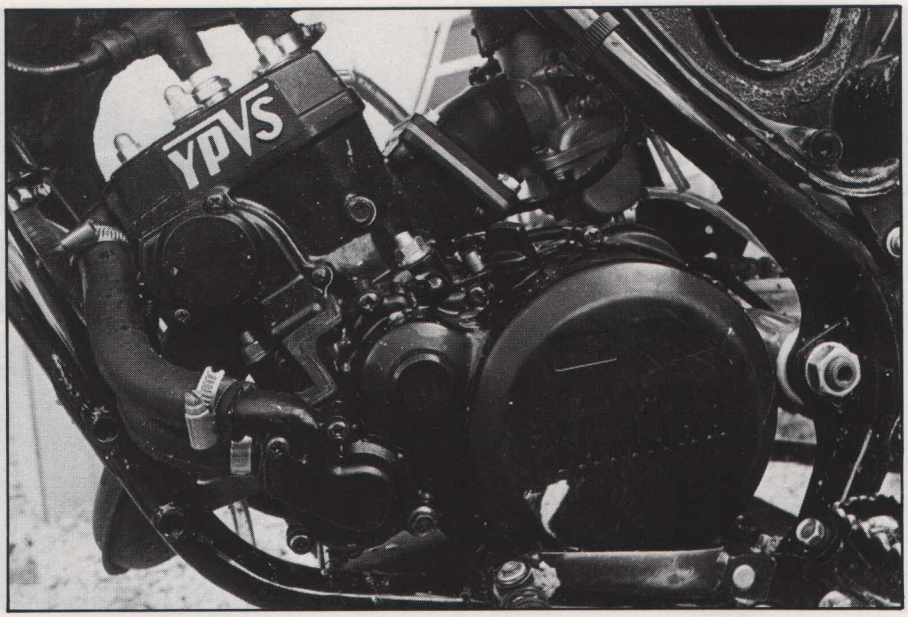
The air-cooled engine is based on the 1980 YZ125 (previously it had been based on the less-powerful DT125 unit) and features YEIS for improved torque.

The Yamaha YZ125:
The liquid-cooled Yamaha YZ125 caused a sensation when introduced in 1981. The 1982 version is even more impressive!

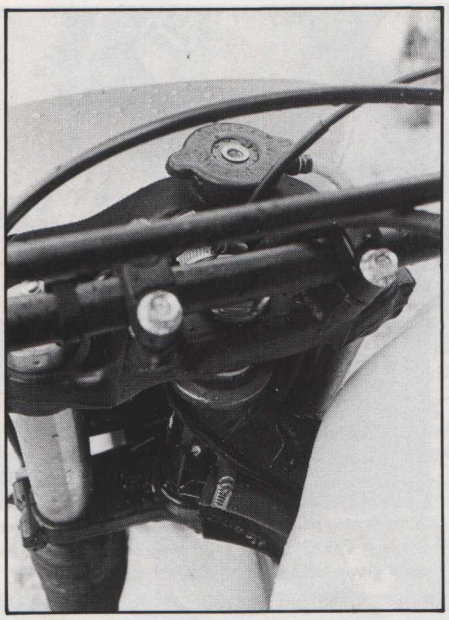
The new machine utilises an uprated version of the YZ125 engine in the new rising rate suspension chassis.

The YEIS system gives more torque for 1982 while the addition of the Yamaha Power Valve System - as used on the factory Grand Prix machines - results in more horsepower throughout the rpm range. The YPVS has a cylindrical valve located in the exhaust port with a graduated cutaway matched to the shape of the port. The valve is linked to the throttle via a cable and drum arrangement and the cutaway effectively controls the height and

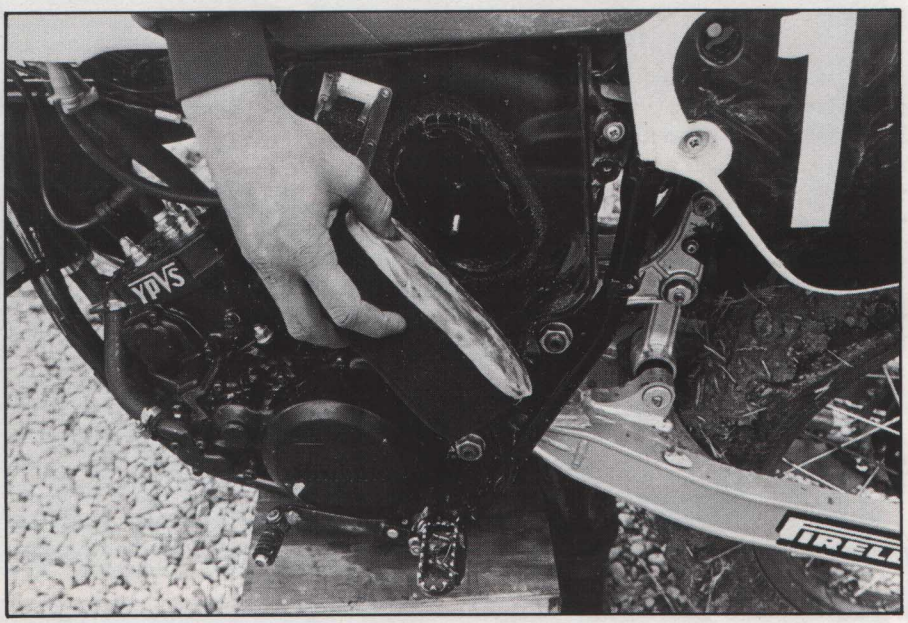
Remote reservoir for the gas damping of the monoshock suspension system.



A potential GP-winner for the private rider - the Yamaha YZ125.



Radiator on YZ125 and YZ250 models is mounted at steering head and steering head tube is used as coolant routing.



The YZ models all feature a large capacity, easily-accesible air filter.

volume of the exhaust port. It cuts down the volume and lowers the port height in the cylinder at low rpm. As rpm rises, so the cutaway increases to maximise exhaust port volume to cope with the increased gas flow.

The result of this is precise exhaust timing matched to the engine's rpm. It gives more power, particularly at low speeds and in the mid-range, and the combination of YPVS and YEIS mean that the YZ125 has more pulling power than any other machine in its class.

Better gas flow and combustion are achieved on the 1982 YZ125 by a redesigned combustion chamber shape for better squish effect and the connecting rod's big end bearing is strengthened to take the added horsepower.

Also strengthened is the transmission, with wider gears and modified shift cam. Weight of the clutch assembly has been reduced and lighter springs on the pressure plate mean that operation is now much easier.

The rising rate monoshock system features a new damper with a stronger damper rod 18mm in diameter. The damper has separate adjustment capabilities for both expansion and compression strokes enabling the rider to get the best possible settings for track conditions and load.

All of this adds up to one of the strongest production racers ever produced for the 125cc class.

The Yamaha YZ250:

Neil Hudson won the World 250cc Motocross Championship for Yamaha in 1981, so obviously all eyes will be on the YZ250 production machine for 1982. What they will see is a motorcycle that is actually even more sophisticated than the machine which Hudson used for the bulk of the season! Neil adhered mainly to an air-cooled engine but the production YZ250 has gone to liquid-cooling to make the machine a potential GP winner even in the hands of a private rider!

The cooling system is the same as used on the YZ125 machine and was well-proven on that model in 1981.

The radiator is mounted at the steering head and the fork crown, steering head tube and chassis front downtube are all used as cooling water passages between radiator and engine.

Power output of the YZ250 is markedly increased for 1982 and liquid-cooling will increase heat

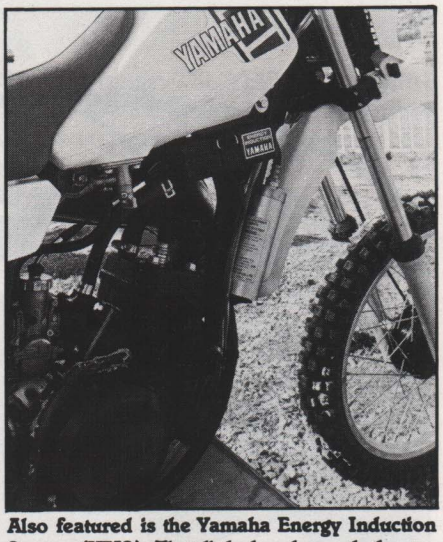
dissipation to bring reliability as well as added horsepower. To meet the higher power output, the primary transmission and clutch systems have been strengthened and individual gear widths increased.

Torque has been increased by the use of YEIS and YPVS and, of course, the YZ250 uses the new rising rate monoshock suspension.

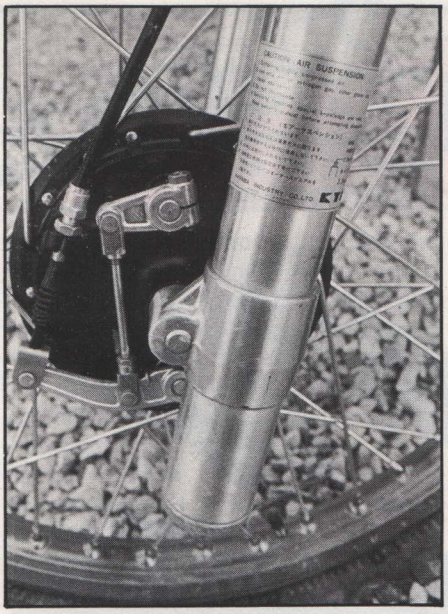
As one of the weight-saving measures on the new machine, rear hub diameter has been reduced by 20mm, the brake plate is made of magnesium alloy and the brake cam lever of cast aluminium.

This type of attention to detail, plus the sophisticated overall design, means that the YZ250 will be the hottest competitor in 1982 250cc class racing.

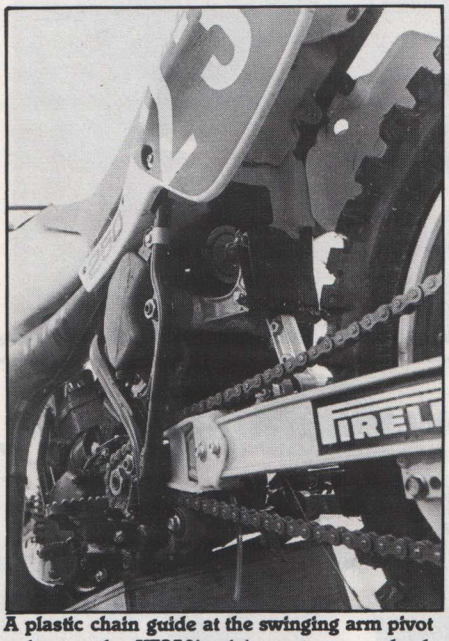
The YPVS 'power valve' exhaust system is part of the YZ250 specification.



Also featured is the Yamaha Energy Induction System (YEIS). That little box beneath the gas tank gives much more mid-range power.



Leading axle forks and a powerful but smooth twin leading shoe front brake on the YZ250.



A plastic chain guide at the swinging arm pivot point on the YZ250's rising rate monoshock suspension.

New-style front number plate incorporates radiator air intake with full-size FIM-legal racing number plate.

The Yamaha YZ490:

In 1981, the Yamaha YZ465 was hailed as the machine with the most success-potential for the private rider in the 500cc class. That potential is even more marked for 1982!

The machine has now grown into the YZ490, thanks to the new 487cc engine. Reason for the extra capacity is to attain smoother power throughout the range and so improve rideability of the biggest beast Yamaha offer. Torque and smooth low-down to mid-range power are also improved by the use of the YEIS induction system.

In fact, power delivery on the new machine is now so smooth that Yamaha have been able to dispense with one of the gearbox speeds. The YZ490 has such a wide spread of power that only a four-speed gearbox is needed. After all, a motocross racer has enough to do without the need for constant gearchanging.

The rising rate suspension developed on the 1981 500cc World Championship machines by team riders, Hakan Carlqvist and Andre Vromans is now used on the 1982 production machines.

More evidence that what Yamaha learns on the GP tracks is quickly passed on to the paying customers!

YAMAHA

A stylish new 'logo' design will be used by Yamaha's competition department in 1982.

Clubs organising motocross events in 1982 will be interested to know that Yamaha are offering a variety of course banners featuring the new logo. These include flags with single, double and triple reproductions of the design plus long trackside banners and start and finish line bannering.

All in bright red, white and blue and a smart, professional way of dressing up your track.

Check the banners out via the Yamaha Competition Department, Oakcroft Road, Chessington, Surrey.

LOOK LIKE A CHAMPION ....

Yamaha motocross campaigners in 1982 will be able to emulate the factory's World Championship team of Neil Hudson and Hakan Carlqvist. Maybe not in actual riding prowess but at least they can look like these superstars thanks to a whole new line of Yamaha racing gear.

Pictured here is the range of clothing and accessories which comprises riding pants and jersey, mouthguard, knee protectors and gloves plus snazzy paddock jacket and travel bag to pack it all into.

And even if you're not a racer, the paddock jacket and travel bag make smooth spectating gear. The bag's big enough for an overnight change of clothes, cameras and whatever else you like to pack when you're off to the races.

It's all in Yamaha's red, white and blue factory racing colours and you can check it out at your local Yamaha competition dealer.

You've seen the SUPERSTARS ... Now wear their shirts!

Barry Sheene or **Kenny Roberts,** whichever you cheer for you'll want to identify with them by wearing one of the terrific **Promoto 'Replica' shirts.** Exact copies of the superstars leathers imprinted back **and** front on to a 100% cotton high-quality English-made tee-shirt for £4.90. Price **includes** VAT, packing and postage.

If you own a **Yamaha RD250LC** or **RD350LC** you **have** to be riding proud! Show your colours by wearing the **Promoto RD shirts** for both 250 and 350 owners.
And if you're one of the millions that have thrilled to **RD350 Series action** then you'll be even more thrilled to know that you can now buy the **official series tee shirt.** The same shirt worn by the series competitors.
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DIRT BIKE RIDERS! Now available, the **official 'Camel Series' World Championship tee-shirt** as worn by all the Grand Prix motocross stars.
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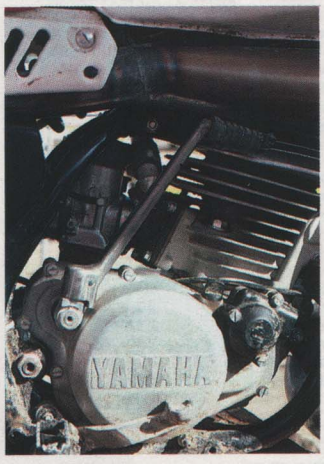
CLOSE UP FACTORY 500

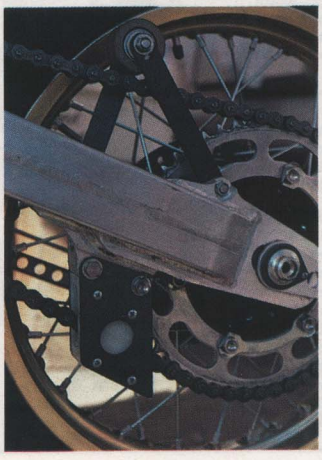
These shots of Hakan Carlqvist (4) and American Champion, Broc Glover (23) on their 1981 factory 500cc Yamaha motocrossers show just how closely the 1982 production bikes match the GP machines in chassis layout. There are still some differences in the engine compartment, however, as our close-up shots show. For example, the GP racers featured YPVS exhaust power valves (upper pictures in the close-up shots below), plus the Yamaha Energy Induction System and a finned monoshock gas reservoir on Glover's machine to cope better with the California heat (bottom left). Also note the chain tensioner on the top of the swinging arm with chain guide beneath (bottom right).

The new Yamaha YZ490 is closer than of its rivals to the factory GP machines but there will always be a difference. And it's that difference which aids the development of better and better production machines. Remember, the only private bike to win a Grand Prix motocross in the past ten years was the Yamaha YZ465 of Marty Moates at the 1980 USGP. Proof that Yamaha really do pass all of their development knowledge on to the private customer.

Mail remittance to:

YAMAHA RIDER SHIRTS,
Circuit Magazine, P.O.Box 49,
Banbury, Oxon OX16 8JG
Please allow 21 days for delivery.





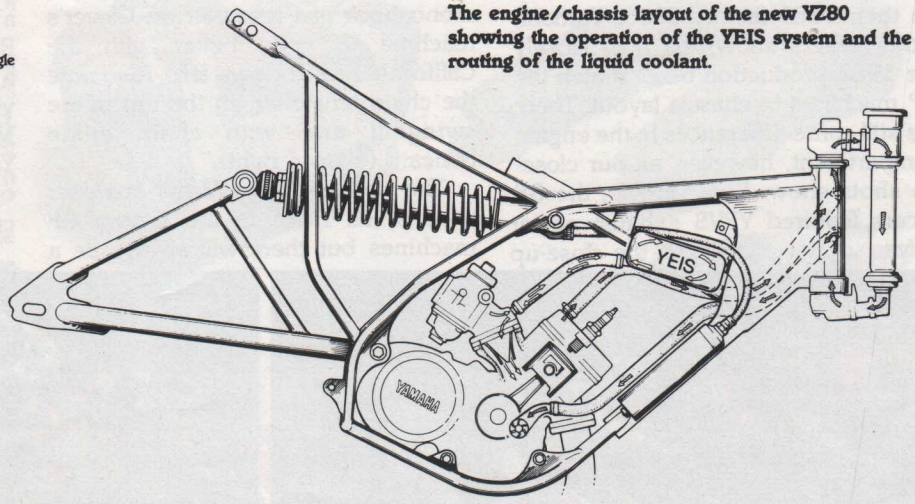
Specifications are subject to change without notice.

MOTOCROSS RANGE

YZ80

Engine	
Type	2-stroke, liquid cooled, single
Displacement	79cc
Bore & Stroke	47.0 x 45.6mm
Compression ratio	7.5 : 1
Maximum horsepower	19.5 PS/12.250rpm (14.3kw/12.250rpm)
Maximum torque	1.1kg-m/12.000rpm (11,2Bn/12.000rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	6-speed
Dimensions	
Overall length	1790mm
Overall width	765mm
Overall height	1040mm
Wheelbase	1230mm
Min. ground clearance	270mm
Weight (dry)	63kg
Fuel tank capacity	5.2 lit
Tyres front	2-75 - 17
Tyres rear	4.10 - 14
Brakes front	Drum
Brakes rear	Drum

The engine/chassis layout of the new YZ80 showing the operation of the YEIS system and the routing of the liquid coolant.



YZ50

Engine	
Type	2-stroke, single
Displacement	49cc
Bore & Stroke	40.0 x 39.7mm
Compression ratio	7.8 : 1
Maximum horsepower	9 PS/10.500 rpm (6.6kw/10.500rpm)
Maximum torque	0.62kg-m/10.000rpm (6.1Nm/10.000rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Flywheel magneto
Transmission	5-speed
Dimensions	
Overall length	1510mm
Overall width	715mm
Overall height	845mm
Wheelbase	1025mm
Min. ground clearance	195mm
Weight (dry)	50kg
Fuel tank capacity	3.3 lit.
Tyres front	2.50 - 14
Tyres rear	3.00 - 12
Brakes front	Drum
Brakes rear	Drum

YZ100

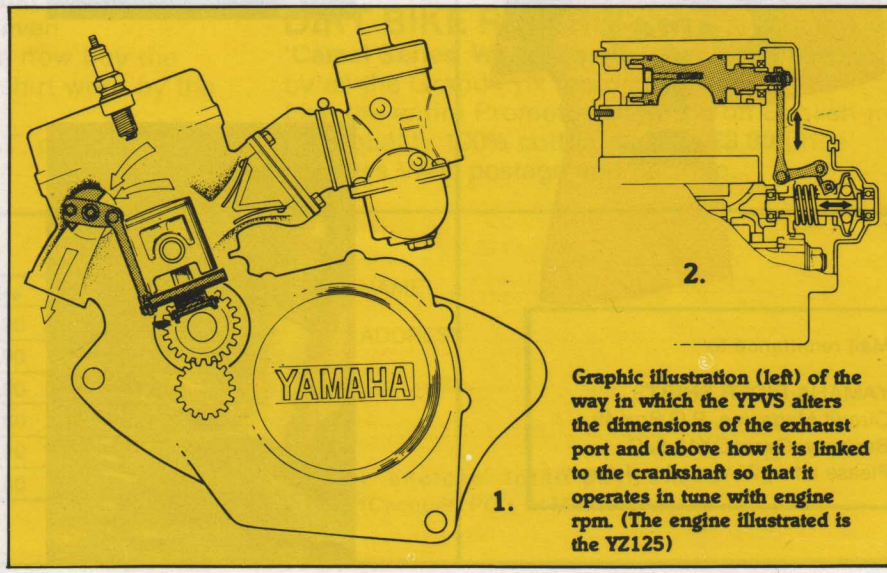
Engine	
Type	Reed-Valve, 2-stroke, Air cooled, Single
Displacement	98cm³
Bore & Stroke	50.0 x 50.0mm
Compression ratio	8.0 : 1
Maximum horsepower	22.0 PS, 11.500rpm (16.2kw, 11.500rpm)
Maximum torque	1,4kg-m, 9.500rpm (13.7Nm, 9.500rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor Discharge
Transmission	6-speed
Dimension	
Overall length	2105mm
Overall width	840mm
Overall height	1195mm
Wheelbase	1420mm
Min. ground clearance	315mm
Weight (dry)	88kg
Fuel tank capacity	8.2 lit
Tyres front	3.00 - 21
Tyres rear	4.10 - 18
Brakes front	Drum
Brakes rear	Drum

YZ490

Engine	
Type	2-stroke, single
Displacement	487cc
Bore & Stroke	87.0 x 82.0mm
Compression ratio	7.0 : 1
Maximum horsepower	53 PS, 7,000rpm (40.0kw, 7.000rpm)
Maximum torque	5.8kg-m, 6.000rpmn (57.9Nm, 6.000rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	4-speed
Dimensions	
Overall length	22.00mm
Overall width	870mm
Overall height	1210mm
Wheelbase	1500mm
Min. ground clearance	320mm
Weight (dry)	106kg
Fuel tank capacity	10.5 lit
Tyres front	3.00 - 21
Tyres rear	5.10 - 18
Brakes front	Drum
Brakes rear	Drum

YZ250

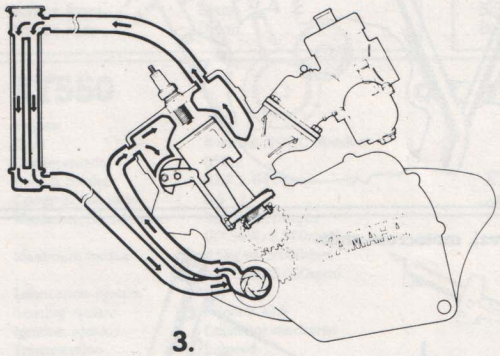
Engine	
Type	2-stroke, liquid-cooled, single
Displacement	246cc
Bore & Stroke	70.0 x 64.0mm
Compression ratio	7.0 : 1
Maximum horsepower	42.5 PS, 8.250rpm (37.3kw, 8.250rpm)
Maximum torque	3.85kg-m, 7.500rpm (37.8Nm, 7,500rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	5-speed
Dimensions	
Overall length	2190mm
Overall width	870mm
Overall height	1230mm
Wheelbase	1490mm
Min. ground clearance	325mm
Weight (dry)	103kg
Fuel tank capacity	9.1 lit
Tyres front	3.00 - 21
Tyres rear	5.10 - 18
Brakes front	Drum
Brakes rear	Drum



Graphic illustration (left) of the way in which the YPVS alters the dimensions of the exhaust port and (above how it is linked to the crankshaft so that it operates in tune with engine rpm. (The engine illustrated is the YZ125)

YAMAHA PW50

The Yamaha PW50 is the perfect introduction to the enjoyment of two-wheeled sport for children of either sex. The 50cc two-stroke engine is governable to various speeds via exhaust restrictors and has automatic transmission with safe, clean shaft drive.



3.

This cutaway of the Yamaha YZ125 engine shows the coolant routing on Yamaha liquid-cooled YZ power units.

Cutaway colour of the Yamaha YZ125 takes you inside the engine as well as showing you the workings of the new 'rising rate monoshock' suspension.

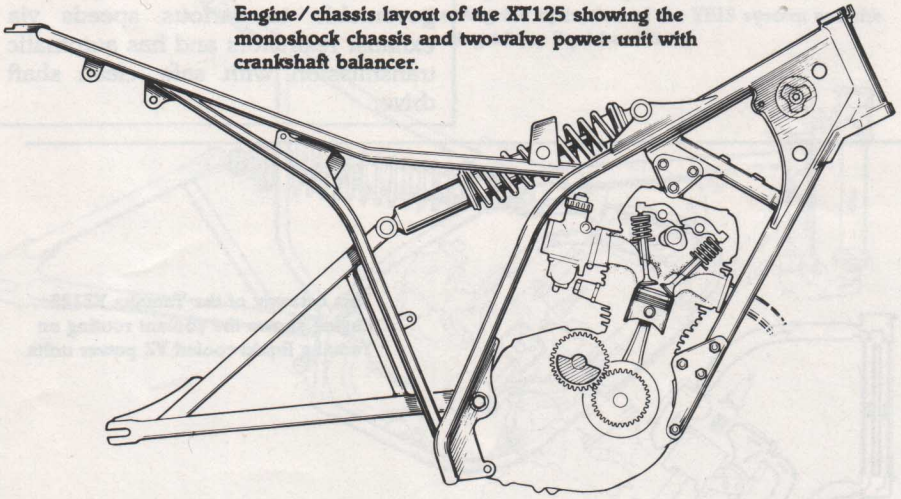
YZ125	
Engine	
Type	2-stroke, liquid cooled, single
Displacement	123cc
Bore & Stroke	56.0 x 50.0mm
Compression ratio	8.2 : 1
Maximum horsepower	31PS, 11.250rpm (22.8kw, 11.500rpm)
Maximum torque	2.07kg-m, 10.500rpm (20.3Nm, 10.500rpm)
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	6-speed
Dimensions	
Overall length	2150mm
Overall width	870mm
Overall height	1255mm
Wheelbase	1465mm
Min. ground clearance	350mm
Weight (dry)	92kg
Fuel tank capacity	8.2 lit
Tyres front	3.00 - 21
Tyres rear	4.00 - 18
Brakes front	Drum
Brakes rear	Drum

Specifications are subject to change without notice.

ENDURO MODELS

XT125

Engine	
Type	SOHC, 4-stroke, air-cooled, single
Displacement	124cm³
Bore & Stroke	57.0 x 48.8mm
Compression ratio	10.0 : 1
Maximum horsepower	12PS, 9.000rpm
Maximum torque	1.0kg-m, 8.000rpm
Lubrication system	Wet sump
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	5-speed
Dimensions	
Overall length	2155mm
Overall width	845mm
Overall height	1160mm
Wheelbase	1330mm
Min. ground clearance	265mm
Seat height	835mm
Weight (dry)	98kg
Fuel tank capacity	7.6 lit
Tyres front	2.75 - 21
Tyres rear	110/80 - 17
Brakes front	Drum
Brakes rear	Drum

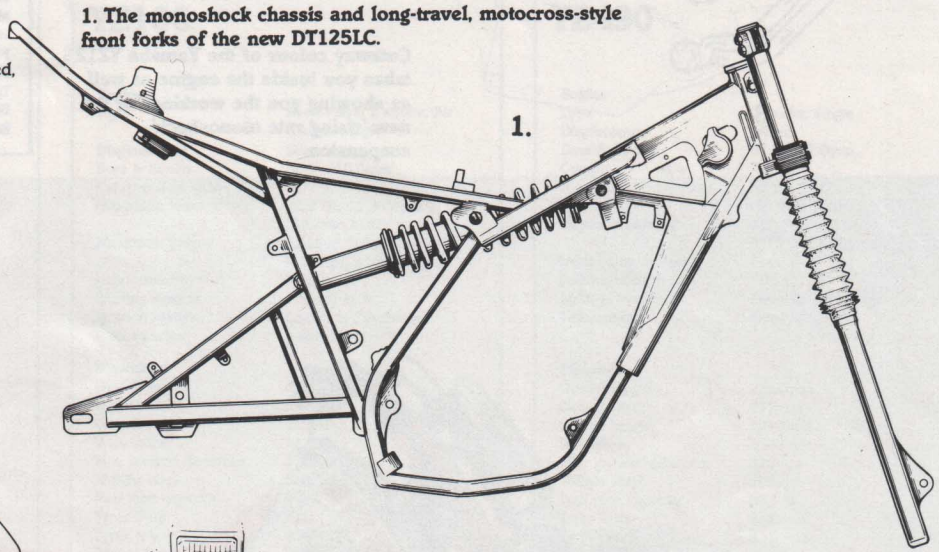


Engine/chassis layout of the XT125 showing the monoshock chassis and two-valve power unit with crankshaft balancer.

DT125LC

Engine	
Type	2-stroke, liquid cooled, single
Displacement	123cc
Bore & Stroke	56.0 x 50.0mm
Compression ratio	7.2 : 1
Maximum horsepower	16.2PS 7,000rpm (11.9kw 7.000rpm)
Maximum torque	1.7kg-m 7.000rpm (16.3Nm 7.000rpm)
Lubrication system	Autolube
Starting system	Primary kick
Ignition system	Capacitor-discharge
Transmission	6-speed
Dimensions	
Overall length	2135mm
Overall width	820mm
Overall height	1195mm
Wheelbase	1345mm
Min. ground clearance	270mm
Seat height	840mm
Weight (dry)	96kg
Fuel tank capacity	9 lit
Tyres front	2.75 - 21
Tyres rear	4.10 - 18
Brakes front	Drum
Brakes rear	Drum

1. The monoshock chassis and long-travel, motocross-style front forks of the new DT125LC.



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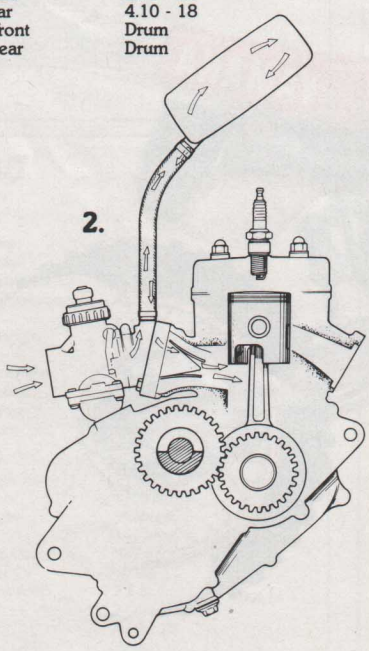

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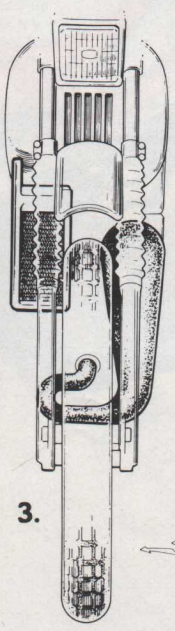
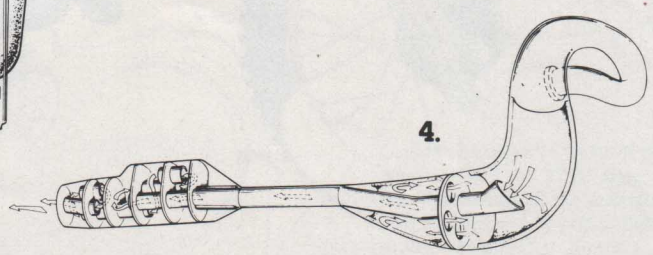


3.

2. The DT125LC is one of the few two-stroke power units with a crankshaft balancer and is, therefore, one of the smoothest!

3. Coolant radiator on the DT125LC is side-mounted for most compact installation.

4. Baffling actually inside the DT125LC expansion chamber combines with integral rear muffler to make the bike both quiet and powerful.



4.

IT175

Engine	
Type	2-stroke, single
Displacement	171cc
Bore & Stroke	66.0 x 50.0mm
Compression ratio	N/A
Maximum horsepower	N/A
Maximum torque	N/A
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	6-speed
Dimensions	
Overall length	2245mm
Overall width	825mm
Overall height	1265mm
Wheelbase	1445mm
Min. ground clearance	340mm
Weight (dry)	99kg
Fuel tank capacity	11.0 lit
Tyres front	3.00 - 21
Tyres rear	4.00 - 18
Brakes front	Drum
Brakes rear	Drum

IT250

Engine	
Type	Reed-valve, 2-stroke, air-cooled, single
Displacement	246cm³
Bore & Stroke	70.0 x 64.0mm
Compression ratio	N/A
Maximum horsepower	N/A
Maximum torque	N/A
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	6-speed
Dimensions	
Overall length	2.205mm
Overall width	890mm
Overall height	1-225mm
Wheelbase	1-450mm
Min. ground clearance	295mm
Weight (dry)	106kg
Fuel tank capacity	13.0 lit
Tyres front	3.00 - 21
Tyres rear	5.10 - 18
Brakes front	Drum
Brakes rear	Drum

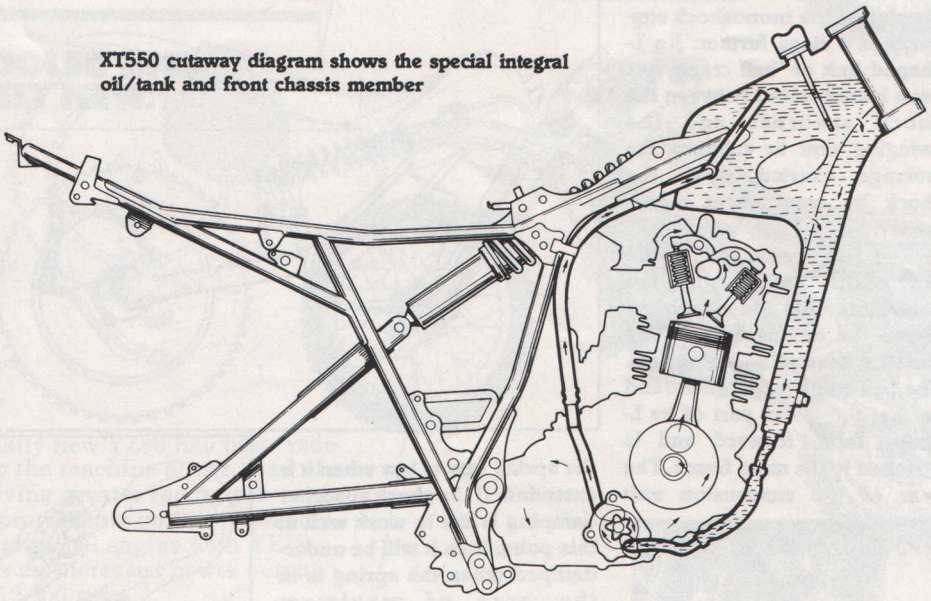
IT465

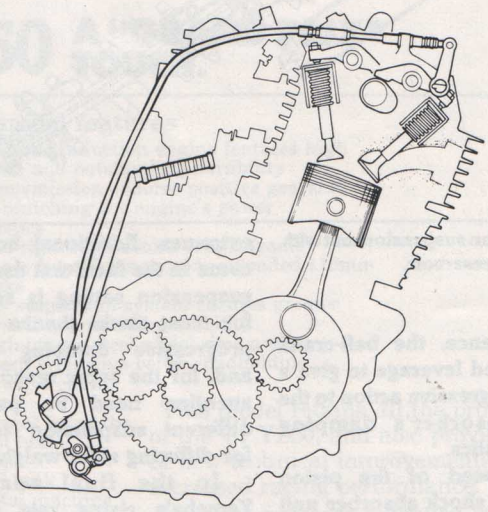
Engine	
Type	Reed-valve, 2-stroke, air-cooled single
Displacement	465cm³
Bore & Stroke	85.0 x 82.0mm
Compression ratio	N/A
Maximum horsepower	N/A
Maximum torque	N/A
Lubrication system	Premix
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	5-speed
Dimensions	
Overall length	2.205mm
Overall width	890mm
Overall height	1-225mm
Wheelbase	1.475mm
Min. ground clearance	295mm
Weight (dry)	110kg
Fuel tank capacity	13.0 lit
Tyres front	3.00 - 21
Tyres rear	5.60 - 17
Brakes front	Drum
Brakes rear	Drum

XT550

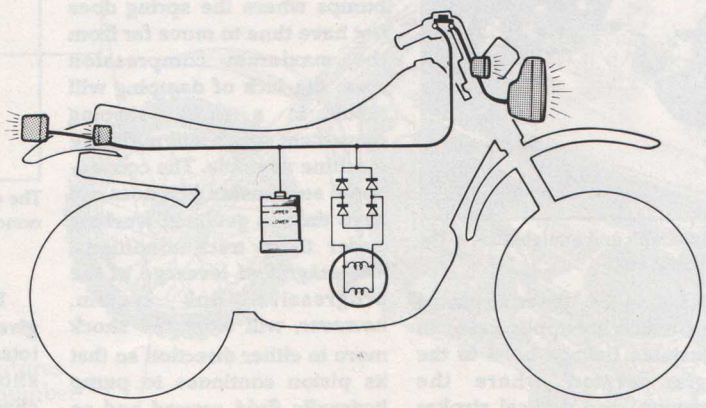
Engine	
Type	4-stroke, SOHC (4-valve)
Displacement	558cc
Bore & Stroke	92.0 x 84.0mm
Compression ratio	8.5 : 1
Maximum horsepower	38 PS/6.500rpm (27.9kW/6.500rpm)
Maximum torque	4.5kg-m/5.000rpm (44.1Nm/5.000rpm)
Lubrication system	Dry sump
Starting system	Primary kick
Ignition system	Capacitor discharge
Transmission	5-speed
Dimensions	
Overall length	2265mm
Overall width	860mm
Overall height	1190mm
Wheelbase	1445mm
Min. ground clearance	260mm
Seat height	870mm
Weight (dry)	130kg
Fuel tank capacity	11.4 lit
Tyres front	3.00 - 21
Tyres rear	4.60 - 18
Brakes front	Drum
Brakes rear	Drum

XT550 cutaway diagram shows the special integral oil/tank and front chassis member





Decompressor is linked direct to the kickstart mechanism for automatic operation and easy starting of the big XT550 single.



The Yamaha XT550 has a 12 volt DC ignition system with quartz-halogen headlight.

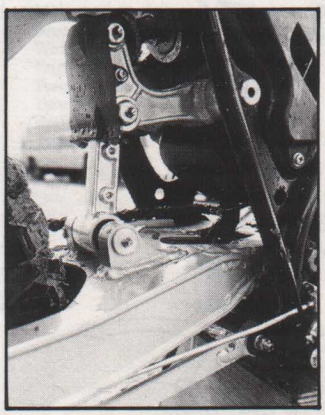
RISING RATE ....

The deservedly-famous Yamaha 'monoshock' suspension led the entire motorcycle world in the switch to single shock absorber chassis designs for motocross racing. Since it was first introduced in 1973, every rival manufacturer has had to follow the Yamaha lead.

Additionally, the inherent advantages of the Yamaha monoshock system under all conditions have meant that it has been used with success in such diverse applications as road racing, motocross and street riding.

For 1982 Yamaha have developed the monoshock suspension a stage further. An L-shaped link or 'bell crank' has been incorporated between the shock absorber and the swinging arm to enhance the leverage exerted upon the shock by rear wheel movement.

The suspension unit of the monoshock remains along the centreline of the machine, above the engine and linking steering head to swinging arm. The bell crank is turned around so that the lower part of its L-shape faces forward and is attached to the main frame. The rear of the suspension unit



The L-crank and straight link to the swinging arm.

attaches to the upper stroke of the 'L' while the upper end of an adjustable linkage bolts to the angle formed where the horizontal and vertical strokes of the 'L' converge. The lower end of the adjustable straight link is connected to the fabricated single-fork swinging arm unit, which pivots on the main frame in the normal way.

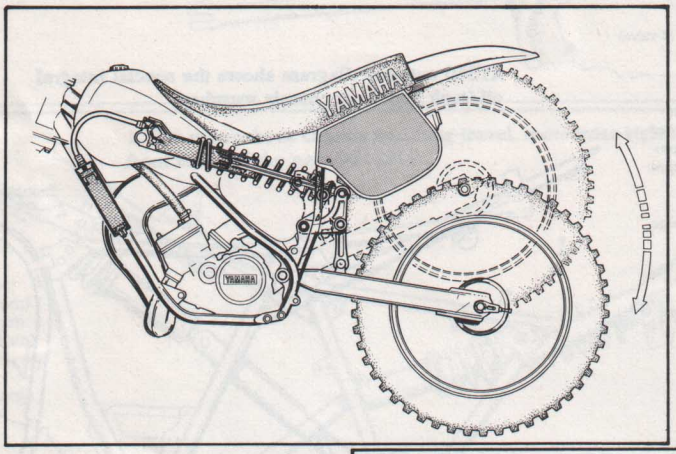
Thus the movement of the rear wheel in its swinging arm is transmitted via the straight link to the bell crank. The extra leverage of the crank magnifies swinging arm movement and more closely matches damper action to the actual movement of the rear wheel.

What this achieves is to bring about a better relationship between the shock absorber's actual damping action and that of the coil spring which controls the speed of its compression and rebound movement. On normal constant-leverage suspension, the spring rate is low when it is extended. If the shock absorber damping is set to work well at this point, then it will be under-damped when the spring is in the area of maximum compression.

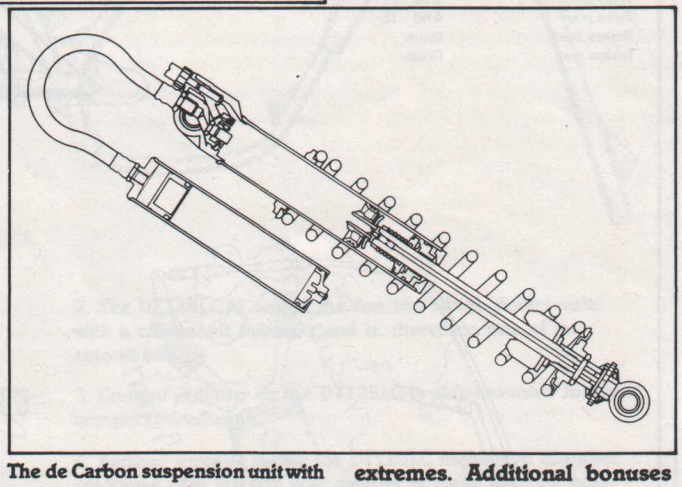
Thus, in conditions like a series of hard, closely-spaced bumps where the spring does not have time to move far from the maximum compression area, the lack of damping will result in a short, hopping movement which will make the machine unstable. The conventional suspension just does not have time to get itself working under these track conditions. The magnified leverage of the progressive 'link' system, however, will work the shock more in either direction so that its piston continues to pump hydraulic fluid around and so damp the rebound action of the spring.

Conversely, with conventional leverage suspension one cannot adjust the damping under the high spring rate conditions of maximum compression. Otherwise there will be too much damping when the shock absorber is at the maximum extension area which would result in a stiffening of the suspension, delayed rebound and a 'sinking' of the machine's rear end in, for example, a series of rolling dips and mounds.

The progressive leverage or 'rising rate' effect of the bell crank works the suspension unit more softly than a constant-leverage system would at this point and so prevents over-damping.



Main illustration here shows the rising rate suspension on full extension. Dotted outlines show component positions under full compression.



The de Carbon suspension unit with remote gas reservoir.

In essence, the bell-crank gives added leverage to give a totally progressive action to the shock absorber's damping characteristics.

The speed of the piston within the shock absorber unit is what decides how quickly the damper fluid is circulated and, therefore, how heavy the damping effect is upon the spring rate.

From the controlled, soft action at maximum spring extension, the additional leverage of the bell crank link system moves that piston progressively faster as the shock compresses. As a result, the damper fluid is circulated quicker and the damping effect gets progressively stronger.

On a conventional, constant-leverage suspension system, the rebound 'up and down' speed of the rear wheel is what governs the amount of damper action in the shock absorber.

On the 'link' system monoshock, damper action is governed by both rear wheel rebound speed and, most important, by the actual amount of travel of the wheel.

The main advantages are a much smoother suspension action under all track conditions and more control of the machine at the suspension extremes. Additional bonuses come in the facts that the same suspension setting is suitable for most tracks thanks to the progressive damping action and, for the same reason, less attention need be paid to different suspension settings for differing rider weights.

In the final analysis, Yamaha's rising rate monoshock suspension means both faster and safer riding under any conditions. And what more can a rider ask for?

YZ THE FACTS

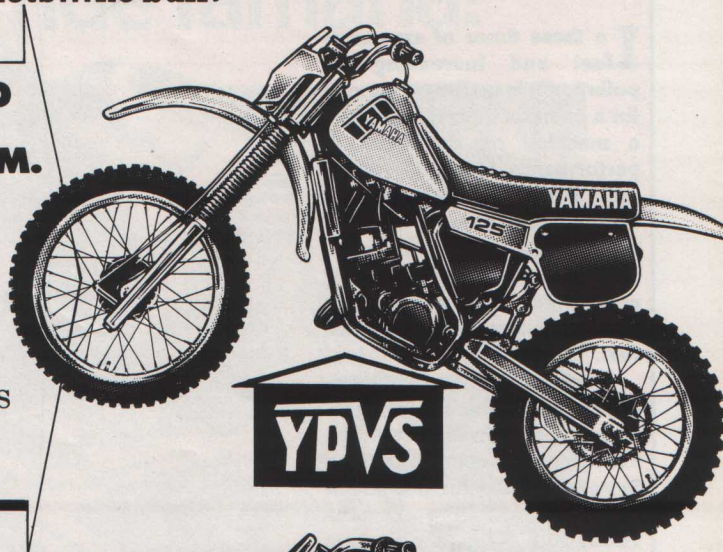
Yamaha asked you to wait. We hope you did and if you've had a chance to see the new bikes you're pleased you did...right.

In any event, for those who have not seen them, here's the facts...no bull.

YZ125LC

GP-PROVED POWER VALVE SYSTEM.

SPARE PARTS KIT

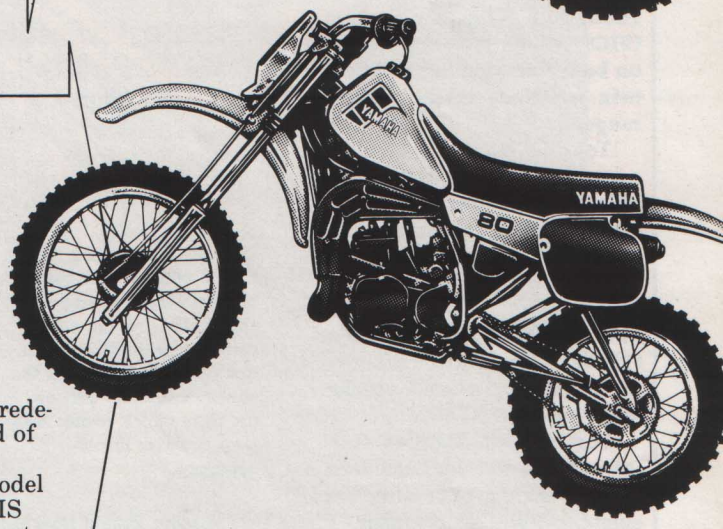


Main technical features

- Powerful liquid-cooled Torque Induction engine with YPVS
- Newly-designed air cleaner, combustion chamber and expansion-chamber muffler
- Durable, easy-to-handle clutch and transmission
- Rigid, strong high-tensile steel tubular frame
- New rising-rate Monocross suspension system using separately adjustable expansion/compression damping shock absorber
- The combination of enlarged fuel tank and extended seat offers better riding position
- New square type number plate and improved front fender
- Convenient detachable side stand

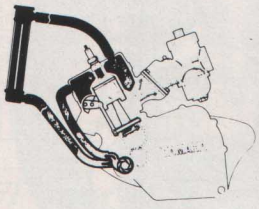
The YZ125 was the first YZ machine to employ a liquid-cooling system for higher racing performance. The '82 model comes with a number of new technical improvements including the race-bred YPVS (Yamaha Power Valve System).

YZ80LC LIQUID-COOLED AND COMPLETELY NEW.



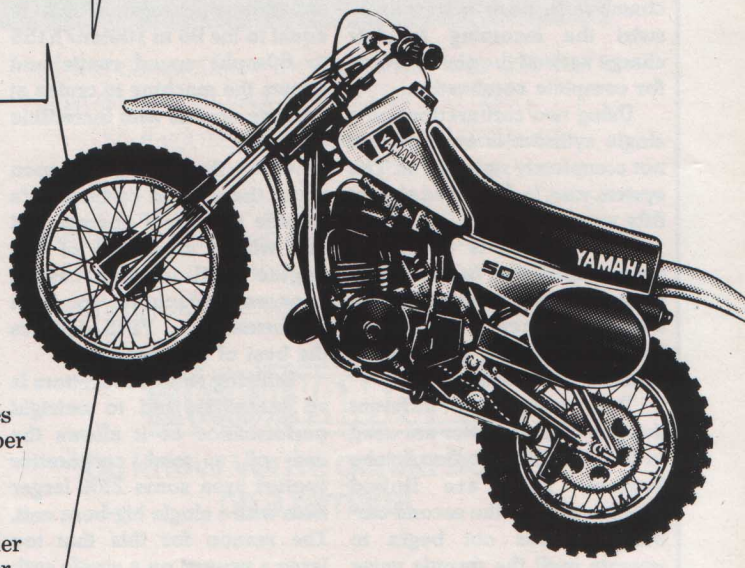
Main technical features

- Newly designed liquid-cooled Torque Induction engine with YEIS
- Near-square type bore and stroke for excellent torque and power
- Strengthened con-rod and newly designed expansion-chamber muffler
- Increased wheel travel front and rear
- Extended swingarm and increased-stroke shock absorber
- Adjustable damping and gas-pressure De Carbon type damper with remote reservoir
- Newly designed fuel tank and extended seat for increased freedom of riding position. Enlarged fuel tank holds 5.2 litres of fuel.
- Improved front fender and new square type number plates
- Bevel-gear throttle grip
- Aluminium front and rear wheel rims and strengthened rear axle



The sensationally new YZ80 has been redesigned to keep the machine at the head of its class by giving greater racing performance. Improvements on this '82 model include a liquid-cooled engine with YEIS which delivers an increased power output of 19.5 PS at 12,250 rpm.

YZ50 A "GRAND PRIX" TOUCH.



Main technical features

- 2-stroke Torque Induction engine features high performance and outstanding durability
- 5-speed transmission ensures positive gearshift operation matching the engine's power characteristics
- Strong and rigid semi-double cradle frame
- Leading-axle front forks provide extended 110mm wheel stroke
- Monocross suspension system ensures greater manoeuvrability and riding stability
- Sturdy high-tensile steel wheel rims and new tread pattern tyres give better roadholding
- Improved drive chain tensioner
- Extended seat helps the rider adopt best riding position
- F.R.P. fuel tank reduces total machine weight
- Improved front fender and new square type number plates

This model retains all the proven features of the '81 YZ50, and also provides a number of new technical improvements for increased racing performance.

The seat has been extended forward and lapped over the fuel tank, allowing the rider a wide range of riding positions for greater control.

YZ...what else!

YAMAHA
THE BREED OF CHAMPIONS

YDIS

In these times of expensive fuel and increasing air pollution it is no longer enough for a manufacturer to carburate a machine on the basis of performance alone. A motorcycle's induction system must achieve three objectives in this modern age ... adequate performance, reasonable economy and reduced air pollution via the efficient use of the ingested fuel.

Yamaha have already introduced two induction systems which meet these aims. The Yamaha Energy Induction Systems (YEIS) for two-stroke machines and the Yamaha Induction Control System (YICS) which is being utilised on both four cylinder and vee-twin machines in the current range.

To that pair can now be added another innovative form of induction, aimed primarily at single cylinder machines and particularly those with a dual on/off-road function.

This one is entitled the Yamaha Duo Intake System (YDIS), a novel twin-carburettor design introduced on the single cylinder XT550J.

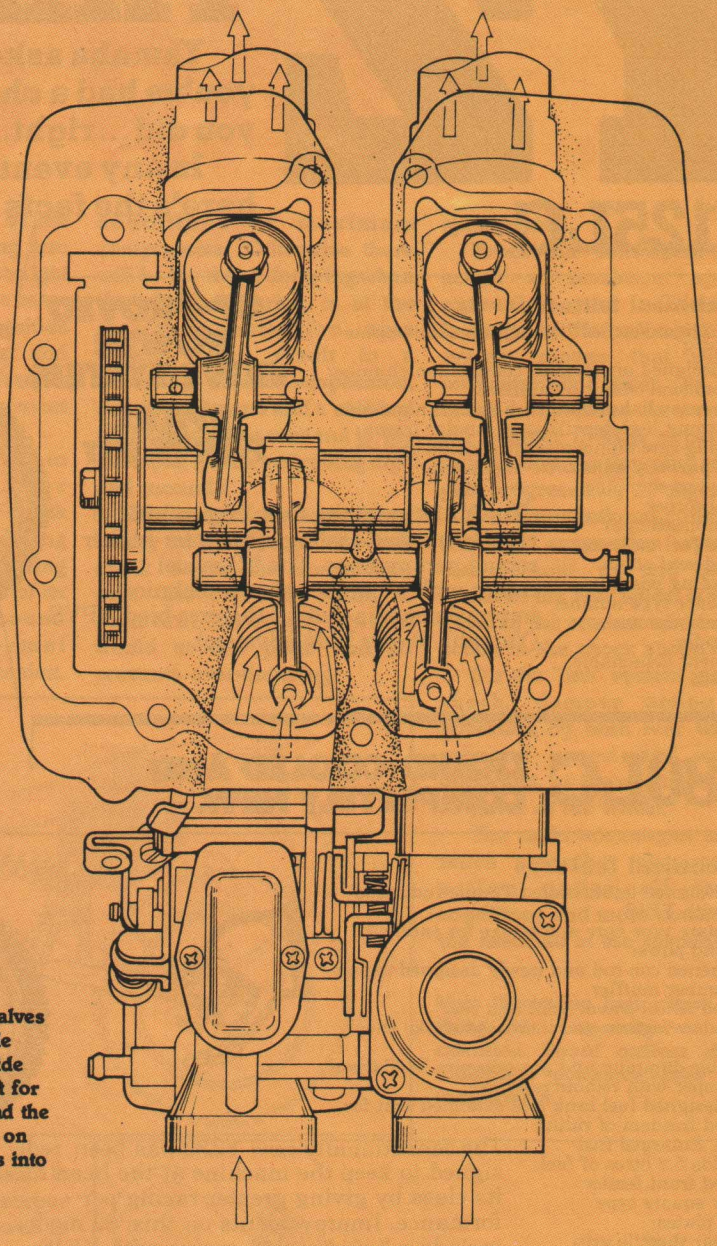
The XT550J features four valves in its cylinder head; twin inlet and exhaust ports into the single combustion chamber.

Two carburettors feed the single cylinder; with the ports angled into the combustion chamber in such a way as to swirl the incoming fuel/air charge around the piston crown for complete combustion.

Using two carburettors on a single cylinder is unusual, but not completely unheard of. The system was, in fact, used almost fifty years ago.

Where YDIS is absolutely unique, however, is in the type of carburettors used and in the way which they are linked to become a single, progressive method of induction.

Two completely different designs of carburettor are used to feed the Yamaha Duo Intake System. They are linked together so that the second carburettor does not begin to operate until the throttle valve of the first is already approximately 50% open.



Cylinder head of the XT550 with its four valves operated from a single camshaft. Note the slide carburettor on the left for low speed running and the constant velocity unit on the right which comes into play at wider throttle openings.

This means that a machine such as the XT550J will be running on a single small-bore carburettor at low to medium twistgrip openings. Which is equal to the 90 to 100km/h (55 to 60mph) speed range and allows the machine to cruise at average speeds with incredible economy.

With the twistgrip open wide, the second carburettor's throttle valve will operate and the whole character of the engine will change. From economy machine to high performance .... YDIS delivers the best of both worlds.

Utilising twin carburettors is an incredible aid to outright performance as it allows the use of a total carburettor venturi area some 25% larger than with a single big-bore unit. The reason for this that too large a venturi on a single carb will inhibit low speed pick-up. Opening the throttle quickly leads to too great an inrush of air for the volume of fuel, which equals faulty carburetion and actual loss of power at low speeds.

Obviously, this situation does not occur with YDIS as low end carburetion is controlled by the primary small-bore carburettor with bore matched perfectly to low-speed fuel flow. It is not until the engine has generated more rpm and begun to pass more fuel that the second carburettor begins to operate and allow in more air.

Where Yamaha have really refined the two-carburettor system is in using two distinctly different carbs on the same cylinder. Each carb is chosen to perform a specific duty. The primary unit is of the mechanical type with cable-operated throttle valve. This type of carburettor reacts quickly to the twistgrip, which makes it ideal for off-road riding or low speed traffic conditions on the street.

The second carburettor is of the constant velocity or 'vacuum' type which allows optimum airflow at high speeds while being totally sensitive to engine load conditions.

Because the CV carb's throttle slide is operated by a rubber diaphragm that is sensitive to pressure changes, it delivers or holds back fuel at the engine's demand, not that of the rider. This, of course, makes for much more even running at higher speeds.

The two carburettors in the Yamaha Duo Intake System are joined by a pre-set linkage so that twistgrip is via a single cable.

The owner has to make no adjustments either mechanically or in riding technique - just twist the grip and the YDIS does the rest!

Why does five times SSDT winner Mick Andrews ride Yamaha?

Mick Andrews, five times Scottish Six Days Trial winner, twice European Trials champion and several times British Trials champion has good reasons to ride a Yamaha.

Four very good reasons, in fact.

Fuss-free running.

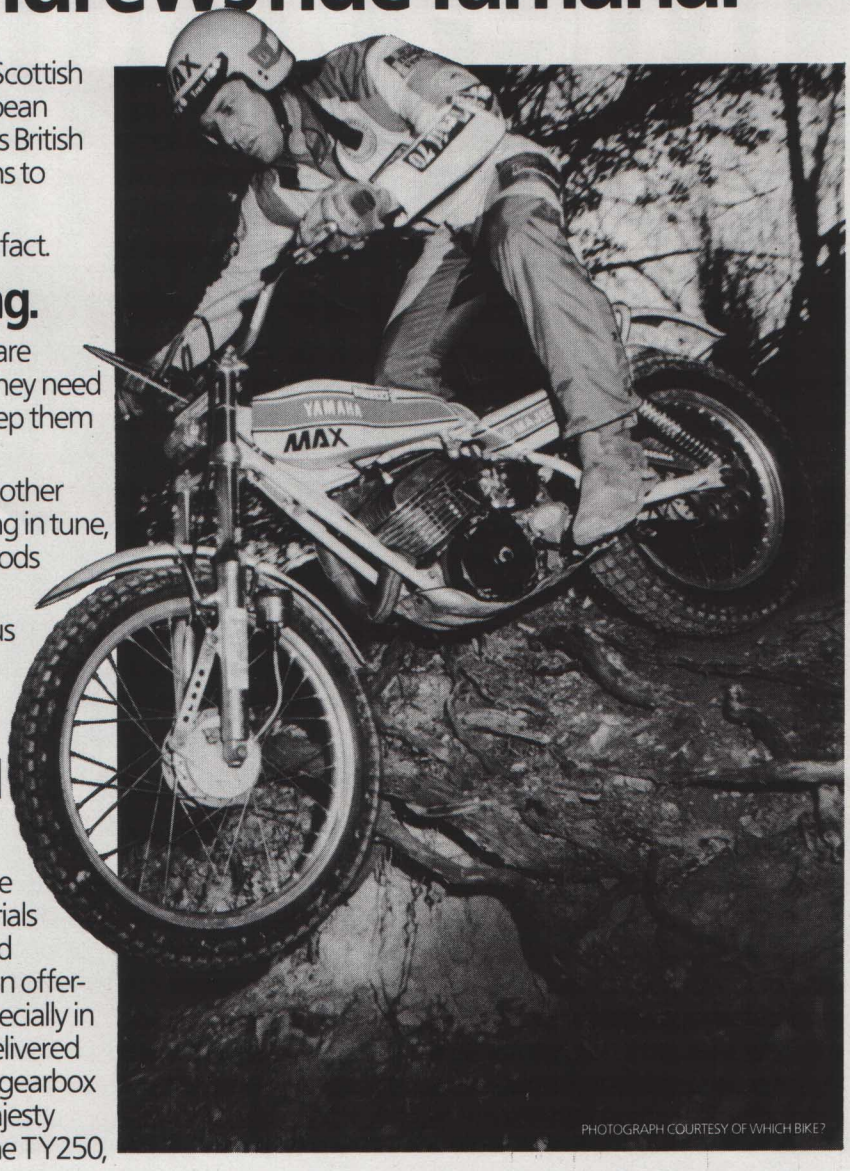
Mediterranean machines are well-known for their fussiness. They need a lot of fettling and tuning to keep them running well.

Yamaha trials bikes on the other hand have a reputation for staying in tune, and one piece, for very long periods with little attention.

And with Yamaha's famous Autolube you can forget about mixing petrol and oil in the petrol tank.

Unquestioned reliability.

Bulletproof engines are one of the hallmarks of all Yamaha trials bikes. They're all well-proven, solid designs with reed-valve induction offering a good spread of power, especially in the lower and mid-ranges. All delivered to the rear wheel via a six speed gearbox in the case of the TY175 and Majesty 200, and five speed 'boxes on the TY250, Majesty 320 and Majesty 250.



PHOTOGRAPH COURTESY OF WHICH BIKE?

High quality finish.

The standard of finish on the Yamahas is enough to put many an expensive road bike to shame. Careful attention to construction and detailing are, again, all hallmarks of the Yamaha engineering philosophy making sure the TYs and Majesties outlast the competition. On, and off the sections.

Low price.

You probably think that all this has to be paid for somewhere. Wrong. Compared to most of the competition the Yamahas have got them beat on price as well as reliability and finish.

So, if you're up to International standard you'll most likely want one of the Majesty Yamahas like Mick's. But if you're a clubman or the occasional green-laner and like to spend your time out on the trail rather than fiddling in the shed, you've now got four good reasons to buy a TY.

YAMAHA

You know you're gonna beat 'em on a Yamaha

The XJ550. Little brother or big mother?

Don't turn your nose up at the c.c, the XJ 550 will leave a lot of bigger 4-strokes standing.

Oh yeah? Yeah.

Because it's the only Yamaha machine in the U.K. fitted with the Yamaha Induction Control System.

A simple, yet ingenious device which ensures that not one iota of power is wasted (unbelievably, it reduces fuel consumption by approximately 10% at the same time).

What's more, a traditional chain drive puts every ounce of that precious power to use.

Just like its big brother the XJ 650, the XJ 550 is a true thoroughbred. Its remarkable narrowness and lightness combined with a double cradle frame for perfect balance make it an absolute doddle to handle.

Other features include 6 gears, transistor controlled ignition, adjustable rear suspension, teflon-lined front forks, an excellent braking system, sporty Italic wheels and believe it or not, even a fuel gauge.

So, if you're going to pick on a little brother, we don't think you could make a better choice.

YAMAHA