YAMAHA YZ-C 125 MONOCROSS

Cycle Test

● Competition between the 125cc motocross bikes is the keenest and most intense in the sport. Year after year, the manufacturers manage to squeeze more horsepower out of the tiny 7½ cubic inch engines. More horsepower means narrower power bands. Narrower power bands mean more gears. These single cylinder two-strokes could probably work as well on a road race oval as a motocross track.

Until now, only one or two horsepower have separated the Japanese 125s. In the performance race, Yamaha's new 20-plus horsepower YZ-C 125 Monocross has lunged convincingly into the lead. The YZ's super-engine is backed up by a new six-speed gearbox and Yamaha's unique monoshock suspension. For the 1975 season all the other Japanese manufacturers are going to have to play catch-up.

Yamaha's experience with two-stroke dirt bikes is far and away greater than any of the other Japanese manufacturers. Only months after the advent of the first DT-1 enduros Yamaha had available their infamous GYT (Genuine Yamaha Tuning) kits that transformed a docile trail bike into an explosive potential racer. Enormous interest in *hot* enduro bikes that could be made into competitive racers led to Yamaha's very successful MX series machines—enduro bikes with GYT engine parts, knobby tires, and no lights.

The first really serious effort by Yamaha to build works-type motocrossers was reflected by their YZ series. While engine performance was competitive, handling and pricing were less and more respectively than other good motocrossers. With the development of the 250cc monoshock, Yamaha was able to leap out in front of the other Japanese. Equipped with an engine offering performance equal to other non-long-travel bikes, the 250cc Monocross had a clear handling edge. The most recent YZ model to receive the benefits of the long travel monoshock system is the 125cc "C" version.

Last year's YZ's had chrome-lined cylinder bores. Because of their short life span and high repair cost, Yamaha is using a steel liner in the "C" model. The single ring piston and cylinderhead are the same as before. Last year's 125cc YZs were barely competitive with the more powerful Elsinores, KSs and TMs. To correct this problem the engineers did a lot of port-moving and reshaping.

All of the ports have been either widened or raised. The top of the exhaust port has been raised from 26mm to 25mm. The forward transfers have been raised two millimeters and the rear ports are the same height as before while their width was narrowed. The rear boost port (the slot that runs up the back of the cylinder from the intake opening) has been broadened from 16mm to 24mm. The intake port window has been likewise widened six millimeters.

Changes in the ports alone do not account for the performance gains in the YZ's power band. The reed valve is now a big six-petal unit in place of the two-petal intake control used last year. The Mikuni carburetor throat diameter has been opened up to 30mm from 28mm. Though appearing identical, the expansion chamber and yard long stinger are minutely different in shape and size.

The results of these changes have given the new YZ a phenomenal increase in horsepower and torque. Percentage-wise they're the most substantial we have ever seen in one model change. Last year's 125cc YZ-A produced 15.32 on Webco's dynomometer. The YZ-C developed a shattering 20.16 hp—up 24%, and the torque output is up 10%. And the useable power range has been broadened.

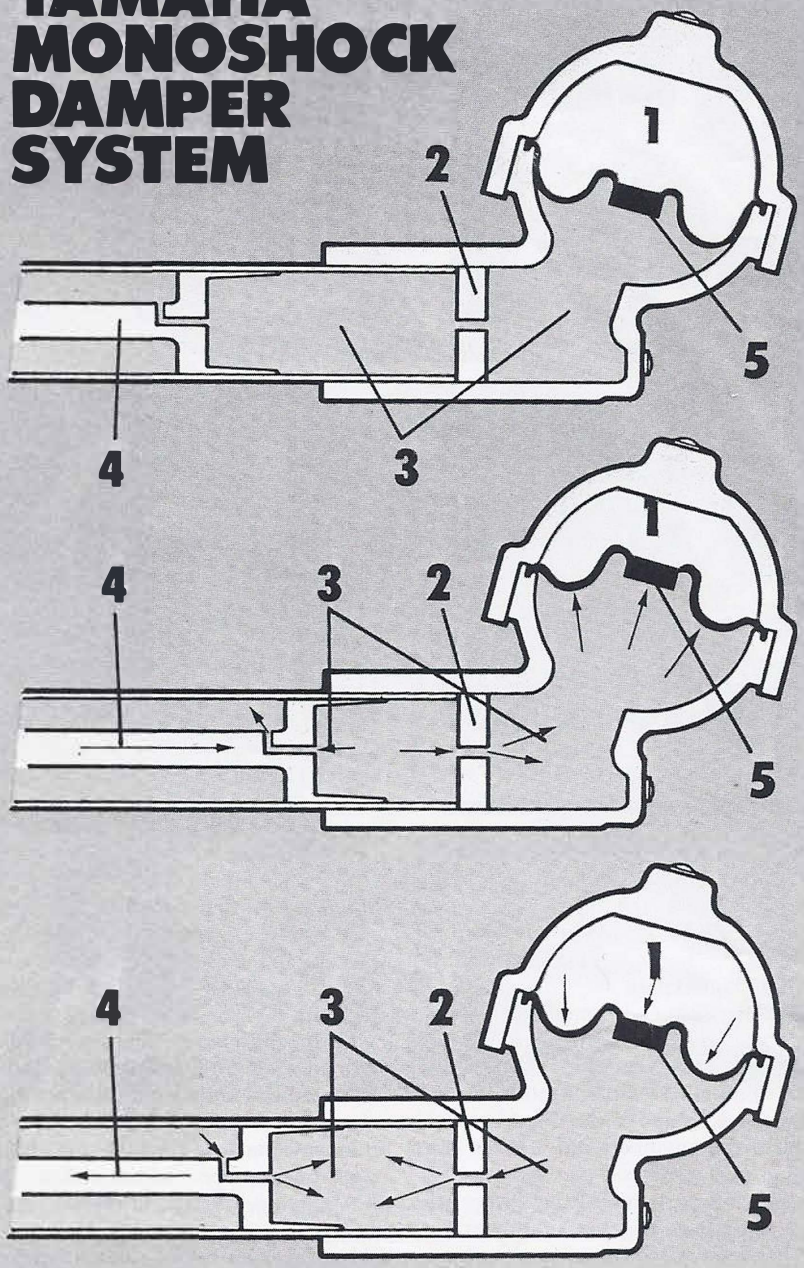
Not only has the power increase put the "C" model far ahead of last year's YZ, but it is the first Japanese 125cc motocrosser to ever get into the 20-horsepower bracket. In the numbers game the new YZ has it all over last year's 16.56 hp Elsinore, 16.58 hp KX, or 16.16 hp TM.

Further enhancing the tremendous performance of the newly tuned engine is a six-speed transmission replacing the five cog gearbox of last year. Using the same crankcase halves, Yamaha has designed a narrow six-speed unit that slips right in where five gears used to reside. The span between each gear is very close and enables an experienced rider to make optimum use of the narrow power range. Primary drive is through helical cut gears.

No unobtanium has been used in the fabrication of the 125cc YZ-C Monocross. The fork and front wheel are the same as those on the YZ 250. Prototype testing with a smaller fork and wheel hub caused undesirable stanchion and axle flexing. The 250 parts eliminated the flex. The only magnesium part on the motorcycle is the front hub backing plate.

The DID rims, wheel hubs, rear brake retaining arm, brake and control levers, gas tank and fork crowns are aluminum. Tire bead locks hold the Dunlop knobbies in place when super-low air pressures are used. The brakes are both small, but very sensitive to the touch. The full-front and rear quarter-length fenders are unbreakable plastic. A rubber mud flap retained to the fiberglass seat base keeps goo off the damper and air cleaners.

YAMAHA MONOSHOCK DAMPER SYSTEM



1: Pressurized nitrogen
2: Base valve
3: Oil
4: Piston
5: Rubber diaphragm

Appearing simple in function, the monoshock Yamaha unit is intricate. Pressurized nitrogen is separated from the air-free oil reservoir by a rubber diaphragm. A large rod is attached to the frame and the cylinder slides over the piston. As the rear wheel moves up, the cylinder is driven over the piston and it displaces the oil. The pressurized nitrogen gas, along with the external coil spring (not shown), can vary the rate of speed at which the cylinder can travel. High gas pressure—370 psi—resists ease of oil displacement on the up stroke and speeds the cylinder return rate. Low gas pressure—240 psi—works inversely. The base valve is the damper that restricts oil flow. Additional holes in the base valve are covered by leaf springs. They open under increased oil pressure. This permits fast oil displacement for long wheel travel.

The advent of the long travel rear suspension motocrossers has committed each manufacturer to a specific method of acquiring six or seven inches of wheel movement. Maico pioneered with their forward mount system; Husqvarna's Heikki Mikola captured the 500cc world title with cantilever (lay down) shocks; and Hakan Andersson bagged a 250cc world crown for Yamaha in 1972 with a monoshock-suspended machine. All three systems are proven, but Yamaha's monoshock is the most novel of the group.

By all other motocross standards, the Monoshock chassis is trick. The frame members are all conventional mild steels. The rake angle is 31.5° and the trail 5.5 inches—both proven dimensions for the smaller motocrossers. The fork delivers over seven inches of travel and the rear wheel moves up and down 6¼ inches.

The monoshock rear suspension unit is the newest and most sophisticated suspension component in motorcycling. Yamaha has been testing and racing monoshockers for a couple of years on a national and international basis. The shock is a high-pressure, gas loaded, oil filled, double-damping, spring actuated unit. All of these components have individual and overlapping duties.

The center section or cylinder of the monoshock unit contains a large diameter connecting rod, piston and numerous O-rings, wave washers, clips, and springs, etc. All of these components are enclosed in a sealed (no air or gas) cylinder filled with oil. In this manner the oil cannot form air bubbles (foam) as it is agitated by piston and valving action, and the oil can control damping more consistently.

A cast aluminum gas chamber is screwed to the end of the damping cylinder. The chamber/cylinder assembly actually moves up and down on the stationary piston. The connecting rod is bolted to the rear of the steering head support. When the rear wheel moves the cylinder slides back and forth over the piston. As this occurs the sealed damping oil is driven down into and out of the gas chamber through a base valve.

A buffer and expansion zone has to be provided for the oil as it's driven towards the gas chamber. The upper part of the gas chamber contains pressurized nitrogen. Between the nitrogen gas and oil is a special semi-toroidal shaped rubber membrane. Basically the rubber membrane is nothing more than a flexible diaphragm that insulates the nitrogen from the oil. Being flexible, the membrane moves in and out with oil pressure changes. When the cylinder is driven up, the piston forces oil toward the gas chamber. The nitrogen compresses allowing the membrane to fold into the gas cavity. As the oil folds the membrane into the gas cavity the cylinder slides over the piston and the rear wheel travels up.

There is no adjustable tensioner for the spring that enables the rider to select load

PHOTOGRAPHY: DAVE HOLEMAN.

The long, large monoshock unit attaches at the frame head support. The cylinder slides over the piston. Split air filters clear shock unit.

force and control ride height. This is the prime duty of the pressurized nitrogen. The amount of pressure in the gas chamber—270 psi is soft, 370 psi is firm—determines the amount of force needed to initially move the axle. In other words, the pressurized nitrogen is performing the same job as a spring adjuster.

The confusing aspect of the combined usage of the pressurized nitrogen and coil spring is their performance overlap. A stiffer or softer ride can be controlled by either changing the gas pressure or installing various springs (three springs are presently available for the 250 monoshockers). But changing the gas pressure will simultaneously alter the ride height and damping. Both compression damping and rebound rate change with variances in the nitrogen pressure.

Complicating the gas/oil damping action variances is an intricate valve that controls oil flow rate. A base valve located between the cylinder and gas chamber has an orifice that controls oil flow in the out of the gas chamber. Severe blows and long movements of the wheel and cylinder cause quicker transfer of the damping oil. On these occasions increased oil flow into the gas chamber is necessary to permit full wheel travel. Increased pressure opens special leaf springs that cover additional oil passages in the base valve. Oil may now travel into the gas chamber more rapidly. As the wheel must return home as quickly as possible leaf springs on the other side of the valve open on the back stroke and expose more orifices.

The complexity of the 43-piece unit is confusing but the results it delivers are not. When riding the YZ it's virtually impossible to tell that you are not on a superbly prepared, conventionally suspended, long-rear-travel machine. The monoshock unit delivers springing and damping equal to, or possibly better than, a works forward-mount bike. On a bike as light as the 125 YZ-C it's hard to determine the full effectiveness of the monoshock system versus other long travel concepts without side-by-side comparisons.

An unusual aspect of the monoshock system is the lack of suspension sag when the rider is seated on the YZ. Nitrogen pressure keeps a constant load on the oil to prevent easy initial compression of the monoshock damper. This control of the ride height keeps the shock unit fully extended, rather than partially compressed, under light loads. Too little gas pressure will let the YZ sag under rider weight; too much nitrogen will make the first inch or two of travel stiff and the ride uncomfortable.

Our test bike was set up for and run-in by Pierre Karsmakers. Because of his faster riding pace, the nitrogen pressure was high and the ride of the 125 YZ-C stiffer than that of a standard 250 Monocross we were riding. When accelerating hard or riding flat out in the upper gears the suspension works great. Tracking through rough stuff is true and predictable but the pitching of the rear end is irritating. Decelerating into choppy turns lets the back switch side-to-side slightly.

The riding position is superb and the controls well placed for most riders. The saddle is deep enough and firm enough

The YZ-C is a rocket with its feathery 193 pound weight (wet) and 20-plus hp engine. Monoshock system is stiff for a light bike.

Because the engine has so much power the little 125cc Monocross can actually be thrown into full lock slides—if you're in the right gear.

to provide excellent comfort. The clutch is almost free of any friction point—it's either engaged or disengaged. Operation of the gear-box is easy and precise and shifts occur with every touch of the lever—with or without the clutch.

The six-speed gearbox gives the rider tremendous latitude for starts and course variations. Lighter riders will be able to stand over the bike and make second gear starts that will get them to the first corner yards before anyone else. Over 180-pound riders will need first gear and all the weight bias possible over the front wheel. Because of the engine's narrow power band and explosive surge, a rider sitting too far aft on the saddle will find himself looking straight up at the handlebars in any of the first three gears.

The engine is absolutely fantastic in every respect. As shown by the dyno chart the YZ engine pulls from 2000 rpm up to its power peak at 10,500. You will want to keep it between 8500 and 10,500 where it accelerates hardest. Like any of the strong 125s, the gear lever has to be run up and down at a furious rate. You have to shift down at least three times each in every corner—sometimes four. As long as you come out of the corner in the right gear no one is going to catch you. No other production 125 motocrosser gets from one corner to the next as quickly as the YZ-C.

Unlike the pre-monoshock YZs, the "C" model can be successfully manipulated by experienced novices as well as top experts. It handles firm and steady. Its steering is quick but it won't spit you off just because you lean in the wrong direction. The engine performance is more than enough to put you up front or let you pass upon command.

There is one noteable drawback to Yamaha's monoshock system. The maintenance of the damper unit is complex, although not beyond the capabilities of a good mechanic. The nitrogen gas chamber is very special and requires equally special equipment to be re-charged or to have the pressure changed. Most of the special monoshock tools—gauges, regulators, hypodermic needles, etc.—are available to dealers from Yamaha. They are costly and, at this time, short in supply. The gas bottle and nitrogen must be gotten from a welding supply.

There are no compact field service units available, although some are planned for the future by Yamaha. This means that adjustment and servicing of the monoshock unit can only be done by Yamaha dealers possessing the special equipment and tools. The pressure of the nitrogen must remain fixed and can't be changed to suit track conditions in the field.

Firm pricing on the 125 YZ-C is not yet fixed. We have been assured that it will be under $1000. This will probably place the YZ-C around $100 to $125 more than the present run of Elsinores, KXs and TMs. The chassis performance is equal to other well-prepared 125s but the engine can't be faulted or bettered by anyone. If you want the quickest and fastest 125 motocrosser the YZ-C is it. Just be sure in advance that your dealer can service its monoshock unit. ◉