YAMAHA YZ400F

Though the words "change" and "progress" are only rarely synonymous, Yamaha's updated YZ400F is both different and better. With a steeper head angle and a wider powerband, the newest YZ is easier than ever to ride . . . and ride fast.

● IT'S IRONIC THAT WHAT ATTRACTS SO many people to open class motocrossers—horsepower—is also what makes them so difficult to ride. The Yamaha YZ400F, for instance, weighs 239 pounds and produces 36.90 horsepower. It seduces power freaks with one horsepower for every 6.5 pounds of machinery. That fact alone attracts a lot of buyers, most of whom are non-racers just looking for adrenaline rushes from a fast, exciting bike. Statistics show that most would-be big-bore motocross berserkos spend most of their time play-riding; they like large-displacement power enough to put up with its unruly characteristics.

Five years ago a peaky, 35-horsepower machine was wild enough, but since then long-travel suspension has established itself as a motocross necessity. A bike needs 10 or 12 inches of wheel travel to be competitive, and that travel combines with the outrageous power to make the typical new-generation motocrosser a real pain to live with. But despite the unpleasant side effects of long-travel suspension and tons of horsepower, both are not only necessary to winning, but are what make big motocrossers so much fun.

The manufacturers have come to realize it's time to minimize the disadvantages of abundant power and suspension; time to produce a machine that develops 35 to 40 *tractable* horsepower and has the suspension travel without the almost comical seat height that goes with it. Yamaha, with the YZ400F, has come as close to that ideal as any company so far. Though early YZs were pipey and unstable handlers, the C and D models were very much

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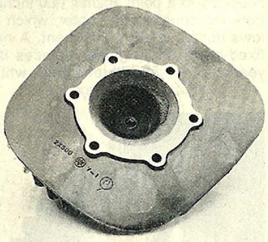
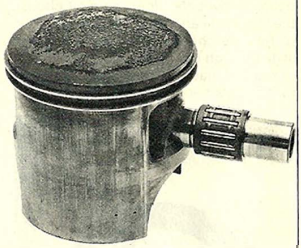
improved. Last year's YZ-E was an outright exceptional motorcycle. Its refinements included an aluminum box-section swing arm and a chrome-moly frame. This year, the YZ400 has a torquier engine, more precise steering and slightly more wheel travel front and rear.

As they did with the IT400F, Yamaha lengthened the YZ's piston stroke (from 70 to 75mm) and reduced the bore (from 85 to 82mm). Long-stroke engines are generally presumed to be torquier than short-strokers. In fact, the YZ-F is torquier than last year's YZ-E, but that's the result of a combination of changes, not simply a product of the longer arm. All of the ports—exhaust, intake and transfer—have altered timing and size. The intake port has been enlarged only half a millimeter, but it's now open 32 degrees of crankshaft rotation longer. The F's large exhaust port is more squarish than the E's, being one millimeter narrower and two taller, and it is open two degrees of crankshaft rotation less. All five of the transfer ports have been changed in height only slightly, but the main transfers (the ones nearest the exhaust port) are substantially wider (6.7mm) to produce better scavenging characteristics (which help the two-stroke's mid-range), and they are open four degrees less.

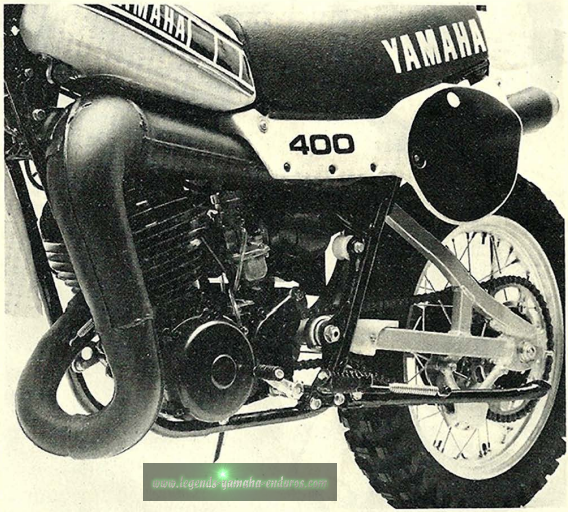
There are several other refinements which combine with the new porting to make the YZ-F's powerplant more peaceful than the E's. The aluminum cylinder head's hemispherical combustion chamber has been narrowed three millimeters, which reduces the chamber volume with spark plug from 41cc to 38.5. A reduction in chamber volume alone would produce a higher compression ratio if it were not for the taller exhaust port and the different bore and stroke. The engine's updates combined produce a lower compression ratio, down to 7.4:1 from 7.59. A 10mm-wider reed-valve cage complements the increased intake timing; the F uses the same 38mm Mikuni carburetor that the E used. Yamaha's factory motocrossers



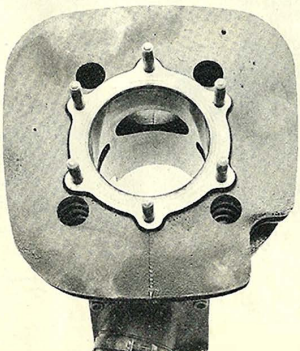
The combustion chamber's volume has been reduced, but new porting produces a lower compression ratio.

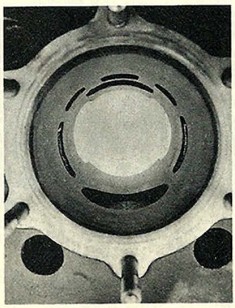


There's nothing tricky about the 400's needle-bearing small end or its two standard rectangular piston rings.



An exhaust pipe with a fat mid-section and narrow engine cases are elements derived from the OW racers.





A longer piston stroke, narrower bore, modified port timing and enlarged reed-valve combine to produce more mid-range.

have been satisfied with the broad power traits produced by the OW exhaust pipes, and this year's YZs and ITs use OW-style chambers, which can be identified by their very fat mid-sections.

On the track the refined YZ is Everyman's open class motocrosser. It's for novices and experts alike because it's so damn fast *and* so easy to ride. In regard to peak horsepower, the Yamaha still has one of the strongest 400cc engines in production, but its punchier mid-range lets the rider go faster easier. There's substantial flywheel effect from the YZ's large crankshaft and external-rotor magneto flywheel, and that combines with the exceedingly wide powerband to make the YZ feel like it revs forever in each gear. The good part of this is that there are never any surprises lurking in the Yamaha's engine. Bursting out of corners or gassing it through traffic, the rider knows what to expect from the 400: smooth and incredibly strong acceleration.

There are just a few complaints associated with the YZ's engine. It's very difficult to start in gear. There seems to be a lot of clutch drag, and when in gear it usually takes four or five kicks to fire. Starting in neutral, however, is a one- or two-kick procedure. Second-gear starts are the norm; they're speed-efficient and controllable, and the YZ consistently digs gaping furrows in the start line. But sometimes the YZ is a bit squirrelly off the start, wig-wagging its tail and breaking the rider's concentration. During the start it also becomes apparent that the 400 wheelies awfully easily. In the first four gears, if the rider isn't hunched over the gas tank, the YZ-F lofts its front end at almost every jerk of the throttle.

The YZ's engine cases have been altered and they're now called OW-style, which simply means they are narrower in comparison to the YZ-E's. Oil capacity has been reduced because of the reduction in size, down from 1100cc to 800. Since the old gears would have been too large for the new cases, the transmission has physically smaller cogs; their ratios are also changed to give the 400 a wider speed spread in each gear. First gear has a numerically higher ratio, up to 2.384:1 from the E's 2.286.

Second through fourth are just slightly higher too, and fifth has a numerically lower ratio, down to 0.833 from 0.840 to help the YZ with its top speed. On a level straightaway the 400 with stock gearing tops out at about 80 miles per hour. The primary gears have been reduced in size and their ratio changed: a 60/23 (2.608:1) combination now replaces the E's 60/24 pair (2.666).

The new wide-ratio gearbox functions well with the YZ's more generous powerband; there's very little danger of falling off the powerband even when the rider lugs the engine. With the F, two or three gears are usually enough to get around

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the typical track. Second (with some clutch work) is good down to a virtual standstill, and fourth yields 60 miles per hour without straining the engine. The transmission is not so praiseworthy. Though the 13-plate clutch is easy for the rider to disengage and rarely fades even during heavy abuse off the start, gear engagement is imprecise, and there's often about one missed shift per lap if the rider is charging hard.

Producing an easy-to-ride big-bore motocrosser has been a twofold job. Developing a tractable engine is only half the battle; designing a tame handler is the rest of it. Two changes—a reduction in head angle from 30.5 degrees to 29.5 and the consequent reduction in trail from 134mm to 128mm—go a long way to make the YZ-F a precision instrument. The Yamaha has lost none of its predecessors' high-speed stability. Over whoops the 400 tracks absolutely straight without any apparent fork, frame or swing-arm flex. Through corners the 400 steers neutrally, translating body English and handlebar inputs slowly and predictably. The real benefit of the steeper geometry is the option it gives the rider: he may choose the inside line and steer through a corner, or he may choose the outside line and slide through it.

Yamaha has not neglected the detail refinements necessary to keep the YZ up to date. The swing-arm pivot has been relocated to a point 102mm (4.0 inches) from the countershaft center, which allows tighter chain adjustment. A new fixed-block chain guide replaces last year's spring-loaded tensioner, which

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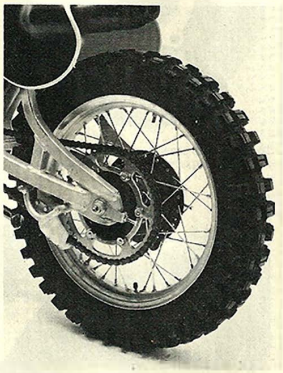
Though several bikes have more wheel travel than the YZ, the fork's performance overall is first-rate.



Yamaha hasn't overlooked detail updates; there's a wider rim and tire and a new block-type chain guide.

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was needed with the YZ-E's slacker chain. A double-layer foam air filter is new for Yamaha and it holds together much better than the old single-layer fuzzy filters. FIM number plates, extending behind the rider's legs, are standard now that the AMA has adopted the FIM's rules regarding the positioning of plates.

Yamaha has taken an individualistic approach in choosing the amount of suspension travel for their stock motocross machinery. We've become accustomed to the More Is Better philosophy; in fact, a lot of wheel travel takes its toll in many ways. Chassis geometry changes radically during braking. A 38-inch seat height (a typical by-product of a foot of travel) is awkward for the average rider. Extended suspension components generally boost the bike's center of gravity, and a high c.g. tends to make a motocross machine stand upright when hitting berms. Long fork pipes are more susceptible to flexing.

So on balance, how much is enough travel? Yamaha Team Rider Mike Bell says that anything over a foot is a waste. We believe that for most riders the deficits usually begin to outweigh the advantages with any more than about 10 inches.

The YZ-F provides 10.6 and 10.4 inches of front and rear wheel movement. The F has 20mm more fork travel than the E; it

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Make and model	Yamaha YZ400F
Price, suggested retail as of 5/22/79	$1939

ENGINE

Type	Two-stroke, reed-valve inducted, single cylinder
Bore and stroke	82 x 75mm (3.23 x 2.95 in.)
Piston displacement	396cc (24.1 cu. in.)
Compression ratio	7.4:1 (trapped)
Carburetion	(1) 38mm Mikuni
Exhaust system	Upswept with silencer
Ignition	External-rotor magneto; CDI
Air filtration	Oiled, washable dual foam
Oil capacity	800cc
Bhp @ rpm	36.90 @ 7000
Torque @ rpm	29.10 @ 6500

TRANSMISSION

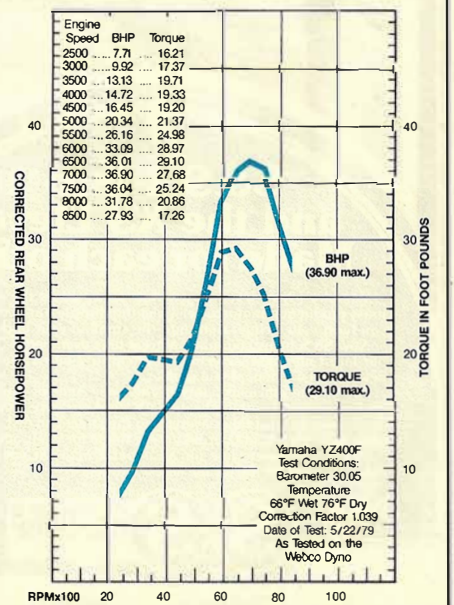
Type	Five-speed with wet-plate clutch
Primary drive	Helical-cut gear; 60/23; 2.608:1
Final drive	DID chain; 50/14 sprockets; 3.571:1
Gear ratios (at transmission)	(1) 31/13, 2.384
	(2) 28/16, 1.750 (3) 25/19, 1.315
	(4) 23/22, 1.045 (5) 20/24, 0.833

CHASSIS

Type	Double-downtube, full-cradle, chrome-moly frame; box-section aluminum swing arm
Suspension, front	Oil-damped, steel-spring/air-spring fork with forward-mounted axle and 270mm of travel
rear	DeCarbon-type, nitrogen-charged monoshock with adjustable damping and pre-load producing 265mm of rear-wheel travel
Wheelbase	1450mm (57.1 in.)
Rake/Trail	29.5°/128mm (5.04 in.)
Brake, front	Conical drum, double shoe
rear	Conical drum, double shoe, rod-actuated; full-floating design
Wheel, front	DID 1.60 x 21 rim
rear	DID 2.50 x 18 rim
Tire, front	IRC 3.00 x 21 Motocross GS-45V
rear	IRC 5.10 x 18 Motocross GS-56F
Seat height	916mm (36.1 in.)
Ground clearance	300mm (11.8 in.)

Fuel capacity	7.6 liters (2.0 gal.)
Curb weight, full tank	108.4 kg (239 lbs)
Test weight	185.5 kg (409 lbs)

CUSTOMER SERVICE CONTACT
Yamaha Motor Corp., USA
6620 Orangethorpe Ave.
Buena Park, CA 90620
(714) 522-9011
Attn: Customer Service



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also has 15mm more rear wheel travel, but that's a result of a 35mm longer swing arm. Aside from the extended travel, there are several other internal fork refinements. The F's fork springs are 77mm (3.0 in.) longer than the E's, up to 579mm (22.7 in.), and they use a slightly thicker wire, 4.0mm instead of 3.8. Also, the individual coils are less tightly wound. Both oil quantity and air pressure have been changed: 26cc more oil is recommended, and 1.4 psi less air pressure is called for. The longer fork tubes require some of these changes (longer springs and more oil), but the modifications basically reflect a move toward cushier suspension.

Though the lengthened swing arm accounts for the F's extra rear-wheel travel, the monoshock assembly is not without its share of changes. Both the YZ250's and 400's aluminum shock bodies have finning for better heat dissipation. There's been some fiddling with other parts of the mono too. The 315mm (12.4 in.) shock spring is preloaded less in the set position; the F's spring's mounted length is 308mm compared to the E's 300mm. To offset the reduced preload effect, more nitrogen pressure is recommended.

The Yamaha has the lowest seat height of any 1979 open class motocrosser *Cycle* has tested. Compare the Yamaha's 36.1-inch height with the 38.1-inch Husqvarna CR390, the 37.6-inch Can-Am 370 and the 37.8-inch Suzuki RM400. Two inches less at the seat translates into more fluid berm shots, fewer errors and more rider confidence.

Actually, there have been no real technological problems with Yamaha's suspension in the last two years. Bob Hannah won the 1978 Pontiac, Michigan, Super Series event on a production YZ250 and then raffled off the machine. Since then YZ owners have been content with running stock suspension. Put into use on the track, the YZ simply won't let you down. There's no noticeable damping fade with the front or rear suspension. The DeCarbon mono avoids this problem with a thermostatically controlled valve, which adjusts the damping orifice as oil viscosity changes with temperature. The oil's rise in temperature begins to close the valve, which thus keeps the damping characteristics consistent. There's also a manual damping adjustment for the mono accessible through a hole in the frame's backbone. Set in the middle position, the damping is just right for average-size amateur-to-expert level riders.

With the stock springs and 15 psi air in the fork, the front suspension is smooth and comfortable. Experience showed that 15 psi of air in the fork (slightly more than recommended) discouraged bottoming but still provided a comfortable ride. The stock rear spring settings are spot-on for 170-pound riders. Even expert riders rarely use all of the YZ's available suspension travel, which shows that 10 inches of

wheel travel is just about enough; much beyond only serves trendiness.

Thanks to a few needed refinements, the YZ-F's wheel assemblies are better than the 400E's. A full-floating rear brake replaces last year's non-floating design; the new unit results in less wheel chatter and hop when braking hard over stutter-bumps or down hills. Some slight modifications to the rear brake backing plate have been made to accommodate the new torque arm, which attaches to the frame just behind the right footpeg. The changes include the addition of a large tab on the backing plate to hold the torque arm, the re-routing of the brake rod under the swing arm rather than above it, and the repositioning of the brake pedal. Though the rear brake has been improved, both it and the front brake are runners-up to a really good system such as the Can-Am 370's. The Yamaha's brakes could be more precise: it's difficult to use the brakes' full power without locking the wheels.

Both the rim and the tire on the F are wider than the E's combination. Finding adequate traction is always a problem with a big-bore motocrosser, but the YZ's new 5.10 x 18 rear tire really helps. On tracks with hard ground, the Yamaha's IRC tires with nine to 11 pounds of air pressure provide pretty good grip. When new, their fairly soft rubber compound is lively enough to allow the tires to grip the slick adobe found on tracks throughout the Sun Belt. On tracks with good traction—either sand or loam—the tires produce an imprecise, almost slippery ride.

Yamaha has come a long way with the YZ. Since the white-tank Monocross, the 400 has progressed from a pretty good handling, fairly fast bike to an absolutely first-rate machine. If someone wants the YZ simply for its engine, he'll be satisfied; it has one of the strongest powerplants of any production dirt bike available. If a novice or expert motocrosser wants the 400 as a genuine race bike, he'll be satisfied; the YZ is easy to ride (most assuredly in contrast to other, taller motocrossers), but it still offers the real advantages of long-travel suspension. Lastly, if an expert Sunday Rider turns to the YZ for reliable, low-maintenance performance, or for hill-climbing potential beyond belief, or just for a lot of thrills, he'll be satisfied.

The YZ400F is not without its flaws. Most objectionable is the gearbox's marginal performance. The few other areas in need of refinement are more easily (and less expensively) modified, and are therefore less objectionable. These areas include the thinly padded seat, the stone-average tires and the insensitive brakes. But what is really important in a big-bore motocrosser is tractable power (without sacrificing peak horsepower), precise steering, and long-travel suspension (without incurring the liability of a 38-inch seat height). The YZ400 has all the really important virtues—and has them in aces. ◉