

CYCLE DIRT TEST

Before 1976 Enduro riders modified YZs for woods work. The machine's performance? So-so. Then along came the IT-C, a factory-modified YZ; the IT was an adequate but uninspired enduro bike. Later, while the 1977-78 YZs took a technological leap, the ITs plodded along—nice, but hardly devastating machines. This year's IT400F combines advanced YZ technology with traditional IT trickiness. Performance? Truly exceptional.

YAMAHA IT400F



● IMAGINE THAT YOU'RE AN AVID ENDURO rider and a major motorcycle manufacturer has just commissioned you to help design an Open-class competition machine. Just for starters, you demand that the bike have low- and mid-range power—tons of it—and agile steering, a sturdy frame, fade-free long-travel suspension and low overall weight.

Now picture this: you're an avid Sunday motocross racer, and The Factory has just asked you to help design an Open-class motocrosser. Your list of demands looks pretty similar to the enduro rider's list, even though at first glance enduro and motocross machines appear to be entirely different creations. After careful consideration, however, you realize they're actually cast from the same mold. What are in fact the differences? And more importantly, what *should* the differences be?

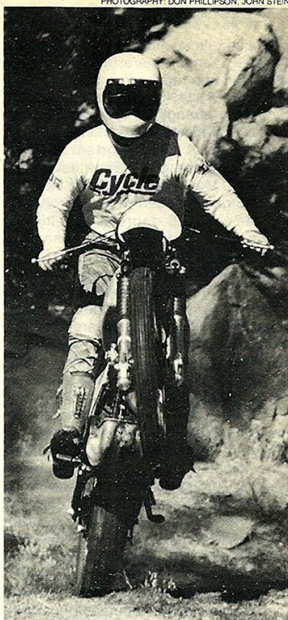
It's easy to assume that a good motocross bike with a few minor modifications makes a good enduro bike. If you believe that, you're exactly where Yamaha was three years ago when they introduced the IT series. At that time, the Blue Machines were basically YZs with large gas tanks, enduro lighting and altered first and fifth gear ratios. Yamaha understood that an effective motocross bike could be the starting point for building a functional enduro machine. After all, zig-zagging through scrub pine does indeed have much in common with dog-fighting through motocross traffic.

Those first machines demonstrated that Yamaha did not know exactly which variations—minor and major—were necessary to produce a superb enduro bike. The D- and E-model ITs benefited from Yamaha's experience in the ISDT, and those machines had many refinements, including quick-change wheels, frame-mounted tool kits and their own engine porting. While the YZ-D and YZ-E bikes were upgraded with major changes, the ITs were left with the original YZ chassis and engine designs. During these two model years, Yamaha seemed as if it had lost sight of the fact that an enduro bike's basic needs were the same as a motocrosser's. The YZ, for example, gained a high-quality chrome-moly frame while the IT made do with an old mild-steel unit.

For the last two years Yamaha has

been developing a clearer idea of how an enduro bike should differ from a motocross machine. That thinking has crystallized in 1979. Yamaha engineers have realized they cannot simply bolt a few items onto a YZ and expect to produce an International Trials bike. But to its credit, Yamaha's engineering department has not hesitated to re-inject the IT with a liberal dose of YZ technology. Apparently, Yamaha is now more aware than ever before that the basic components of an enduro machine must also be technologically first-rate.

It is the quality of detailing and the exactness in a few specific areas such as gearing and engine porting which identify an enduro bike and make it different from a motocrosser. For 1979 Yamaha has combined superior design and con-



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struction with an attention to details. With the 400F, Yamaha has arrived at a precise definition of a real enduro bike.

All the chassis refinements are intended to strengthen the frame and to make the IT handle more precisely. Nearly every one of the important suspension and frame dimensions have been changed. Most importantly, the steering-head angle has been reduced from 31.5 degrees to 29.5 degrees, resulting in much quicker steering response. This change is sensible because most enduro riding is done at speeds under 50 miles per hour; the 29.5-degree head angle does not adversely affect the bike's handling until higher speeds are reached. Another consequence of the reduced rake is a shorter wheelbase; the F-model has a 1420mm (55.9 inches) wheelbase, 10mm shorter than the E-model's.

Both front and rear suspension components have been increased in length to give the IT more wheel travel. (The only other method of increasing rear wheel travel is through lengthening the swing arm, which increases the axle's arc.) The oil/spring fork has longer tubes (but they're still 36mm) and longer springs to increase the IT's travel to 230mm (nine inches). The longer springs have a different spring rate than last year's bike, and for a reason which undoubtedly has nothing to do with function and everything to do with cost, Yamaha has replaced last year's dual-rate springs with single-rate ones. The monoshock has also been massaged. Its travel is increased from 107.5mm to 120mm, which results in a 25mm increase in wheel travel, from 185 to 210mm (8.2 inches). Both pre-load and damping are adjustable on the mono. A side benefit of the lengthened suspension is slightly more ground clearance, increased to 260mm (10.25 inches).

Realizing that enduro riders need heavy-duty frames as much as motocrossers do, Yamaha has finally produced the IT chassis in chrome-moly. The tubular-section chrome-moly swing arm is just slightly heavier than the YZ's box-section aluminum one. In an effort to reduce chain-tensioning fluctuations, Yamaha has pulled the swing arm about 15mm closer to the countershaft, which results in a distance of 110mm (4.37 inches) between the centers of the countershaft and swing-arm pivot.

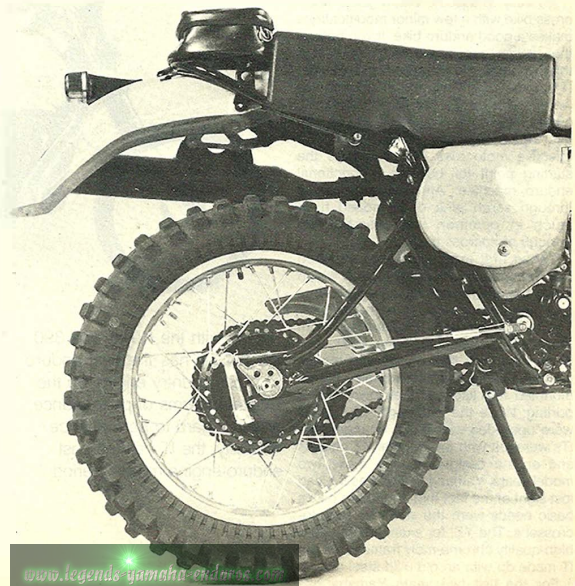
All of the updates make the IT handle much differently—and better—than earlier models. The most noticeable change in its handling characteristics is the new feel to its steering. When the rider is following a tight, twisty trail, the IT reacts quickly to handlebar inputs; it can be steered along a trail rather than being maneuvered primarily by body English. In woods riding the IT's new characteristics are most appreciated; given good traction the bike tracks through esses as if it were on rails.

For cross-country riding, the steeper rake and trail produce different responses. The geometry makes the bike work fine on flat high-speed terrain, but over whoops the reduced wheelbase and rake combine to make the IT less than perfectly stable. By no stretch of the imagination does it handle poorly. Not at all. But riding in deep whoops over 35 mph—and in mildly deep ones over 50—the IT rider tends to bounce off the trail. Moreover, in any sandy terrain over 50 mph, the front end develops an incipient wobble. Nevertheless, the machine never gets out of control, and much to the IT's credit the described symptoms develop slowly. Because the IT's handling restricts seriously high-speed riding in really rough country, it's not surprising that neither frame nor swing-arm flex is ever apparent.

Even though Yamaha has increased the IT's suspension travel, its nine/eight inches of front and rear wheel movement is still notably less than the YZ's 10.6/10.4 inches. The IT has less travel because every incremental increase in travel usually affects the seat height. Yamaha research and development people realize that enduro riders need to reach the ground easily for a number of reasons; riders must be able to help their bikes up hills and around immovable objects. However, the YZ has a seat height of 36 inches; the IT's is 35. So there isn't much height liability in the YZ's extra 1.6/2.2 inches of wheel travel, but the difference between the two bikes' suspension per-



Major changes such as different cases, bore and stroke, exhaust pipe and chrome-moly frame make the IT a brand new bike. Race-proven details, including a tool kit and quick-change wheels, remain.



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formance is significant. Yamaha should have set aside height and cost considerations and used YZ-quality units on the IT.

Over sharp jolts at moderate enduro speeds—up to 40 mph—the IT fork has good damping characteristics and enough travel to keep it from bottoming very often. However, over a series of less-than-harsh bumps, like whoop-de-dooos, the fork has an ever-so-slight hitch: the damping action isn't perfectly smooth; it feels almost as if the fork has a momentary hydraulic lock. A switch to 10-weight oil from the stock 20-weight does not cure this minor annoyance.

In all conditions the monoshock has fade-free and smooth damping action. With the shock adjustment set for light damping, the rear suspension would respond quickly to bumps of all sizes, keeping our 170-pound test rider in perfect control. Adjusting the damping to stiff (or what the owner's manual calls heavy) slows down the shock action; there's greater resistance to bottoming. Theoretically, the rider should be able to tackle rough terrain at higher speeds with greater damping. In fact, slowing down

the mono's damping adversely affects the front end's suspension action, overworking the fork and making the bike dive in rough conditions. *Cycle's* testers agree that for 170-pound riders, the shock works best on the lightest settings where the bike handles quickly and controllably, is comfortable and is well matched to the amount of available travel. In sum, there is no point in trying to make up for lack of travel by stiffening up the suspension. For its intended purpose—enduro riding at speeds of up to 50 mph—the travel is fine.

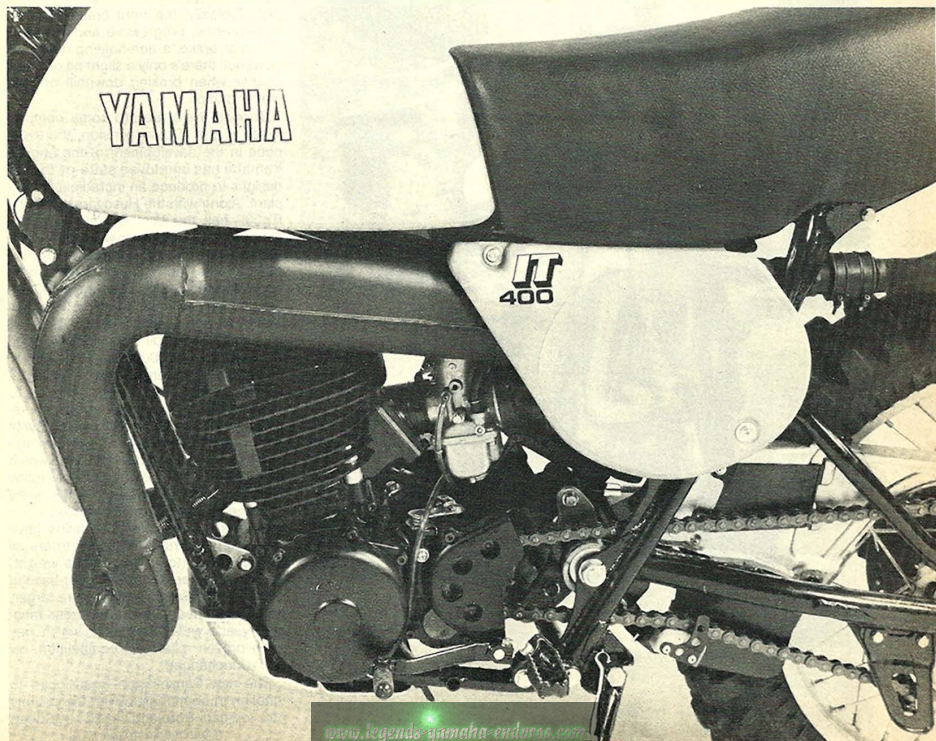
Center of gravity and footpeg height are also related to frame geometry and suspension travel. First, the IT's center of gravity is low, corresponding to the bike's general design. This results in greater maneuverability on the trail, less rider fatigue and greater stability in tight, slow riding. A low c.g. also somewhat disguises the IT's 268 pounds, which is slightly more than average for a 400. The KTM weighs 260 pounds, and the Husky OR just a couple of pounds more than that. But the Husky does not have a headlight and neither bike has a tool kit (two pounds).

Though the squat dimensions of the IT

are beneficial in terms of center of gravity, they detrimentally affect footpeg height. The bottom of the footpegs are a tight 13 inches above the nastiness below. Especially over whoops, when the suspension has used up most of its travel, and occasionally on rutted trails, the low footpeg height results in some disconcerting brushes between the rider's boots and the terrain.

The final point about the 400's handling is the performance of its tires. They are new IRC Volcanduros with rim savers, which are thick portions of the tires extending over the rim. The first design objective is to save the rims from nicks; the second is to enable the bike to run on a flat tire without damaging the rim. The Volcanduros provide good traction in sand and mud—and on typical soft mountain trails.

Other detail chassis components have changed only marginally. Like last year's IT, the wheels are quick-change in name only; there are cotter pins in the axles and rim locks securing the tires. These are beneficial for enduro riders who probably are not interested in two-minute tire



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changes, but Two or Six Day riders may abandon the cotter pins and install rim spikes. The snail-cam chain adjusters do provide hassle-free chain tightening.

Although some riders may wish to make the IT's wheel quick-change, other enduro details will require no mods—even for the demanding off-road enthusiast. The hefty aluminum skid plate has new large-diameter holes drilled for drainage. Yamaha was the first major manufacturer to offer stock folding-tip gearshift and brake lever; their design has proved to work well and help prevent lever breakage. The IT's seat is long and soft and proves to be comfortable even on day-long rides. *Cycle* test riders crossed several streams; the water lapped at the IT's gas tank but the air cleaner kept dry. For maintenance purposes, the cleaner is accessible and easy to re-install.

Through the streams, though, the brakes did not fare as well as the induction system. They did not fade completely, but almost. Moreover, it takes several minutes and/or several tugs on the lever before the braking action returns to normal. Typically, the front brake is excellent—precise, progressive and powerful. The rear brake, a non-floating design, is powerful; there's only a slight bit of wheel chatter when braking downhill or over stutter bumps.

Though there are still some compromises in the IT's suspension, there are none in the development of the engine. Yamaha has employed state-of-the-art designs to produce an incredible powerplant. Along with the Husqvarna 390, the IT400F has the best enduro or cross-country engine on the market in terms of performance, and in regard to reliability/performance, the IT has the best enduro engine made—period. This year's 400 has new engine cases based on the YZ. They are much narrower and lighter than last year's IT cases. Oil capacity has been reduced from 1200cc to 800cc. The IT employs a new crankshaft and flywheels, which are wider and heavier than the E-models. A 4.0mm larger crankpin secures the assembly. In combination with the crank, the powerplant has new primary gears (60/23 from 64/24), which move lowers the reduction ratio slightly and also reduces the weight of the gears because they're physically smaller.

All five transmission-gear ratios have been altered. First through fourth are all smaller gears (to save precious weight) and have higher ratios. Fifth gear has the only pair of drive cogs which are larger, and these effect a lower top gear ratio. Last year's wet-plate clutch, which has been proven reliable in competition, remains unchanged.

The new transmission is designed to function in coordination with the entirely new top-end. Bore and stroke have been

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altered from a large-bore 85 x 70mm to a long-stroke design of 82 x 75mm, a move which fits in with the designers' emphasis on extracting a wider powerband from the 400. Though a longer stroke prohibits very high rpm running because of stress on the connecting rod, it makes more port area available in the cylinder wall. Taller ports—ones more nearly square—result in better scavenging which especially helps out a two-stroke's mid-range. The cylinder has the same number of ports and the same basic port design, but the port timing has been changed reflecting the switch to a long-stroke engine and a move to give the new IT even greater mid-range.

The cylinder head is identical to the YZ's head, and both bikes have new combustion chambers. It has a moderate-size squish band. The compression ratio is down to 7.4:1 from 7.6:1.



Both the induction and exhaust systems have been refined. Last year's 38mm Mikuni carburetor is the same, but a 10mm wider reed cage is installed; the same modification was made on last year's YZ250E. Though the new exhaust pipe is not identical to OW works motocrossers' or even the YZ's, its basic design is remarkably similar. It has a moderately wide header pipe with a very fat center section, as do the OW and YZ pipes. Though neither we nor Yamaha knows precisely why this configuration results in more mid-range power, the fact is that it does.

There's a substantial change in the feeling of the IT's power. At any rpm, the engine gives a feeling that constant tractor-like power is barely being held back. Any time the throttle is cracked the engine lets out an incredible surge but never explodes. Wheelies in the first four gears

Make and model Yamaha IT400F
Price, suggested retail \$1798

ENGINE

Type Two-stroke, reed-valve inducted, single cylinder
Bore and stroke 82 x 75mm (3.22 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/spark arrestor
Ignition Magneto, CDI
Air filtration Oiled washable foam
Oil capacity 800cc
Bhp @ rpm 36.70 @ 6500
Torque @ rpm 29.65 @ 6500

TRANSMISSION

Type Five-speed with wet-plate clutch
Primary drive Helical-cut gear, 60/23, 2.608:1
Final drive 520 DID chain, 46/14 sprockets, 3.28:1
Gear ratios (at transmission) (1) 2.666 (2) 1.750 (3) 1.315
(4) 1.000 (5) 0.785

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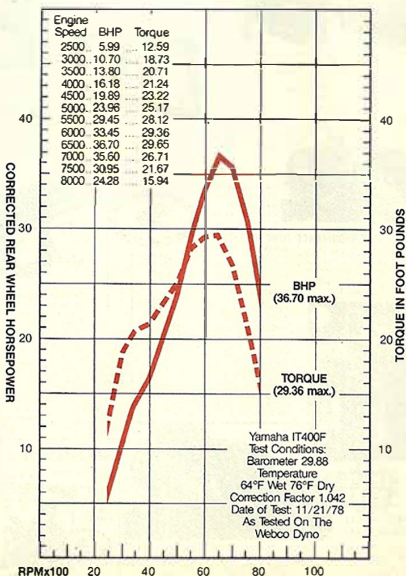
Type .. Double-downtube, full-cradle chrome-moly frame,
tubular chrome-moly swing arm
Suspension, front .. Oil-damped, coil-spring, 230mm-travel
fork with forward-mounted axle
rear .. DeCarbon-type, nitrogen-charged monoshock
Wheelbase 1420mm (55.9 in.)
Rake/trail 29.5°/122mm (4.8 in.)
Brake, front Conical drum, double shoe
rear Rod-actuated, conical drum, double shoe
Wheel, front DID 1.60 x 21 with one rim lock
rear DID 2.15 x 18 with two rim locks
Tire, front IRC Volcanduro VE-1 3.00 x 21
rear IRC Volcanduro VE-1 4.50 x 18
Seat height 889mm (35 in.)
Ground clearance 260mm (10.25 in.)
Fuel capacity 12 liters (3.2 gallons)
Curb weight, full tank 121.5 kg (268 lbs)
Test weight 198.6 kg (438 lbs)

INSTRUMENTS

Includes 80 mph/130 kph speedometer with
resettable odometer and standard odometer:
25/25W headlight with high/low beams and
on/off switch; 5.3W taillight

CUSTOMER SERVICE CONTACT

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



YAMAHA IT400F ...Continued from page 162 are simple even for people who don't normally ride unicycle. On the trail, second gear is most valuable for the really nasty stuff—it will pull from 10 to 35 mph, up most any hill, through the deepest sand or over rocks. Third gear is the most useful gear in moderately tight riding situations; it pulls from 20 to 45 mph. Fourth gear is most appreciated on fireroads, or where the terrain is more or less flat; fourth pulls strongly from 30 to 60 mph. Fifth is good only above 40 mph in competitive situations where the rider doesn't want to bog the engine; if he's just out play riding, the top cog pulls without much hesitation from about 35 mph. These figures should suggest the IT's astonishing speed range in every gear. In short, the bike is easy to ride and doesn't fatigue the rider; it can do most anything most anywhere.

The dyno figures indicate why the IT feels as strong as a bull. It is able to pull a full load at 2500 rpm, which very few bikes can do. The power increases steadily until 4000 rpm when it starts making exceptionally good power. At both 4000 and 4500 rpm, the IT is making more power than any other Open-class enduro bike *Cycle* has tested. At 5000 rpm the Husqvarna 390CR (the strongest Open-class dirt bike in this range) catches and passes the IT by about one-tenth of a horsepower. At 6500 the IT makes its peak power and so re-passes the Husky. Making peak power—and gobs of it—at 6500 is what enduro riding is all about. The rider can laze along in the 4000–5000 rpm range at a respectable pace and know that all the power the bike can make is just an instant away.

At sea level to about 2000 feet, the engine carburets cleanly with stock jetting. *Cycle* testers rode the IT at high elevations—4000 and 8000 feet—but in both instances temperatures (from 20 to 40 degrees) were atypical. The only reliable guide to jetting properly when dealing with temperature and elevation variations is to read the spark plug. In these rather peculiar situations our testers ran a 360 main jet (one smaller than stock) and lowered the needle one notch. The bike still ran just slightly rich throughout the rpm range.

In all circumstances the IT averaged between 15 and 20 miles per gallon. Even for a 396cc engine with a 38mm carburetor, this isn't too great. With that mileage figure and a 3.2-gallon tank, the IT has a maximum range of 64 miles under the best of conditions. In fact, *Cycle*'s IT never made it 64 miles on a full tank. On the average, the IT required two- and three-gallon fill-ups about every 40 miles. Apparently, this is simply the price to pay for outstanding engine performance.

It is never necessary to abuse the IT's clutch; since you don't need to slip the clutch, there's never a clutch problem.

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Mechanical actuation of the clutch is smooth, and the gears engage nicely if the clutch is used. If clutch use is abandoned, the gears engage precisely only if the throttle is backed off completely. A forestry-approved spark arrestor is included in the 400's exhaust system. The massive silencer can't be accused of robbing engine power or of overly quieting the IT's roar.

If one takes a step or two away from the IT400, it's easy to see what Yamaha has done with the machine and where it stands in relation to other Open-class enduro bikes. Yamaha has aimed it toward the serious enduro rider, despite its International Trials designation. Thanks



to progress made by the Yamaha motocross racing program, they've been able to slice pounds off the IT and bring it down to fighting weight. Further, using YZ technology they've produced an absolutely sensational engine. And they've been able to do all of the above and still keep its price—\$1798—reasonable in the face of today's inflation.

In comparison to its competition, there's no machine that's all-around better than the IT-F. Some bikes are better in specific areas. Both the Husky and the KTM have suspension units superior by virtue of offering more travel, but more travel is beneficial and necessary only when the rider's intention is to ride high-speed Hare Scrambles or Two-Day Qualifiers. For that matter, the IT suspension units can easily be modified to resemble closely the YZ system. If the prospective IT owner considers this refinement, he can console himself with the fact that the IT costs two- to three-hundred dollars less than a Husqvarna or KTM. Stock, the IT400 has enough power and suspension to win any enduro in the country with the correct rider aboard. For the majority of riders who (statistics say) will buy the IT for use primarily as a playbike, the IT offers unlimited fun in every gear and first-rate reliability. ©

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