PHOTOGRAPHY: DON PHILLIPSON, DAVE HAWKINS

CYCLE DIRT TEST

YAMAHA IT250

After 1000 miles of high speed over rough ground, there's only one legitimate question: Do six gears, loads of power at any rpm and countless trick details make up for too much weight and not enough suspension?

YAMAHA IT250

● IN THE 1976 AUSTRIAN INTERNATIONAL Six Days Trial, Yamaha riders earned three Gold Medals aboard IT400s. Bill Stewart, a Yamaha Research and Development man, performed extensive modifications on the 400s specifically for the ISDT team's effort. Since then the factory has incorporated most of the Stewart modifications into the stock machines in the IT line.

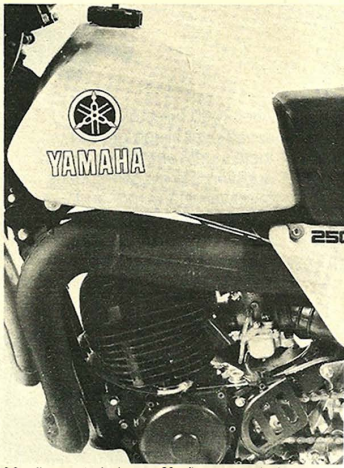
For 1978 Yamaha is essentially offering production-line machines developed for and proven in International Trial competition. We thought this would be an appropriate time to subject one of these bikes to Six Days-type testing. Since the 250 had never been a subject for one of our full-scale dirt tests, we chose to take the IT250E to Baja California for six consecutive days of riding. In that time, we rode 850 miles, carried our living supplies on our backs, went on rescue missions, fared well against the vengeance of Montezuma and were entirely pleased with the IT's performance.

The developmental history of the IT is short but interesting. Yamaha had the basic machine ready for production in 1976. At that time, the IT was significantly different from the YZ-racer in some respects, though mechanically the enduro was pretty similar to the motocrosser. The major differences were the addition of lights, a large gas tank, a speedometer, a coil-spring fork (rather than the YZ's air fork), a high breather intake, a chain tensioner, lower- and higher-ratio first and fifth gears, helical-cut gears (rather than the YZ's straight-cut gears), a DT-model clutch which was narrower than the YZ's clutch, and Bridgestone tires.

As enduro-kitted motocrossers, the ITs were a giant step ahead of previous Japanese enduro bikes, but they were still technologically behind the better European enduro mounts. With Yamaha's serious 1976 Six Days' effort, the company proved it had the knowledge necessary to produce Gold Medal-winning machines.

Most of that knowledge appeared in material form on the D-model ITs. Changes included a cutaway countershaft-sprocket cover to eliminate the buildup of mud, a frame-mounted tool kit, quick-release front and rear wheels and an improved chain tensioner. With these refinements, the IT took its place as one of the leading enduro bikes on the market.

But where the first ITs were essentially YZs with modifications, this year's ITs are their own motorcycles. This did not happen because Yamaha made any sweeping changes in the IT's chassis or engine specifications. Rather, Yamaha changed the *YZ's* basic makeup, leaving the ITs as sole proprietors of the YZ's original design—and free to continue the process of refinement. Regardless of the origin of the IT's original components, or the impetus for the YZ's changes, all the ITs—specifically the 250—perform remarkably well.



3.2-gallon gas tank gives an 80-mile range; tucked-away pipe allows a comfortable standing position.

According to Yamaha Motor Corporation spokesmen, the ITs are basically ISDT-ready. The one qualification to this statement, they add, is in the area of suspension. Many enduro riders feel the disadvantage of the height increase from very-long-travel suspension is not balanced by the benefits. Consequently, in this area, Yamaha has chosen to compromise with relatively short suspension—8.5 inches of fork movement and 7.3 inches of rear-wheel travel. For Six Days riders, this isn't enough. In Special Test sections, in which speed is the primary consideration, at the very least riders need YZ-quality suspension. In other areas, the ISDT riders concentrate on detail improvements to personalize the bikes; there are only a couple of the very fastest riders who need more power.

The IT250 is annually gaining Six Days-proven refinements. The E-model engine has received some important yet subtle changes which add to its already high-quality design. Yamaha has changed their method of casting cylinders. Previously, Yamaha would use a sand casting to mold the cylinder, with the sand occupying the space for the piston and the port areas; then they would press in an iron cylinder liner. This production method sometimes led to a mismatch between the liner's port holes and the cylinder's port holes. Now Yamaha is casting the aluminum cylinder around the iron sleeve. The sleeve has protrusions which occupy the space which will become the ports, a method resulting in precise alignment.

There are also some changes in the actual port design. The number-two transfer ports (those nearer the rear of the cylinder) are now aimed straight across the piston crown instead of upward, and the main transfer ports also enter the cylinder at a more horizontal attitude than before. These two alterations redirect the flow of gases along the top of the piston rather than above it, a flow which provides better scavenging. The exhaust port is typically Yamaha—large, and it empties into a relatively small-diameter pipe. On the intake side, the very wide port matches up to the six-petal reed valve. Also, there is a fifth transfer above the intake port which allows the charge trapped between the intake port and the reed block to enter the cylinder. The metal band between the intake port and the fifth transfer serves a couple of functions: it ties the rear cylinder wall together a little more securely, which gives the cylinder better dimensional stability; and it provides a bit of additional support for the rear piston skirt, which wasn't too well-supported before and has been further compromised by the new, and necessarily wide, intake port that couples to the huge reed cage.

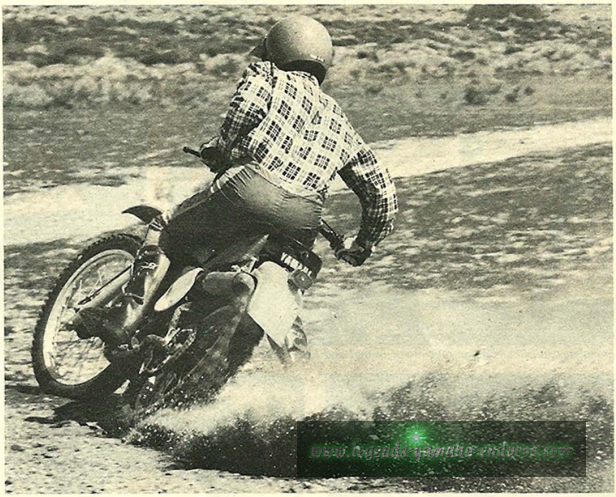
Another subtle variation has been made in the cylinder head. Until recently, Yamaha was a great believer in symmetrical combustion chambers. Now they've moved the chamber itself back toward the rear cylinder wall, a move which does two good things. First, the rear-set pocket is good for scavenging flow—the mixture streams shoot right up into the pocket, and the pocket serves to send them smoothly down toward the exhaust, a pattern which is better than having the flow bounce off a squish band. Second, the rear-set chamber equalizes thermal stresses on the piston. Fire shooting down the piston skirt at the moment of exhaust opening tends to overheat that side of the piston crown; moving the chamber back biases the heat input from combustion in the opposite direction and thus equalizes the crown temperature. As an added note, the repositioned chamber has not altered the compression ratio.

With the 1978 models, the trend toward ever-larger exhaust pipe diameters seems to have stopped. The E-model's pipe is the same as last year's; it's a standard up-pipe with a very effective silencer/spark arrestor. The five-pound combination muffler must be detached separately when the pipe is removed, and the muffler attaches securely by a sturdy rear mounting-bracket.

Only one minor update has been introduced in the 250E's 36mm Mikuni carburetor. There is now a main jet ring, which serves to keep the gas from sloshing all around when the bike is going over very rough ground. The carburetor still attaches to the six-petal reed valve *via* the rubber manifold.

Perhaps the most significant modification to the 1978 IT is the addition of the sixth gear. With the added gear the IT is now allowed the luxury of a stump-pulling first gear and road-racing top cog. To match the different internal ratios, a 14-tooth countershaft sprocket has replaced the D-model's 13-tooth sprocket. The shift fork and the shift cam have been refined to make shifting easier. Helical-cut gears are still used in the gearbox, and the power is transferred to the rear wheel by a #520 D.I.D. chain.

Other engine components have remained unchanged. Underneath the magnesium clutch cover resides a healthy-size, wet, six-plate, seven-friction plate clutch. A flywheel magneto generates current/voltage for the capacitor-discharge ignition system. It puts out 35/35W for the lights.



In all cases, engine performance was no less than excellent. Starting was never a problem: when cold, the engine needed two or three kicks with closed throttle to bring it to life, and when hot it needed only one kick with a fair amount of throttle.

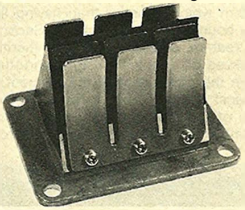
Two words describe the powerband of the IT: deceptive and unusual. There was an abundance of low-end power in any gear. It would pull cleanly and evenly from just above idle. In tight trail situations this characteristic can really be used. The power became deceptive, however, in the mid-range. Suddenly the engine no longer felt like it was really grunting out power. Throughout the middle-rpm range the power was noticeably flat. Acceleration was there, to be sure, and the rider found himself clicking through the gears, but there was no overpowering sensation of torque or any blinding acceleration. At first, this led us to believe that the IT was simply slow. However, in an impromptu

Subtleties abound: the brake rod routes over swing arm; removable pins let rear wheel pull straight out.

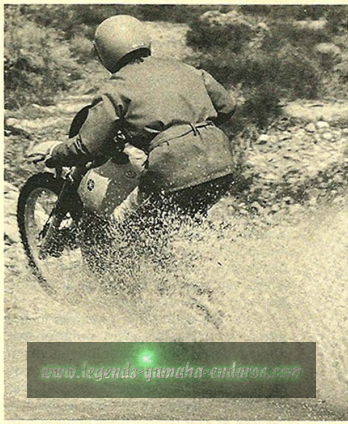
YAMAHA IT250

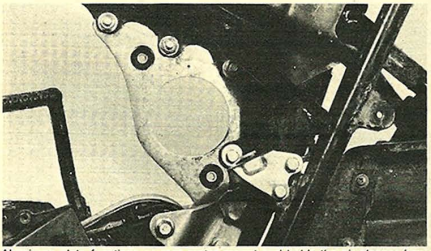
drag race against a YZ250D, the IT pulled ahead in first through third gears, dropped back about a bike length in fourth and fifth and, thanks to its tall gearing, very slowly played catch-up in sixth. We began riding the IT hard, keeping it at peak rpm from the moment we let out the clutch in first gear. The IT is a hard charger and can be ridden as an all-out high-speed race bike if the rider is concentrating on keeping the revs up. But that deceptively torquey mid-range is always there, as is the very apparent strong low-end power to get the rider out of trouble when the revs drop.

Certainly much of the credit for the clean-running engine must be given to the carburetion. Yamaha has refined the reed-valve induction system to get impressive horsepower-to-torque figures out of a 250cc engine. However, there is a powerband, and in this gear the bike will pull strongly from about 30 mph to 50 mph. This range is perfect for fast trail riding and will let anyone ride shiftless with a minimum of effort. Fifth and sixth are for very fast riding or fireroad cruising. On one asphalt highway entering Punta Prieta, we had the IT up to 85 mph in sixth and it was still pulling. Granted, this was on a paved road and with an approximate 10-mph tail wind. But it was also running on 80-octane Mexican Pemex gas.

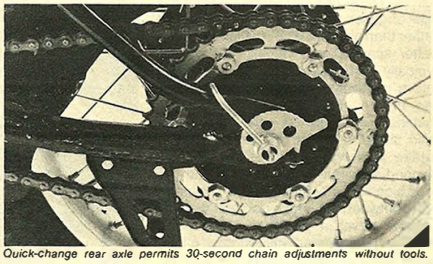


Heart of induction system is the six-petal reed block.

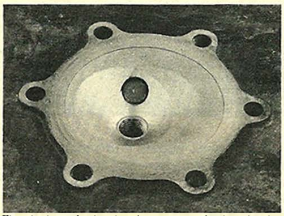




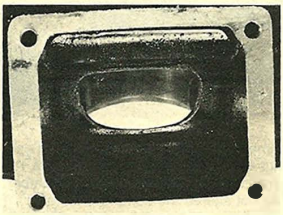
Aluminum plate functions as rear motor mount and holds the air cleaner box.



Quick-change rear axle permits 30-second chain adjustments without tools.



The dual-spark plug head was once the hot tip; the threaded plug now only serves to collect deposits.



Reed cage assembly has been removed to expose port. Wide intake port mates accurately with reed assembly.

price for the performance, paid for in relatively poor gas mileage: the IT consistently averaged 25 miles per gallon. This gave the rider an 80-mile range before the bike was turned on reserve. This compared unfavorably with one of the Baja bikes, a Honda MR250, which covered the same territory and averaged 35 mpg.

Throughout the 850-mile, six-day test, the gearbox and clutch made life easy for the rider. Yamaha obviously spent much time on the internal gear ratios' relation to the final drive gear ratio. First through third are fairly low, encouraging the rider to use the bike's abundant low-end power. Fourth gear is the rider's first opportunity to really use the bike's overall

On paper the IT's chassis design is straightforward. Its double-downtube frame is tubular steel, as is the swing arm. Below the gas tank, the backbone is very large in diameter in order to encase the monoshock. One interesting feature on the E-model 250 is the aluminum plate which does double duty as the rear motor-mount and as the air-box support. This intricate piece actually functions as part of the frame, and there was undoubtedly much consideration given to frame wall-thickness and to gusseting in relation to this aluminum member.

A KYB oil/spring, leading-axle fork and a DeCarbon monoshock provide the bike's suspension. D.I.D. rims, with one rim lock in the front and two rim locks in the rear, each attach *via* 36 spokes to aluminum hubs. Front and rear, respectively, the IT uses 5.1-inch diameter and 6.3-inch diameter brake shoes. IRC tires are on both ends, a 3.00 x 21 Motocross and a 4.50 x 18 Volcanduro. Other features of the chassis include fork boots and quick-release axles.

The IT's specifications look standard on paper but belie a unique-handling machine. The old truism that more head angle results in greater high-speed stability is, in general, true. Recently, however, motorcycle manufacturers have begun to learn that chassis dynamics are more complicated than even their wildest nightmares envisaged. A multiplicity of factors influences a motorcycle's handling, so much so that certain factories are turning to computers to plot the course their designers' pens will follow. On the IT, a 31.5-degree head angle, 5.59-inch trail and 56.3-inch wheelbase result (the truism has it) in loads of straight-line stability and only marginally good steering. Wrong. The IT turns and slides precisely with only minor adjustments in seating and throttle. In very tight cornering situations, the bike is not as nimble as it might be, given less rake, wheelbase,

trail or a combination thereof. But for basic woods and cross-country riding, it is excellent. In a straight line, it is very stable—up to 55 miles per hour. Then it develops a slight wobble in the front end which becomes worse as the ground gets softer. In deep sand at about 75 mph—a common situation in Baja—each handlebar end moves back and forth a solid four inches.

There is an obvious adjustment to be made on the IT: raising or lowering the fork legs. Just over two inches of each leg protrude above the top triple clamp; an adjustment of less than an inch will greatly affect the head angle and consequently the cornering and stability. After some experimentation, we returned the legs to the stock position, as this offered a suitable compromise in both areas. Also, most of our riding was done at below 55 mph; further, even when the bike wobbled at speed, it was not a frightening wobble, just a noticeable one, something akin to the initially frightening heave of a ship in rough seas.

We were not disappointed in the IT's suspension. But if we had to side with someone in the argument over the benefits *versus* liabilities of long-travel suspension, we would back the Yamaha Team riders. The IT simply didn't have enough travel. The fork's damping and spring rate were fine for our riders (150 pounds to 175 pounds), but we bottomed the front end again and again regardless of their smooth operation.

We like the forward-axle design for several reasons. First, this design moves the mass of the fork tubes and sliders back closer to the steering axis, which reduces the amount of steered-mass inertia. Next, with a forward-mounted axle fork, the fork tubes and sliders can be extended, providing for more tube/slider bearing area, which in turn results in less stiction. Finally, with enough fork length, even the typically poor-quality Japanese spring materials can be made reliable. All springs have the same rebound qualities. The difference between high-quality springs and poor-quality ones (given springs of equal wire diameter) is that better springs will take higher stresses without collapsing. Increasing the length of a spring effectively results in increasing its ability to absorb more stress without collapsing. A forward-axle fork allows the use of longer springs.

(Continued on page 64)

Make and model ..... Yamaha IT250E
Price, suggested retail $1498

ENGINE
Type ..... Two-stroke, single cylinder, air-cooled, six-petal reed-valve induction
Bore and stroke ..... 70 x 64mm (2.76 x 2.52 in.)
Piston displacement ..... 246cc (8.36 cu. in.)
Compression ratio ..... 7.8:1 (trapped)
Carburetion ..... 1; 36mm slide-throttle Mikuni
Exhaust system ..... Single upswept with silencer/spark arrestor
Ignition ..... Capacitor-discharge, reverse-voltage triggered, magneto
Air filtration ..... Oiled, washable foam
Oil filtration ..... None required
Bhp @ rpm ..... 26.11 @ 7500
Torque @ rpm ..... 18.52 @ 7000

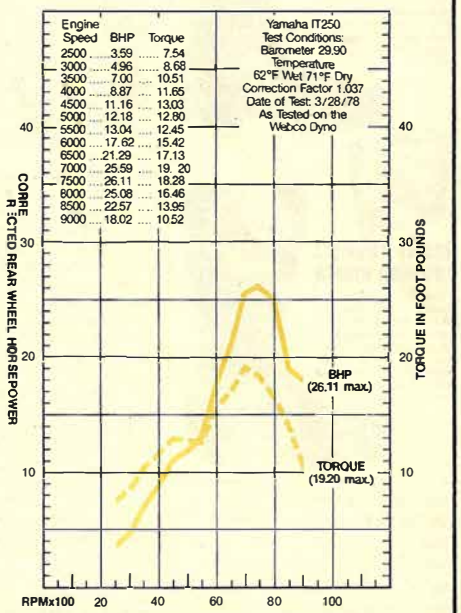
TRANSMISSION
Type ..... Six-speed, constant-mesh, wet-plate clutch
Primary drive ..... Helical-cut gear, 64/24, 2.66:1
Final drive ..... #520 chain, 46/14 sprockets, 3.28:1
Gear ratios, overall ..... (1) 2.714 (2) 2.067 (3) 1.600 (4) 1.261 (5) 1.050 (6) 0.917
Oil capacity 1100cc

CHASSIS
Type ..... Double-downtube, full cradle, leading-axle fork, monoshock rear suspension
Wheelbase ..... 1430mm (56.3 in.)
Rake/Trail ..... 31.5°/142mm (5.59 in.)
Brake and hub, front .. drum, cable-actuated, double-shoe
rear ..... drum, rod-actuated, double-shoe
Wheel, front .. DID shoulderless, 1.60 x 21, single-rim lock
rear .. DID shoulderless, 2.15 x 18, double-rim lock
Tire, front ..... IRC 3.00 x 21 Motocross knobby
rear ..... IRC 4.50 x 18 Volcanduro knobby
Seat height ..... 889mm (35 in.)
Ground clearance ..... 241.3mm (9.5 in.)
Fuel capacity ..... 12 liters (3.2 gallons)
Curb weight, full tank .. 124 kg (275 pounds) with full tank
Suspension, front ..... Telescopic fork, oil/spring
rear ..... DeCarbon monoshock

ELECTRICAL
Headlight beams, high/low 25w/25w

INSTRUMENTS
Includes: 100 mph speedometer, odometer, trip meter

CUSTOMER SERVICE CONTACT
Yamaha Motor Corp., U.S.A.
6600 Orangethorpe
Buena Park, CA 90620
(714) 522-9444
Attn: Customer Services



The DeCarbon monoshock performed in basically the same manner as the fork: damping was fine but more travel was needed. During our Baja testing, moreover, our rider was carrying a 52-pound pack and six extra pounds of tools. All total, he and his gear weighed 234 pounds. He bottomed the bike's rear suspension constantly. But before you say that you don't weigh anywhere near that much, consider this. With all that gear on his back, his riding speed was, needless to say, somewhat reduced. Still, it bottomed. And on two days when he rode *sans* pack, at a somewhat increased trail pace, he still noticed frequent bottoming. The IT has adjustable pre-load and damping; they both help but don't make up for the bike's limited suspension travel. Fortunately there are many interchangeable parts from the YZ which can give the IT significantly longer travel.

A direct result of the IT's travel is its amount of ground clearance: 9.5 inches.

Details on the IT are generally utilitarian and often clever. The hand grips are hard but pretty comfortable. The wide levers are especially easy on the hands. A particularly noteworthy item is the air-cleaner positioning: it is easy to get to, a cinch to remove and provides very effective sealing. The stock aluminum skid plate is large and tough. Though the stock lights are pitifully weak compared to any standard halogen light (which is absolutely necessary for nighttime riding), the stocker will cut an adequate yellowish path out of the night blackness. Wide fenders do a good job of keeping mud and water off the rider. A simple thing, but one which manufacturers often overlook, is the front brake cable routing; the IT's is simple and functional. Both the shift lever and the brake pedal have fold-back tips which reduce the chance of breaking a lever in a crash. Slotted footpegs, another Six Days' refinement, serve to eliminate mud build-up. Lastly, in the area of details,

the chain tensioner is a model of efficiency; it kept the chain taut throughout our test ride and showed no signs of wear.

The bike never had a problem scraping its underside on the terrain. However, there is a connection between ground clearance and footpeg height, and in this area the IT has a problem. The IT's pegs are 11.5 inches off the ground; compare this with, for example, a YZ125, which has a footpeg height of 14.5 inches. The low footpegs caused trouble only in areas with many bushes. But in these areas, bushes would grab a rider's foot.

Both brakes on the IT are excellent: they are very progressive and require only a light touch to operate. Tires provide good traction in sand or mud, and on hard ground they slide easily and controllably.

There is one final fact regarding the IT—its weight—which cannot be ignored. Full of gas, all 3.2 gallons of it, and equipped with a fairly complete tool kit, the IT weighs in at an undeniably portly 275 pounds. In the IT's defense, it doesn't *feel* that heavy. In all of our testing time, the bike did not fatigue the rider. But weight is weight, and all those pounds make the best argument for buying an IT 400 (which weighs only four pounds more) instead of the 250.

The IT had power for every situation—from lugging up steep, rocky hills to gratuitous, chest-on-the-tank, dry-lake speed runs. The suspension was limited, but the bike was still comfortable and could be ridden hard and fast with no fear of the bike taking some unprovoked side trip; its bottoming was expected. Reliability, in every way, is exceptional.

Against the competition, the IT is first-rate. It may have less suspension travel than a KTM, but the IT is easily modified in that respect. And, at $1498, it is priced to be competitive with vastly inferior bikes.

In six days and 850 miles of Baja testing, the IT never let us down. During that time, we tightened the spokes, oiled and adjusted the chain, kept track of all the nuts and bolts, and checked the air cleaner. That was it. The IT didn't suffer any flat tires; it didn't lose any parts; it didn't break in any way. We didn't even change a plug. ◉