

## Cycle Test

● Yamaha's long-standing marketing philosophy on dirt bike development is to cover the full spectrum of off-road interests. Yamaha has full-tilt motocrossers (the YZ series), pseudo-racers (the MX models), and dual-purpose trail bikes (the enduro line). While no one particular model crosses all lines of dirt riding enthusiasms, Yamaha's best racer/playbike combination to date is the MX 400B. It has an abundance of power; yet it can be tamed by the vast majority of novice dirt riders. The monoshock rear suspension, gearbox, carburetion and tires work smoothly and predictably. Though not without faults and limits, the MX 400B will certainly become a standard for desert racers and power-hungry trail riders.

The MX 400B package is, like the dual purpose enduro bike, an assemblage of compromises. The engine is a large variant of Yamaha's basic two-stroke, reed valve single. It's internals are, for

the most part, new. The displacement comes from the 70mm stroke and an 85mm bore, the latter being ten mm smaller than the out-of-production MX 500 and five mm larger than the 360cc engine. The crankshaft is the same for the Yamaha 360, 400 enduro and the old 500 single. While the dimensions are the same for the 400 enduro and MX, the pistons are different. The enduro uses a conventional two-stroke piston while the MX has a slipper-type casting with reinforcing ribs indented in the side under the wrist pin bosses. Two piston rings are used in both engines.

The helical-gear primary drive and 14-plate oil-bathed clutch are the same for both Yamaha 400s. The gearbox of the MX 400 has different ratios than the enduro with the exception of the 1:1 fourth cog. Ratio staging in the MX400 is closer than the enduro, though still wide enough to keep it from being classified as a close

# YAMAHA MX 400B

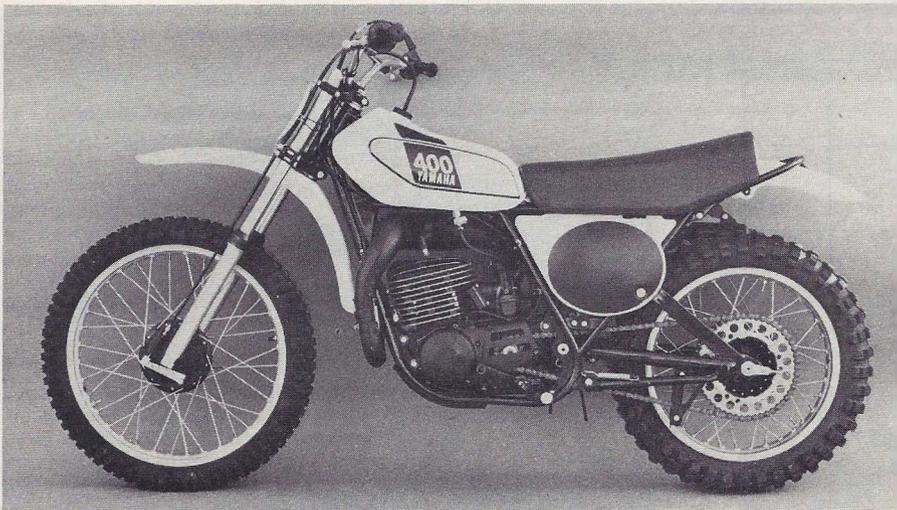
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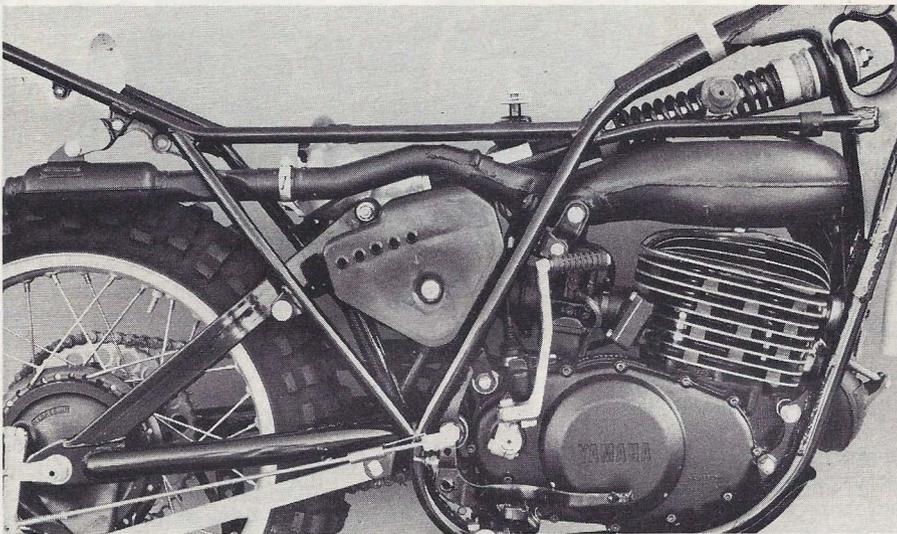


Basic construction and abundant alloy castings keep weight at a moderate 242 pounds wet.

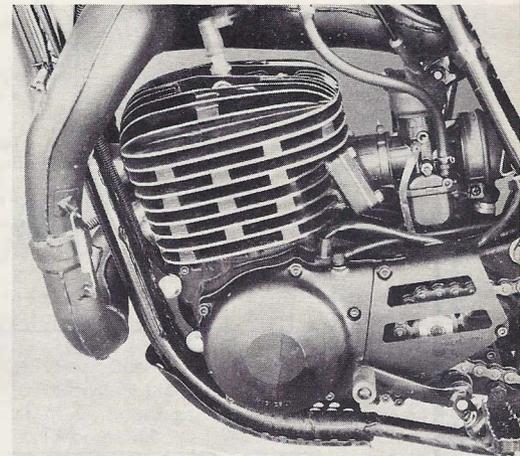
PHOTOGRAPHY: DAVE HOLEMAN



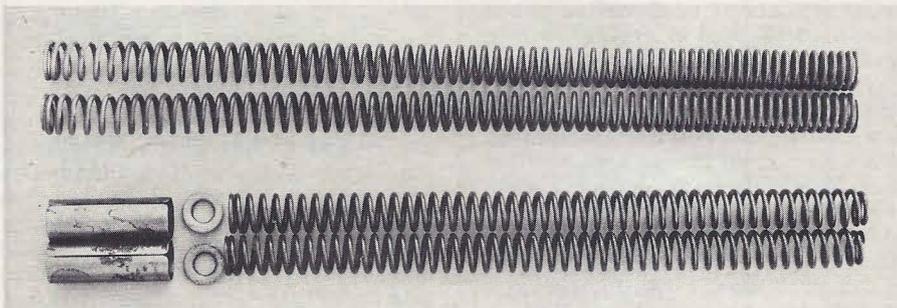
Double-dish hub is strong but brakes are grabby. Dunlop Senior tire is superb for motocross work.



Up-and-over expansion chamber breaks into three pieces. Token silencer permits excessive noise.



Minimal external finning for big engine deters from efficient cooling. Overheating can be a problem.



Standard fork springs (below) collapsed early on. Installation of S & W springs helped considerably.

ratio transmission. Secondary drive via the  $\frac{1}{4} \times \frac{1}{2}$  inch DK chain includes a 14-tooth primary sprocket (same as the enduro) and a 50-tooth drive at the rear—ten more than the enduro.

The aluminum and magnesium engine castings are identical to the enduro model, except for the narrower clutch cover. With the oil injection pump and tachometer drive absent, the cover has been tucked in on the frontal section. Included in the cylinder casting is the starting de-compressor, which reduces kicking effort to a manageable level. The

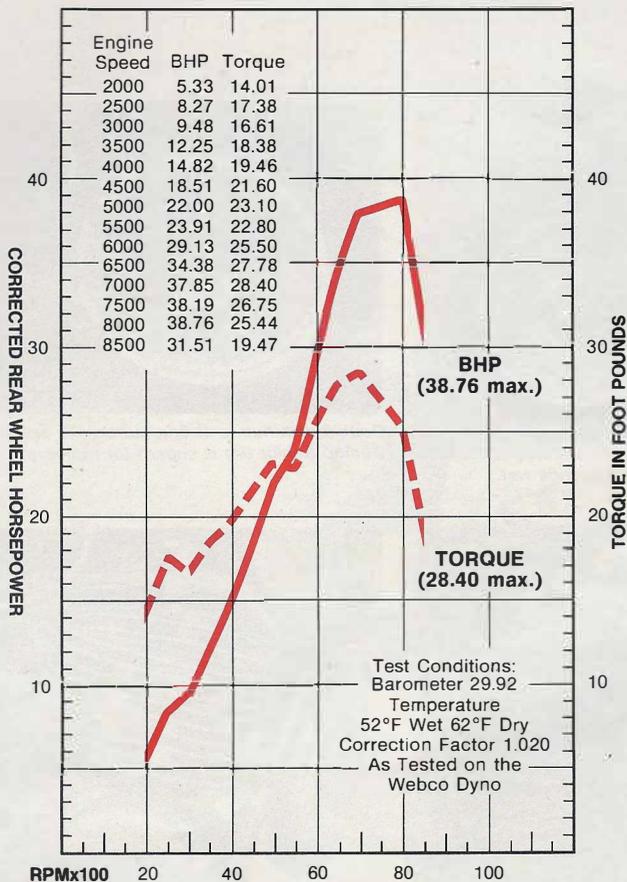
ignition is the same external-flywheel CDI unit as used on the enduro, but with the charging coil eliminated. The exhaust is from the proven up-and-over expansion chamber with a token silencer attached. It's divided into three sections—headpipe, center section and stinger—to permit its removal. Under the engine there's a sheet metal rock guard to protect the cases.

The wheel hubs are the same castings used on the 250 and 360 motocrossers. The front is of conical design and the rear is a double-dish type. The spokes taper out to a larger diameter on their butted

ends in an effort to prevent excessive settling into the counter-sunk hub holes. Shoulderless aluminum DID rims are fitted with Japanese-made Dunlop knobbies. Bead locks, one front and two rear, keep the tires from slipping on the rims when low air pressures are used.

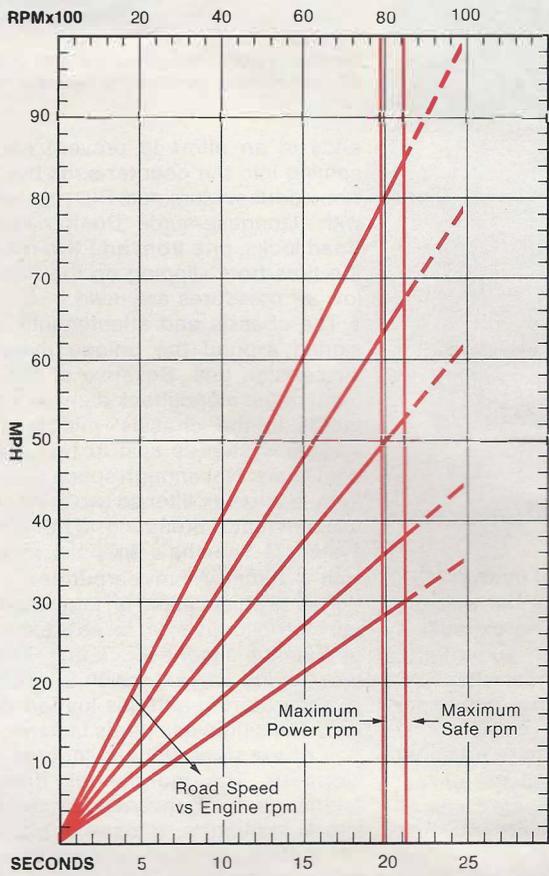
The chassis and attachments are designed around the unique monoshock suspension unit. Because of the placement of the monoshock damper's attachments in the chassis' middle, the air cleaner system is split in two and uses dual filters. Not enough space is available for one large air filter so two must be used for adequate breathing. The induction system is Yamaha's six-petal reed valve with a 38mm Mikuni carburetor.

The sophistication of long travel suspension in today's dirt bikes is exemplified by Yamaha's monoshock unit. The triangular swing arm extension is attached to a single spring-and-gas-loaded damper unit. The single damper is fastened to the rear of the steering head in large rubber stoppers. The monoshock damper is enormous by conventional motorcycle shock standards. It uses a big spring, large shaft and piston and contains about 20% more oil than a pair of normal shocks. Its design incorporates the use of pres-



**YAMAHA MX400B**

- Price, suggested retail..... \$1486, POE West Coast
- Tire, front ..... 3.00 x 21 Dunlop Sports
- rear ..... 5.969 in. x 1.0 in. (151mm x 25.4mm)
- Brake, front..... 5.125 in. x .875 in. (130mm x 22mm)
- rear ..... 5.969in. x 1.0in. (151mm x 25.4mm)
- Brake swept area ..... 32.84 sq. in. (209 cm<sup>2</sup>)
- Specific brake loading..... 12.28 lbs./sq. in.
- Engine type ..... Two-stroke reed valve single
- Bore and stroke ..... 85mm x 70mm
- ..... 3.346 in. x 2.756 in.
- Piston displacement..... 397cc (24.2 cu. in.)
- Compression ratio ..... 7.57:1
- Carburetion..... 1; 38mm; Mikuni
- Air filtration..... Oiled foam
- Ignition ..... Mitsubishi CDI
- Bhp @ rpm..... 38.76 @ 8000
- Torque @ rpm ..... 28.40 @ 7000
- Mph/1000 rpm, top gear ..... 9.8
- Fuel capacity ..... 2.1 Gal. (7.9 liters)
- Oil capacity ..... 1.0 qt. (1 liter)
- Primary drive ..... Helical Gear; 2.667:1 (64/24)
- Gear ratios, overall ..... (1) 21.429 (2) 16.040
- ..... (3) 12.008 (4) 9.524 (5) 7.553
- Wheelbase ..... 57 in. (144.8cm)
- Seat height ..... 33 in. (83.8cm)
- Ground clearance ..... 9.0 in. (22.9cm)
- Curb weight ..... 246 lbs. (111.6kg)
- Test weight ..... 406 lbs. (184.2kg)
- Average fuel consumption ..... 16-25 mpg



surized nitrogen gas to load the air-free damping oil. By separating the high pressure nitrogen (315 psi average) and sealed oil with a rubber diaphragm aeration (foaming) is eliminated.

At the front Yamaha uses their standard double-damped, internal-spring fork. The MX 400B has 7 7/8 inches of working travel—an inch more than previous models. The outside of the fork sliders have been turned down in diameter to reduce unsprung weight. Retaining the fork stanchions to the steering head are aluminum triple clamps and a tubular steering stem that rides in ball bearings.

Taking the MX 400B out for its initial run-in revealed that the bike excels in cross-country surroundings far more than closed-course sprinting. With all its power and size, the engine starts with ridiculous ease. Four-kick, choke-on starts are demanded when cold, and one boot does it when the engine's hot. The kick-crank-actuated compression release takes all the bite and leg effort out of pushing the start lever. The engine produces herds of low speed and mid-range torque, which makes acceleration depend more on simple throttle roll-ons than down-shifting. Vibration is almost absent at all engine speeds. For a big-displacement single the MX 400B is exceptionally smooth.

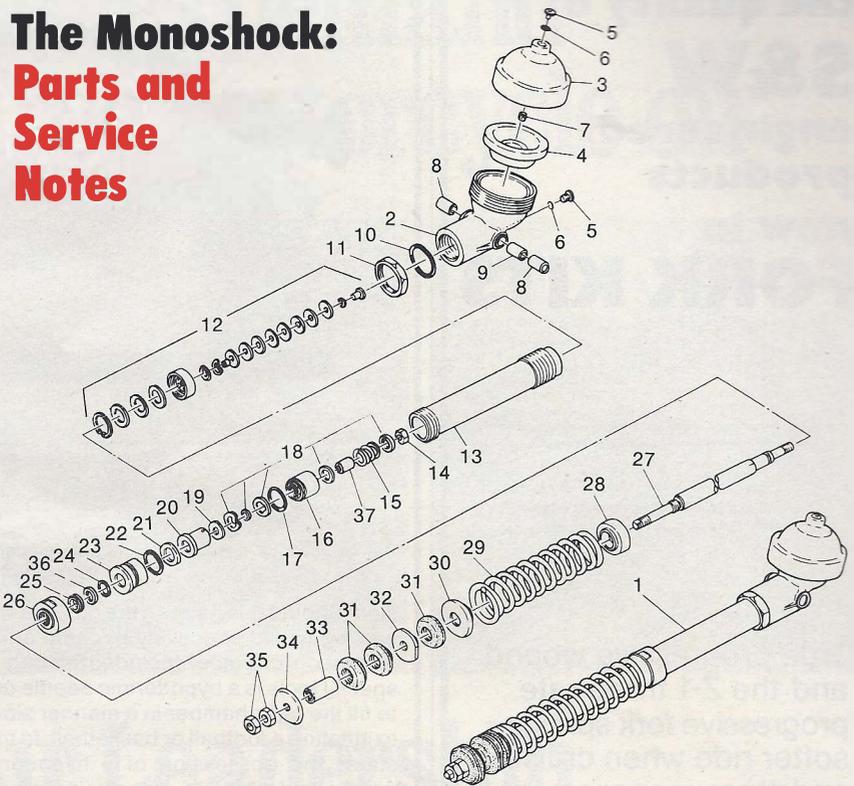
Throttle response is relatively quick, but the engine won't rev as quickly as the YZ models with their small internal-rotor flywheel ignitions. Clutch pull is light and the softness of the lever pressure makes a triple of the necessity to use it when shifting gears. Gear selection requires a heavy foot action and lacks the easy-engagement quality of the YZ gearbox. First gear in the five speed transmission feels tall initially but is compensated by the enormous amount of low speed torque the engine produces—14 pounds-feet at 2000 rpm. Gear spans are easily jumped by the engine, which delivers usable horsepower from 4000 to 8500 rpm.

The MX 400B's strongest feature is its engine's power. On Webco's dynamometer the MX 400B produces more horsepower than any two-stroke single yet tested by *Cycle*. At 38.76 bhp the MX 400B produces 15 more bhp than its enduro brother, four more than the Penton Mint 400 and 1.2 more than the big 450 Maico. The MX 400B delivers five more pounds-feet of torque than the Yamaha enduro, three more than the Penton Mint and two less than the 450 Maico. Most impressive is the engine's usable power range, which allowed it to pull the dyno from 2000 up to 8500 rpm. However, one serious problem came to light during the dyno runs: overheating. At higher engine speeds—7000 to 8500 rpm—flash readings had to be made because the cylinderhead temperature would jump 110° in just seconds to a near-terminal 410°.

Usable power over a wide range makes the MX 400B one of the most pleasant cross-country bikes we have tested. Carburetion is smooth and crisp at all speeds and, combined with the reed valve system, arrests fuel loading and over-rich

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## The Monoshock: Parts and Service Notes



● In creating and marketing the monoshock suspension unit, Yamaha has leaped ahead of all other manufacturers in rear shock absorber sophistication. The monoshock assembly is a highly complex mechanism manufactured to precise tolerances. Intricate assembly procedures and the high-pressure gas loading system mean surgical cleanliness is a must when adjusting or servicing the monoshock unit. A particle of dirt, misaligned O-ring, loose circlip or improper bleeding of the hydraulic fluid can render the shock damper useless. In total, 43 parts make up the monoshock damper and about half of them are critical internal pieces.

Other than spring replacement, any adjustment or periodic maintenance must be done by a trained (preferably by Yamaha's monoshock service clinic) dealer mechanic. In addition to the surgical cleanliness, detailed knowledge and special parts needed to care for the damper, a number of very special tools are required to properly service the unit. For all intents and purposes, adjustment and maintenance are not chores that can be done in the field or at home by the owner. Improper servicing of the monoshock damper could ruin the unit.

The cast aluminum gas chamber is designed to contain a maximum pressure of 415 psi. Excessive pressure could cause an internal or external leak, or at worst, a failure and explosion of the casting. Equally important is that the chamber be filled only with inert nitrogen gas. Yamaha says the use of any other gas (oxygen, acetylene, etc.) can cause an explo-

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ITEM	QTY.	RETAIL PRICE
1. Rear Cushion Assembly	1	\$154.06
2. Housing, membrane	1	42.00
3. Cap, housing	1	24.54
4. Membrane	1	6.40
5. Screw, bind	2	.12
6. O-ring (1.9-5.8)	2	.16
7. Valve, rubber	1	1.00
8. Bush, high metal solid	2	.98
9. Collar (12.2-14.8-26)	1	1.20
10. O-ring (3.5-41.7)	1	.56
11. Nut, ring	1	3.14
12. Base Valve Assembly	1	17.20
13. Cylinder, case	1	39.10
14. Nut, hexagon	1	.44
15. Spring	1	NA
16. Piston	1	11.60
17. O-ring (3.5-30.7)	1	.56
18. Piston Valve Set	1	4.68
19. Washer, plate	1	.78
20. Stopper	1	4.20
21. Damper 1	1	1.52
22. O-ring (3.5-30.7)	1	.48
23. Housing, seal ring	1	8.76
24. O-ring (3.5-21.7)	1	.48
25. Seal, ring	1	2.04
26. Cap, case	1	13.08
27. Rod, piston	1	40.31
28. Seat, spring	1	5.60
29. Spring 1 (rate K 4.1)	1	18.76
30. Spring 1 (rate K 4.2)	1	18.76
31. Spring 1 (rate K 3.8)	1	18.76
32. Seat, spring	1	1.44
33. Damper 2	3	1.54
34. Nut	1	10.58
35. Collar, distance	1	2.64
36. Plate 1	1	.98
37. Nut, hexagon	2	.90
38. Seal, ring	1	.52
39. Spacer	1	NA

tendencies. Sheer acceleration from a stop is bettered by few other machines, the exceptions being specialized, and peaky, motocrossers.

Control of the Yamaha's power is tightly tied to throttle opening—there are no super-abrupt power surges. Power builds evenly as the throttle is rolled open. With the throttle held full open, power gets to the rear wheel smoothly and predictably. Most motocross-type machines, even the big-bore models, require downshifting once or twice to pass, accelerate or climb. Not the case with the MX 400B. We had to accustom ourselves to *not* downshift in many conditions because more time was lost changing gears than could be gained by having the engine rev higher.

Because gear selection is less critical with the Yamaha than any other big-bore racer (excepting the 450 Maico), reflexes have to be coordinated more with the throttle and brakes than the shift lever and clutch. The MX 400B gearbox has a heavy action and won't snick from one cog to another without disengaging the clutch. At lower speeds in rough or rocky terrain the short friction point of the clutch makes the power snap to the ground in choppy bursts. Mild enduro-type clutching makes the clutch fade rapidly from heat and lose its ability to disengage.

Handling characteristics of the bike are a confusing mixture of good and bad. For the most part, the faster the Yamaha goes the better it handles. The rear monoshock suspension performs with incredible consistency over long cross-country sections. The spring rate and damping resistance will meet the demands of cross-country racers, fast trail riders and fire-roaders alike. At slow plonking speeds the rear unit is stiff and produces a choppy, bouncy ride. Low rear-wheel air pressure and the superb 4.60-section Dunlop Senior tire's traction can alleviate most of this discomfort.

While the monoshock rear suspension is the most modern and consistent-performing in motorcycling, the front fork is horribly inadequate. The MX 400B fork is of traditional design with internal springs and an intricate oil damper unit. However, the parts design in the fork assembly date back to the 1967 DT-1 enduro era. The fork springs are not full length items; they are three inches shy of reaching the stanchion caps. On top of each spring is a three inch steel-tube distance piece. The stanchions are long and have almost two inches of unused (and unsupported) space between the lower triple clamp and the slider top. The sliders are an inch longer than those in the previous Yamaha fork, but they could be another 1.5 inches taller for increased and much-needed support.

At all speeds in rough terrain the efficiency of the rear monoshock unit puts an exceptional amount of load on the fork. The rear suspension is good enough to let you ride really hard, and that demands more in strength, springing and damping from the front end. In the case of the MX

400B the fork springs collapsed so badly after one hundred miles that they wouldn't stand fully-extended under the weight of the unladen bike. When riding, the too-soft front fork sags to the extent of only allowing about three inches of working travel. Compounding the softness is ineffective damping and wobbly tendencies from weak fork construction.

The end result of the weak fork is instability that largely offsets the benefits of the rear suspension. The softness, flexing and poor damping make the steering erratic and unpredictable. Making turns in sand and cutting side-to-side in soft terrain gets the bike nose-down and pulls the handlebars to full lock.

If the rider doesn't have strong arms and quick reflexes the result is a slide-out or high-side crash. We installed various S&W springs in an attempt to correct the softness. The best combination we arrived at was 19 inches long, 18 to 28 pound/inch progressive springs and 180cc (six ounces) of Torco MTF 10 weight fluid. The springs corrected the sagging and the oil allowed full travel without topping or bottoming bangs.

We used the MX 400B in a multitude of conditions—cross country desert, motocross, enduro, fire roads and general trail riding—to pin-point what the Yamaha does best. For fast trail and desert conditions (with the fork modifications) the MX 400B could easily become a standard for cross-country riders. Plenty of power over a broad spectrum, good high-speed handling qualities, comfort and ease of riding make the bike a Hare and Hound weapon. The engine and monoshock unit are forgiving and permit long, shiftless sit-down rides over diverse terrain. Because it traverses fast desert so smoothly and effortlessly it also makes an ideal mount for weekend trail warriors and fire-road lovers. On smooth trails and winding Edison rights-of-way it works very much (minus 120 pounds) like the infamous, stretched-out Triumph 650cc desert sleds of the past. Sliding through corners is a feet up, throttle-on, no down-shift affair.

Enduro usage could fall within the competence of the Yamaha if it had a lower first gear and were fitted with a speedometer. We did find that the 360/400 Yamaha enduro front wheel and speedometer will bolt right onto the MX 400B's fork. Expert riders can work with the gearbox as-is for enduros. Motocross is the one thing that the Yamaha does least well. At 246 pounds (wet) it requires a lot of rider effort to muscle it over rough courses and through the numerous slow speed motocross turns. The soggy front end isn't predictable or precise enough to allow fast, consistent entries and exits from turns. The semi-wide ratio gearbox makes it difficult to keep the engine on its power peak.

We spent a lot of time with the MX 400B; enough to wear the rear tire almost smooth. In this lengthy test-period we had a number of irritating problems. The on/off petcock will not stop fuel flow when

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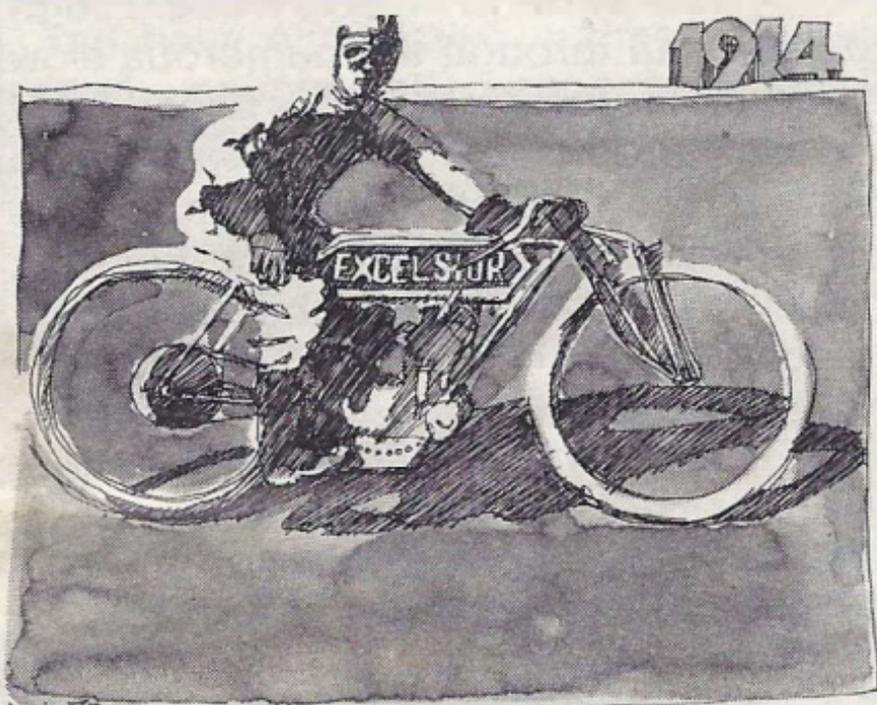
shut. A replacement item did the same and is the fourth of its type with which we have had this problem. When loaded in a truck or in a closed van gas dribbles out of the carburetor breather as the vehicle moves. The countershaft sprocket seal leaked oil from the onset of the test and had to be replaced. The rear retaining tab on the gas tank fractured from fatigue.

There are also some nuisance areas that should be corrected in the factory design department. The 2.1 gallon gas tank is unnecessarily too small. We continually ran out of gas in just 35 to 38 miles of riding. A three gallon gas tank is a requirement for 50-mile jaunts. The spokes require constant attention and must be tightened every 50 to 100 miles to keep the wheel from coming apart. The brakes are alarmingly grabby and lock the wheels at the slightest touch of either lever or pedal. The clutch engagement point should be wider for smooth take-offs at low speeds and in rough terrain. Engine bogging is too often the result, as the clutch slams into engagement in just a fraction of the lever's travel.

Most serious of the problem areas is engine overheating. After 15 minutes of running, continuous acceleration drives the scantily-finned engine to alarming temperatures. When overheated, power slumps markedly—to where the 20-pound-heavier, four-horsepower-weaker 357cc Penton enduro will handily pull away. Rider attention to overheating must be maintained on long roads, uphill pulls, sandwashes and lengthy WFO jaunts to prevent seizing.

The MX 400B is designated as a racing machine and therefore received careful scrutiny of its weak points. Racer/mechanics, particularly cross country speedsters, can overcome the weak fork problem with a set of eight-inch-travel Cerianis and thereby perfect handling and stability. Racing the Yamaha also demands castor-bean oil to provide maximum insurance against potential seizure. Further attention to details will make the MX 400B a near-perfect desert sled. With only a few of these machines presently in desert racers' hands, MX 400Bs are already taking overall wins in hotly-fought Hare and Hounds and Hare Scrambles in the Southwest.

For the most part, Yamaha's big-bore single will give semi-serious trail riders all the motorcycle they can handle. New fork springs, simple maintenance and detailing will alleviate its major flaws for occasional race and trail use. ©



CYCLE