Cycle

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TOURING: THE GREAT ASPENCADE EXPLOSION

6-CYLINDER KAWASAKI KZ1300...ZZAAAPP!

1-CYLINDER HONDA XR500...THUMP!

CAN-AM 250 QUALIFIER

YAMAHA IT400F

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Cycle

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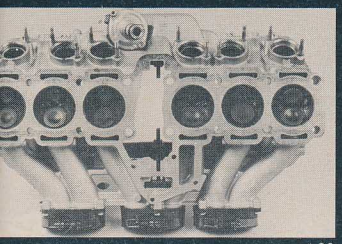
March 1979 Volume XXX No.3



p.38

p.116

p.156

p.146

This Month's Cover: They may look different, but there's a lot in common between the XR500 Honda Single and the steaming Kawasaki 1300. They're both big for their age, powerful, technically interesting, and capable performers. Another capable performer: Robin Riggs, who built a studio in our shop just for *Cycle*'s March cover, then took the shots.

Road Tests

Features

Technical

Departments

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After the creation of the innovative XL250S, Honda was ready to tackle a big-bore dirt thumper. The XR500 uses all of its sibling's technology including engine counterbalancers and a 23-inch front wheel. The trickery makes the XR a good bike; its smooth power makes it Pure Fun.

HONDA XR500

CYCLE DIRT TEST

● WE'RE REALLY ROLLING NOW. SINCE 1976 each of the four major Japanese motorcycle manufacturers has introduced at least one four-stroke dirt or dual-purpose bike. There are currently six basic four-stroke singles available, and counting variants there are 11 thumpers total on the market.

You need to know two things about those 11 machines. 1) The new XR500 is the best of the bunch. 2) Do not for a moment think that being the best compared to the other four-strokes means that it is truly competitive in relation to the best two-stroke enduro bikes. That second statement is not an irrelevant comparison, because Honda offers the XR as "enduro-ready." Consequently, the XR's performance must be compared both to other four-strokes—with which it has the most in common—and to other open-class enduro machines—against which it competes.

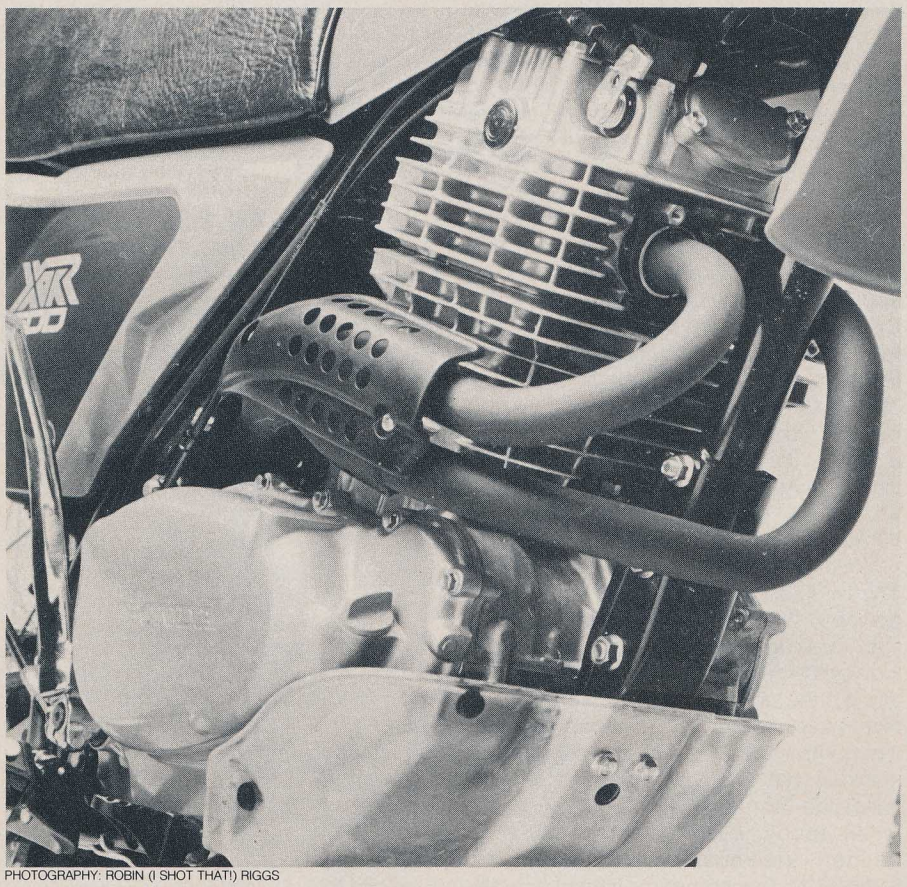
Honda Motor Co. took advantage of their experience with the XL250 to develop the XR500. In fact, the 500's basic engine, chassis and suspension designs are nearly identical to the 250's. However, Honda spokesmen are quick to point out that the 500 is not merely a bored and stroked 250; they use similar designs, but the big bike has beefier parts throughout to handle the extra power and weight.

As with the quarter-liter machine, the 500's mainshaft-mounted engine counterbalancers are keys to the bike's entire design. Honda R&D men believe the balancing system effectively quells the big single's inherent vibration; consequently the lower stresses allow the use of more delicate engine and frame components. Since excess weight is any four-stroke's major handicap, any design which results in less weight is of primary significance.

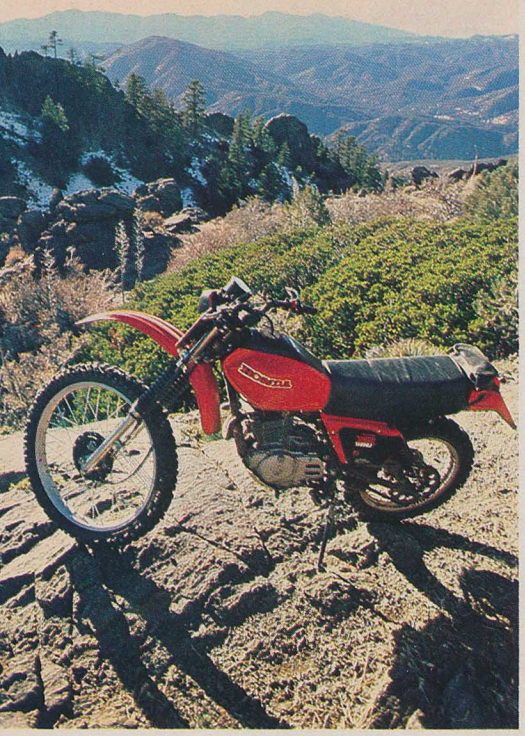
Regardless of Honda's intentions in designing the balancer system, its use has these real-life results. First, the balancers genuinely reduce vibration. There is no high-frequency vibration apparent at any time; though there's some noticeable low-frequency thumping, it's just there and it's not irritating at all. The XR is smoother than the Yamaha TT500, which simply uses extensive rubber mounting to absorb vibration; it's also smoother than the smaller Suzuki DR370, which uses no balancing system.

Next, it is perfectly logical that the 500's minimal vibration persuaded the designers to cut the weight of stressed parts in the engine and chassis; they knew they would not be sacrificing reliability. However, there's a Catch-22 snag in the balancing system. It weighs several pounds, and the XR itself, full of gas, weighs 293 pounds—exactly the same as last year's Yamaha TT500. Apparently the counterbalancers saved exactly enough weight in other places to offset the amount added. In the end, its major and only real benefit is to make the XR extremely smooth, and that alone is praiseworthy.

Technoids are probably wondering exactly how the balancer works and why it is significant that the aft balancer mounts on the mainshaft. The system's purpose, naturally, is to offset vibration produced by piston movement. The balancing mechanism consists of two bobweights mounted



PHOTOGRAPHY: ROBIN (I SHOT THAT!) RIGGS



"The XR is controllable and offers its best power up high. There is also a predictable but abundant surge of power in the mid-range, at which point it's incredibly easy to wheelie the machine in the first three gears. Thanks to its smooth powerband, riding the Honda is above all fun."

HONDA XR500 TEST

on different shafts; each shaft is chain-driven by the crankshaft in the opposite direction of the crankshaft. As the piston downstrokes, the crank turns the heavy sides of the balancing weights upward. When the piston reaches bottom dead center, the weights have turned 180 degrees from the big-end. Without the balancers to produce an equal and opposite reaction to the piston's movement, the piston's action results in vibration.

Honda has kept the system as simple and light as possible and has made it feasible to use on a dirt bike by mounting the rear bobweight on the transmission mainshaft. Ordinarily, a balancing system's two shafts have only one function: to mount the weights. Two shafts result in an unacceptable amount of extra weight in a dirt bike. Honda has at least broken even in the weight department and reaped the benefit of outstanding engine smoothness by eliminating the need for a separate aft counterbalancer shaft.

Though the 500's balancing system's design is identical to the 250's, there are two main differences between the assemblies. First, the front balancer in the 500 is heavier and larger: 31mm instead of 19mm. Second, the gears which turn the

roller chain are coil-spring-damped to cope with the extra power of the big single; the 250's are rubber-cushioned.

In other respects the engine differs in detail rather than in design. The piston, of course, is larger. Though the 250 uses a high-dome piston for maximum compression (9.0:1), the 500 uses a flat-dome design for a more mild 8.6:1 compression ratio. Following Honda tradition, the 500 uses a four-valve head, a design with several benefits.

First, four small valves are usually lighter than two large ones; lighter reciprocating parts can be moved quicker than heavier ones. Consequently, a four-valve engine can rev higher, pump greater quantities of air and fuel in and out and thus make more power. Next, two exhaust valves allow the use of two small header pipes which can bend quickly and thus make room for the large 23-inch front wheel. Finally, two exhaust valves permit an air passage to run from the front of the engine and up to the top of the head, and this passageway provides better cooling.

In more and more of their machines, Honda has begun to use Hy-Vo-type cam chains which have proven stronger and quieter than standard roller chains. The XR500 has a Hy-Vo chain. The camshaft turns directly on the metal of the cylinder head, a method which has proven reliable so long as adequate oil pressure is maintained. It's lighter and less expensive than a ball- or roller-bearing assembly, and damage to the camshaft journals or to the cylinder head is a danger only in the complete absence of oil. Even when an engine is first started—when most of the oil is in the sump—there is enough residual oil in the top end to provide adequate lubrication until fresh oil arrives.

The powerplant's lower end differs from the 250's in several ways. Though the gear material is the same as in the smaller bike, the duration of the hardening process is lengthened to produce stronger

HONDA XR500 TEST

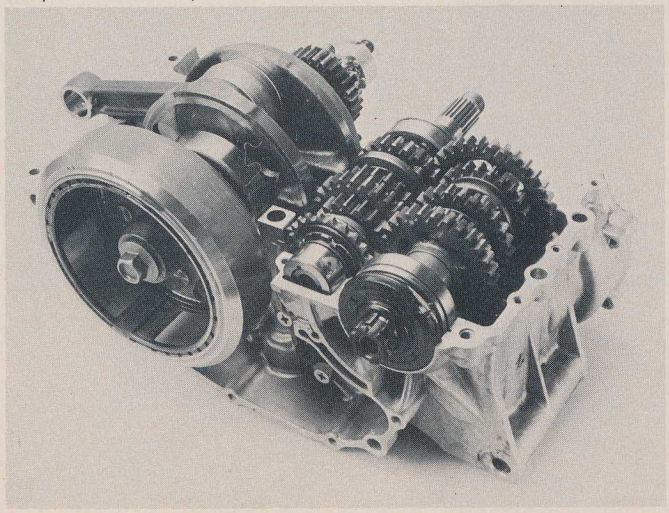
gears. All the gears differ in number of teeth to lower all the gear ratios for higher speeds. The primary gear ratio is identical to the 250's, but the crank gear has been increased in width from 12mm to 15mm. To handle the big bike's extra torque, the 500 uses a seven-plate clutch rather than the 250's four-plater.

Finally, the trochoidal pump has been increased in diameter from 13mm to 15mm to pump about 15 per cent more oil through the larger wet-sump engine.

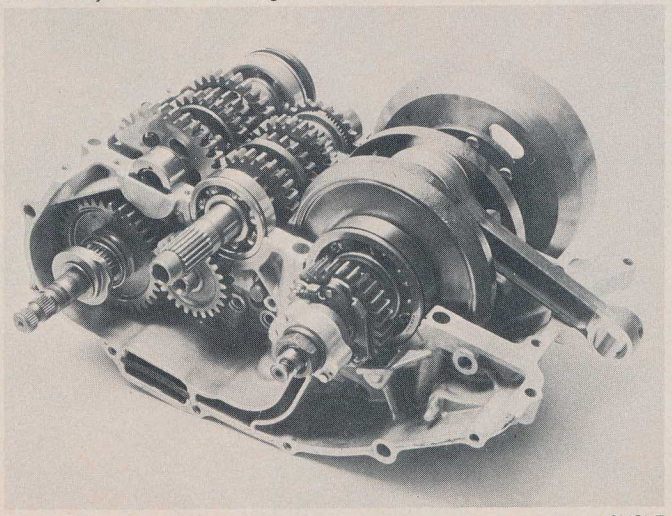
All of the other "Features" on the XR are functional, and some are even unique. The mechanically activated exhaust-valve lifter facilitates starting. When the kick lever is depressed, it operates a cable which opens the exhaust valves, making the engine easy to kick through the compression stroke. The kick lever ratchets over the cable actuater and lets the valves close as the lever passes through about one third of its stroke. Capacitor-discharge ignition eliminates the fuss of points maintenance, and a mechanical advance retards the timing, relieving the potential for a terrific kickback.

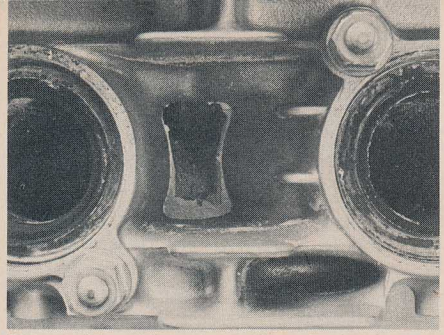
Both the intake and exhaust systems of the XR are fairly standard. Street-legal XL Hondas have carburetors with accelerator pumps. These pumps supply extra fuel in the low- and mid-range when the throttle is suddenly opened. The XLs need extra gas in such circumstances because Honda has chosen to meet emissions standards by leaning out the bottom end of the carburetion. Since the XRs, as dirt bikes, are not so strictly regulated, their carbs have sufficiently rich low-end jetting and do not need accelerator pumps. A

For quicker throttle response, XR uses a lighter ignition flywheel than XL.



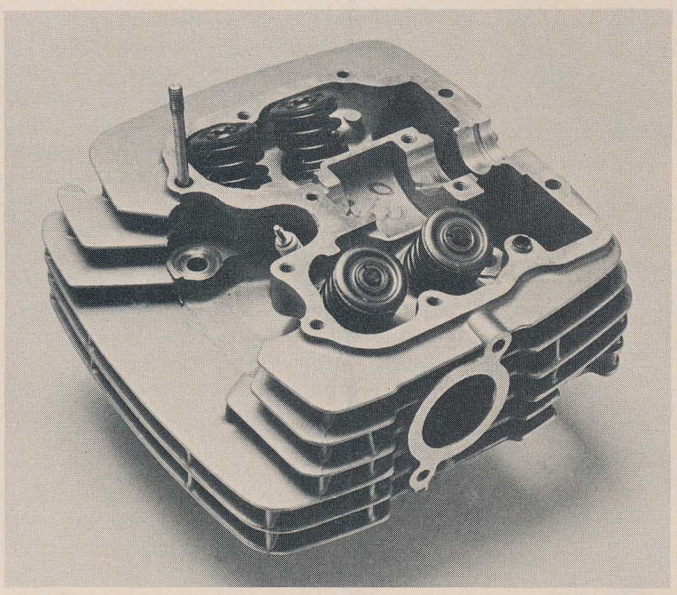
Crank nearly touches mainshaft gears, evidence of effort to keep unit compact.

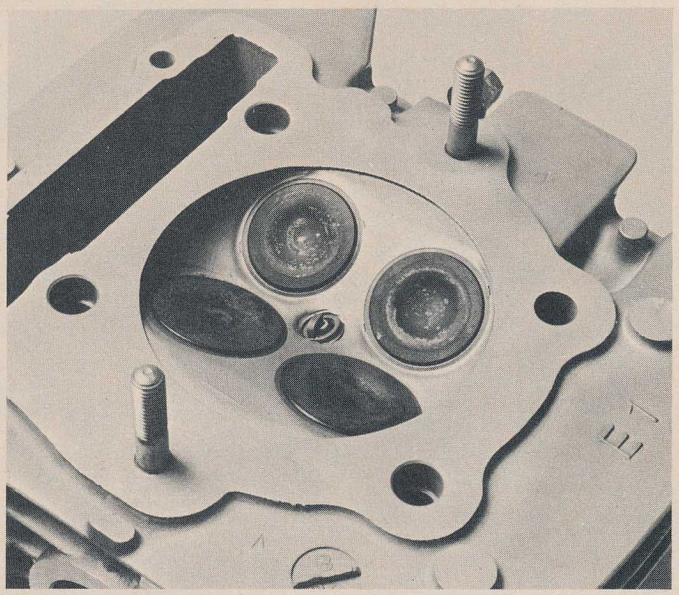




Passage (above) for extra cooling runs between exhaust ports up to the top of the head near the spark plug. Camshaft—run by a Hy-Vo chain—rides on plain bearing surfaces (below) machined into head. Four-valve head (right) reflects Honda's latest technology.

the Honda is lacking in low-end power; check these figures out. The XR develops 11.82 horsepower and 24.82 pounds/feet of torque at *2500 rpm—barely above idle.* At 3500 rpm it's producing 17 horsepower and 26 lbs/ft of torque, compared to 13 horsepower and 19 lbs/ft of torque developed by last year's Yamaha TT500. While the XR makes its best power at 6500 rpm (33.44 horsepower), it doesn't penalize overrevving, continuing to produce nearly 27 horsepower up until 8500 rpm. This to use large gear engagement slots—giving the dogs a large target, so to speak—to help prevent missed shifts. To this end the design succeeds: the Honda never misses a shift. The drawback is that the dogs, once engaged, can move back and forth in the engagement slots. When the dogs first enter the slots there is a clunk, and the gears resist fluid engagement when the clutch is not used; luckily, clutch actuation is progressive and fade-free. Every time the engine is accelerated





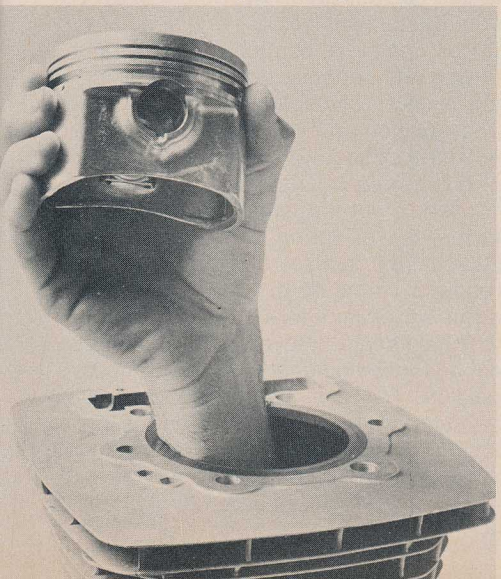
large dual-header pipe with a spark arrestor and muffler effectively quiets the Honda's roar, weighs a ton and tucks in unobtrusively.

When the rider clicks the XR into gear, he feels the 500 accelerate smoothly right from idle. In light of Honda's fondness for high-revving engines, it is not surprising that the XR quickly builds power into the high rpm range. One does not ordinarily want to keep a big four-stroke single spinning hard because of the vibration, but the XR is controllable and offers its best power up high. But this doesn't mean powerband is superb: it lets the rider power out of tight situations, chug up hills effortlessly and relax while he trail rides. There is also a predictable but abundant surge of power in the mid-range, at which point it's incredibly easy to wheelie the machine in the first three gears. Thanks to its smooth powerband, riding the Honda is above all *fun*.

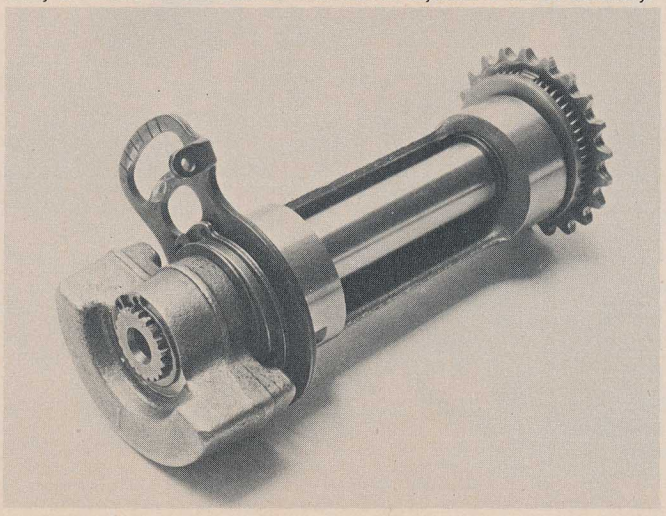
Even though the engine is smooth and makes the XR enjoyable to ride, its power delivery to the rear wheel is jerky; there is a disconcerting amount of gearbox-generated backlash. It's a common practice or decelerated, though, the engaging dogs rush from one end of their matching slots to the other end; this condition is known as backlash.

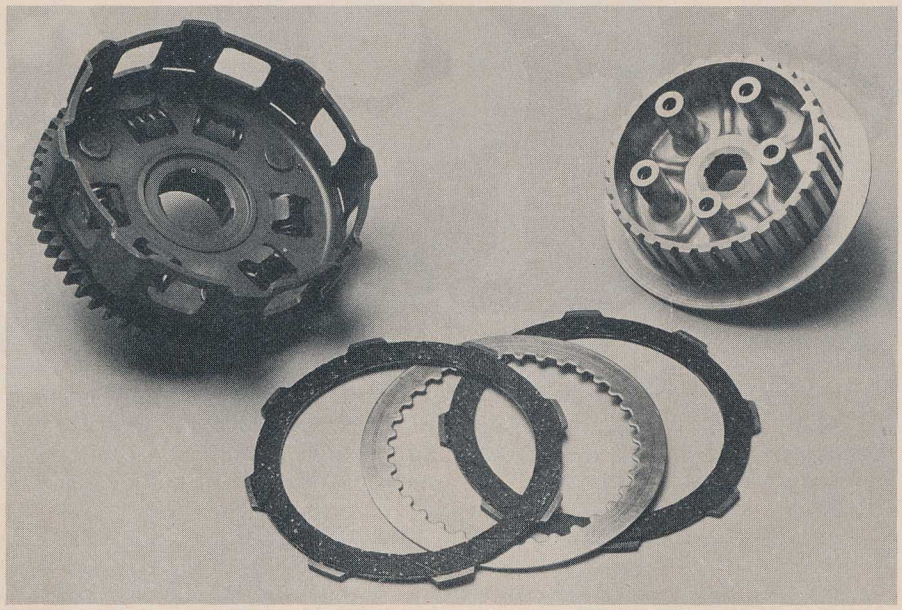
This sloppiness is especially noticeable in a big four-stroke single where it combines with the normal but abundant engine-braking effect. In a dirt bike, backlash alone is not usually a legitimate complaint, because loose rear-wheel traction disguises it. But occasionally at low speeds, and particularly at low rpm in the bottom gears when there is not enough inertia being generated to keep the run-

XR500 runs an 89mm piston through an 80mm stroke.

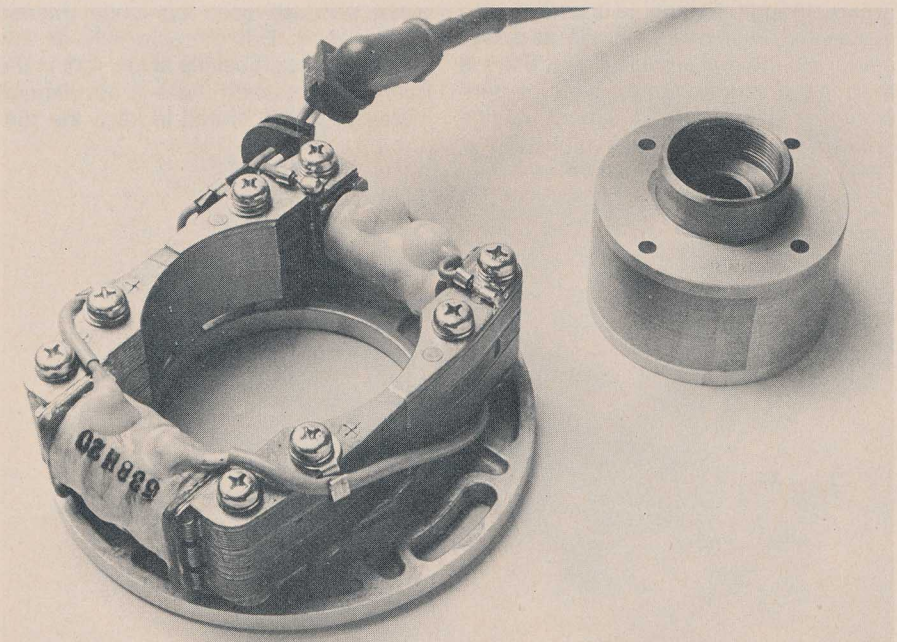


Easily accessible forward balancer shaft can be adjusted to service assembly.





Clutch basket is coil-spring damped (the 250's is rubber-damped) to cushion 500's additional torque.



Dual coils power lights and ignition; internal rotor functions with no-fuss capacitor-discharge ignition.

HONDA XR500 TEST

ning gear moving, the backlash and engine compression combine to lock the rear wheel momentarily and kill the engine. Unfortunately, the rider most often uses low-rpm power in tight trail conditions when he can least afford to stall the bike. A rider can work around the problem and get power to the ground perfectly smoothly by running the engine in the mid- to high-rpm range, but this practice should not be necessary: the primary reason for buying a big four-stroke is to enjoy its low-end slogging power.

One of the more pleasant aspects of the Honda is its range on a gallon of gas. Under any condition—fireroad cruising, full throttle in sand or winding along mountain trails—it consistently averages 30 miles per gallon. With its 2.6-gallon fuel capacity, the 500 has a range of 78 miles, enough for very long enduro loops.

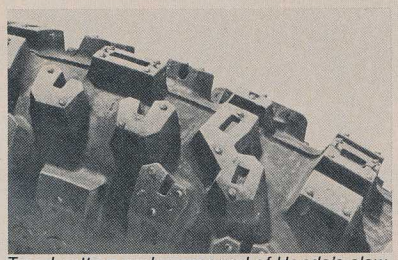
Like the engine, the XR chassis' basic design derives from the 250. The 500 has greater frame-wall thickness for more strength and weighs 23.54 pounds compared to the 250's 20.24 pounds. Both frames are mild-steel units with bushing-mounted swing arms, and use the engine as stressed members.

Several features of the XR chassis combine to give the XR very unusual handling characteristics. Honda is still the only manufacturer offering a 23-inch front wheel, and the XR uses it. As many designers have discovered, the large wheel necessitates many other changes. Honda has given the XR a rather steep 28.5-degree head angle, a rather long 138mm (5.4-inch) trail and a rather short 1400mm (55.1-inch) wheelbase. Through tight twisty terrain the XR steers precisely and quickly; despite its steep rake it offers neutral steering response when traction is maintained. When the rider slides the XR, however, the bike understeers a lot, tending to straighten out of the slide early and follow the direction of the 23-incher. The bike must be leaned over farther than is typically necessary to keep a bike sliding, probably a result of the front wheel's larger contact area. The XR, moreover, can be thrown into a very deep slide under complete control. It is a unique feeling and certainly stems from combining a short wheelbase and steep head angle (which ought to result in oversteer and easy sliding) with a large front wheel.

In the area of suspension Honda has chosen to cut corners. The leading-axle fork is an oil-spring unit which allows 223mm (8.8 inches) of travel when the rebound spring is fully compressed. In addition, 35mm fork tubes are used, which compare unfavorably with the typical 36 to 38mm items found on the competition. The gas-charged shocks, with adjustable preload and single-rate springs, are long 17-inch units, and they are basically the same in design as the

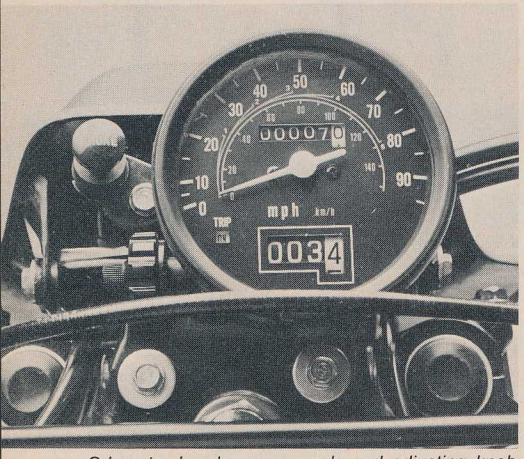
(Continued on page 126)

HONDA XR500 TEST



Tread pattern and compound of Honda's claw-action tires make them superior on hard ground.

Fork with 8.8 inches of travel provides good performance for play riders; it's just adequate for competition.



Odometer has large numerals and adjusting knob. Speed-in-gear figures on speedo face match redline.

Large muffler/spark arrestor is extremely effective; seat is comfortable but foam breaks down quickly.

CR250R shocks.

In very rough terrain—especially landing off jumps—the fork has just a hint of flexing. There is also a modest amount of stiction, an initial resistance to compression over small or smooth bumps. In moderately rough areas the fork works well, soaking up medium-size bumps with smooth damping action and a spring rate which provides a comfortable ride for 170-pound riders. Over very sharp bumps the fork bottoms frequently, though, and this inhibits the rider from making serious high-speed runs over rough ground.

Similarly, the shocks bottom often over rough ground, but on typical woods or cross-country trails they work fine. It is most important to point out that even though the suspension uses its travel quickly, the bike never gets out of control; through whoops and even in rough ground when the suspension has bottomed, the XR does not side-hop. The bike's weight is noticeable, but it's easy for the rider to discover the bike's limits and then ride right to them without fear of the bike suddenly turning nasty.

Durable six-ply knobbies are standard on the XR. Because they are heavy-duty tires and can withstand some punishment, a couple of options are available when selecting tire pressure. Running 12 to 14 pounds of air pressure smooths out the ride considerably and lets the owner stiffen up the suspension to help prevent bottoming; using a bit more air protects the rims from rocks. The patented claw-action tires work very well on hard surfaces; they are excellent on fireroads and on typical mountain trails which are a mixture of rocks, loam and leaves. But they steadily deteriorate in performance as the ground gets softer, and they are marginal performers at best in sand.

Both brakes on the Honda are powerful and progressive. The front unit is excellent; the rear's action occasionally becomes grabby, especially when being applied over bumps.

A long, soft seat feels too comfortable to be true. The foam compresses quickly, though, and wherever the rider sits in the first few hours of riding becomes His Spot. Because the foam is deepest at the front of the seat, and that's where the average-sized rider sits, it's normal for a pocket to form there. Despite the compressing of the foam and the fact that the rider is more or less confined to one position, the seat remains comfortable even for hours-long rides.

Claims about the Honda's competition potential notwithstanding, the knowledgeable enthusiast knows what the XR's real forte is—play riding. He also knows that the 500's true competition is other four-stroke singles. Taken as an enduro machine, the XR500 just isn't in the same league as the Yamaha IT400, KTM 400 or

(Continued on page 128)

HONDA XR500 TEST

Husqvarna 390. All three of these machines have more wheel travel than the Honda, and better suspension damping. Moreover, none of these two-strokes has any noteworthy mechanical defects.

But in any discussion of the comparative virtues of the Honda and the three above-mentioned bikes, it's necessary to mention the four-stroke's extra weight and all its implications. The XR is heavier than most two-stroke dirt bikes because its *engine* is heavier; its powerplant is such because of all the paraphernalia—including valves, rocker arms, a camshaft and cam chain—which make a thumper a thumper. All these parts cost money—money which could be spent in other areas. Manufacturers of two-strokes take the money they *don't* spend on engine parts and apply it to suspension. As long as the Honda is a four-stroke it won't have superior suspension, unless Honda Motor Co. is willing to raise the price.

As a play bike, the Honda doesn't need state-of-the-art suspension. Stock off the dealer's floor, with its decent fork and shocks and excellent powerplant and chassis geometry, the XR500 is pure fun, ready for a family-style enduro. More important, it's the best bike in the new generation of dirt thumpers. ◉

Make and Model ..... Honda XR500
Price, suggested retail $1875

ENGINE
Type ..... Four-stroke, single-cylinder with Hy-Vo chain-operated single overhead camshaft and four-valve head
Bore and stroke ..... 89 x 80mm (3.50 x 3.14 in.)
Piston displacement ..... 497cc (30.3 cu. in.)
Compression ratio 8.6:1
Carburetion ..... (1) 34mm Keihin
Exhaust system ..... Upswept pipe with dual headers and spark arrestor
Ignition ..... Capacitor-discharge; magneto
Air filtration ..... Oiled, washable foam
Oil filtration ..... Wire strainer
Oil capacity ..... Two liters (2.1 quarts)
Bhp @ rpm ..... 33.44 @ 6500
Torque @ rpm ..... 28.24 @ 5500

TRANSMISSION
Type ..... Five-speed; seven-plate wet clutch
Primary drive ..... Straight-cut gear; 2.379:1
Final drive ..... DID 520 chain with removable master link, 14/48 sprockets, 4.0:1
Gear ratios (at transmission) .... 1) 2.462 2) 1.647 3) 1.250 4) 1.000 5) 0.840

CHASSIS
Type ..... Semi-full cradle, mild-steel frame; bushing-mounted tubular-section swing arm
Suspension, front ..... Oil spring, forward-mounted axle fork with 224mm (8.8 in.) of travel
rear ..... Dual gas-charged shocks with single-rate springs, providing 198mm (7.8 in.) of wheel travel
Wheelbase ..... 1400mm (55.1 in.)
Rake/trail ..... 28.5°/138mm (5.4 in.)
Brake, front ..... Conical hub with cable-operated drum brake
rear ..... Conical hub with cable-operated drum brake
Wheel, front ..... DID 1.60 x 23 rim with one rim lock
rear ..... DID 2.15 x 18 rim with two rim locks
Tire, front ..... Bridgestone 3.00 x 23, 6 PR
rear ..... Bridgestone 4.60 x 18, 6 PR
Seat height ..... 863mm (34.0 in.)
Ground clearance ..... 274mm (10.8 in.)
Fuel capacity ..... 10 liters (2.6 gal.)
Curb weight, full tank ..... 133 kg (292 lbs.)
Test weight ..... 210 kg (463 lbs.)
Suspension, front ..... Telescopic, forward-axle fork
rear ..... Gas charged KYB shocks.

ELECTRICAL
Power source ..... Flywheel magneto
Charge control ..... Regulator
Headlight beams, high/low 25W/35W
Tail/stop lights 3cp/32cp
Battery 6V 6AH

INSTRUMENTS
Includes ..... 70 mph/110 kph speedometer; odometer; trip meter; neutral light indicator; turn signal indicator; high beam indicator

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