
BELL
TEAM HONDA
250R

# HONDA CR250R

**Build a 250 with a 34.92-horsepower, water-cooled engine and 12 inches of suspension travel, and what do you get? First place, usually.**

● WELCOME TO 1981. REMEMBER THIS YEAR well, because it will go down as the year the major manufacturers got serious about producing state-of-the-art motocross bikes. Never before have production motocrossers so closely resembled—in design, if not material—the factory racers. Honda, Suzuki and Yamaha offer water-cooled 125s, and those three and Kawasaki have turned to single-shock rear suspension systems similar to the designs found on their works bikes.

Honda's CR250R stands alone as 1981's only water-cooled 250 motocrosser. It differs completely from last year's Elsinore, using a new bore and stroke (identical to last year's works bikes'), a new frame to allow the use of a center-port engine, a KYB fork with 41mm tubes and, of course, the new Pro Link rear suspension system. Amazingly, Honda has priced the bike only about 15 per cent higher than last year's CR. At press time they had not established an

PHOTOGRAPHY: DAVE HAWKINS


# HONDA CR250R

exact retail figure, but Honda spokesmen believe the new CR250R will cost about $300 more than the 1980 machine.

Honda had valid reasons for water-cooling the 250. Water-cooling helps any engine run cooler, which allows the powerplant to maintain very nearly its maximum cold-temperature power output. Most people appreciate the benefit of water-cooling in a 125. Smaller engines, which constantly run close to their peak power output, suffer most dramatically from horsepower loss due to heat buildup. But water-cooling helps a 250 too; Honda spokesmen claim Honda R&D has found that the water-cooled CR loses 20 per cent less power than the air-cooled CR after 20 minutes of running. That's a reasonable claim. Though we did not experiment with our particular 250, our previous experience with water-cooled engines suggests that you can expect up to a 20 per cent power loss in an air-cooled engine after three laps.

Less-than-expert riders may figure that's not good enough reason for building a water-cooled 250. They might think they don't ride a 250 hard enough to appreciate the higher sustained horsepower output. Instead they may look at only the supposed trade-offs involved: more weight, difficulty in maintenance and increased cost. In fact, we believe there's no validity to any of those objections. The 1980 CR engine weighs 56.7 pounds; the '81's powerplant weighs 53.8. If you add in the weight of the new CR's two radiators and hoses, you can figure that the two engines weigh just about the same. Further, if you take a good look at the CR's engine, you'll see there's nothing complicated about water-cooling, and Honda has produced a particularly straightforward system. Indeed, because the cylinder and head have no fins, it's easier than ever to reach the top end's nuts and bolts. Though Honda cannot pinpoint exactly how much the water-cooling system contributed to the '81's jump in cost, it can't be much. This year's percentage price increase is barely more than the inflation rate.

Even if the above were the whole argument in the debate about water-cooling, we'd opt to use it. There are other functional reasons, though, which favor water-cooling, require no trade-offs and which convince us that water-cooling a 125 or a 250 is a good thing.

Because the cylinder does not overheat, there's little danger of bore distortion. That produces a couple of practical benefits and also allows Honda to make a change for the better in the construction of the CR's cylinder. The CR's rings are likely to wear less and stick less often than the rings in an air-cooled engine, primarily because they will stay cooler. Also, because the more evenly cooled bore will remain more nearly perfectly

round, the rings have a better chance to seal properly, allowing less blow-by and power loss. Finally, because Honda engineers no longer have to worry about close-fitting an iron liner to an aluminum cylinder, they're not even tempted to use a chrome-plated cylinder bore, as they did with previous CRs with the hope of avoiding uneven transfer of heat or hot spots. Consequently, seizures do not demand that the owner junk the cylinder, as is most often required with chrome-lined barrels.

Careful tuners will appreciate the ability to jet more precisely a water-cooled engine. What is nearly spot-on in an air-cooled engine is rich in a water-pumper. More nearly spot-on carburetion equals crisper throttle response—a definite plus in any two-stroke, especially a race bike.

Of course, any theoretical benefit of water-cooling becomes a real-life advantage only if the builder designs a properly functioning system. Honda has done a splendid job of exactly that. The CR's system consists of two radiators and a crankshaft-driven water pump (via spur gears, but turning at a one-to-one ratio with the crank), which routes water around the cylinder and head. Honda recommends a 50-50 mix of water and anti-freeze; be sure the manufacturer approves the anti-freeze for aluminum-block engines. Honda has mounted in close the hoses which connect the radiators to the engine and installed guards in front and to the sides of the radiators. All in all, there's minimum opportunity for someone's handlebar to rip a hose or radiator off during a crash.

Honda has done an excellent job of designing the cylinder and head's water jacket. Some manufacturers of water-cooled engines simply try to pump as much water through the channels as possible. That's not the best—or sometimes even an acceptable—way to circulate water. The key is to flow the water quickly, and the easiest way to do so is to narrow the jacket's channels (given a certain pump's rate of flow). Pumping water quickly scrubs steam bubbles off the inside channels' surfaces—which are effectively the reverse sides of the cylinder liner's walls. Steam bubbles form at the cylinder's hot spots, particularly around the exhaust port; and if the flowing water doesn't scrub off the bubbles, local temperatures rise and there's a likelihood of liner distortion, at which point a seizure is possible. The CR's water jacket has narrow passageways, an indication that its water flows quickly enough to prevent bubbles from creating hot spots.

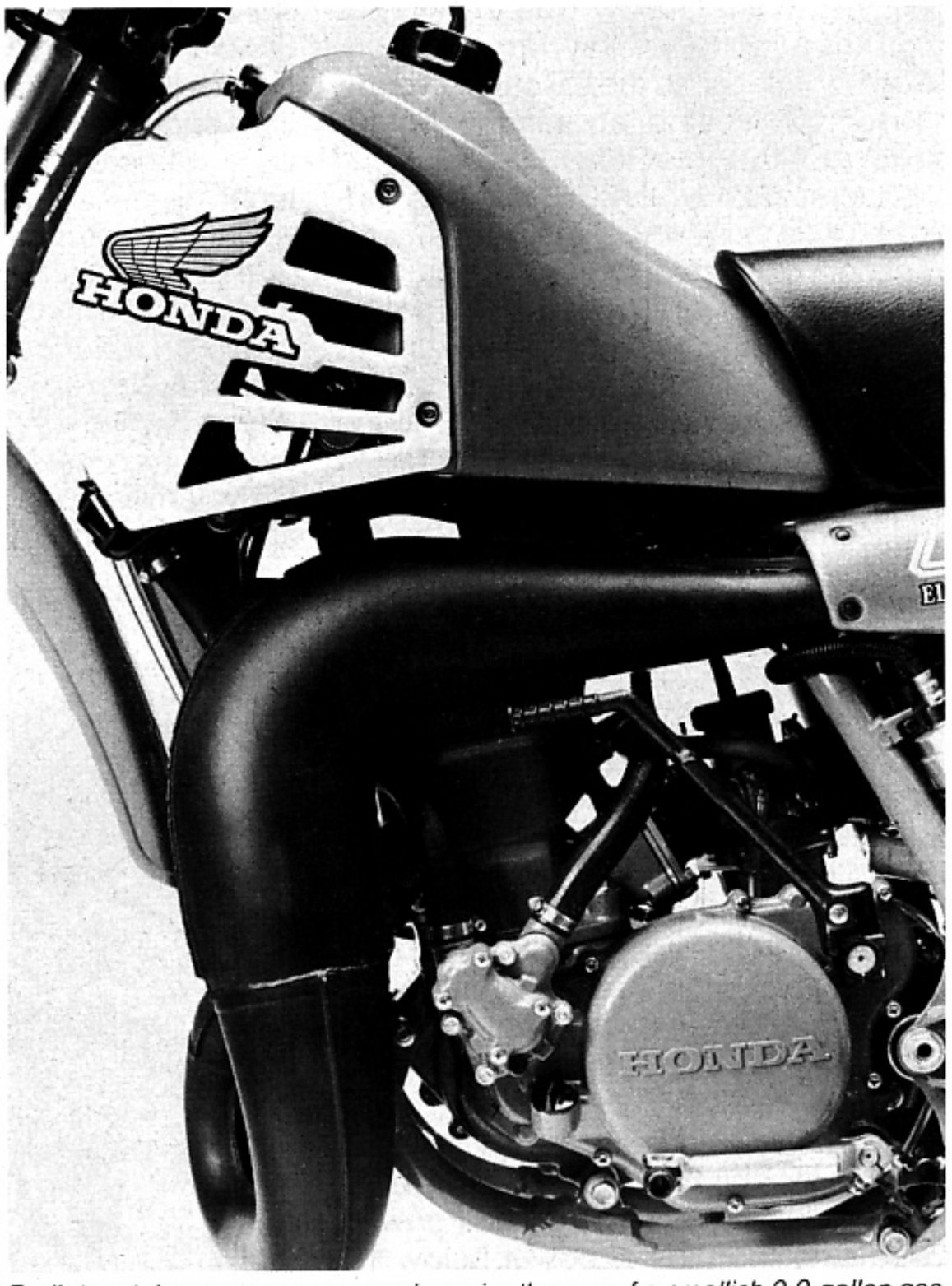
This year's CR resembles the factory racer in another significant way. It has a 66 x 72mm bore and stroke. Long-stroke engines—especially two-strokes—have gained a reputation for being torquey, and for good reason. Tall cylinders allow more vertical space in the bore. The builder can use that extra space to design more nearly square transfer ports, which helps the engine's scavenging and in turn improves mid-range power.

For the first time, Honda offers production 250s with a center-exhaust port, a design which they've been using on their factory bikes for quite a while. Using a forward-facing exhaust port complicates frame design, but it obviously is considered worthwhile—probably because the straightened port promotes a more symmetrical scavenging flow in the cylinder.

R&D has also built an exhaust pipe which is strikingly similar to the works bikes' pipes, with a fat midsection which tapers quickly. Exhaust tuning is the *pièce de résistance* in two-stroke engine building, and whenever you see a newly designed pipe mated to an engine which has no glitches in the powerband (and the CR definitely does not), you know the engineers have done extensive and successful experimenting.

Larger-diameter and thus heavier crankshaft flywheels were necessary to accommodate the engine's longer stroke. Honda knew some extra flywheel weight would nicely complement the CR's broader powerband, but the new flywheels were a bit too heavy. They switched from an external-rotor magneto flywheel to an internal-rotor design, reducing the engine's potential flywheel mass but increasing it over that of last year's 250.


*Fork-mounted screen and radiator-mounted screens protect the front of the radiators; shields guard the sides. New frame allows the center-port engine.*




*Radiators take up some room and require the use of a smallish 2.0-gallon gas tank—still good for 40-minute motos. The water pump's hoses tuck in nicely.*

# HONDA CR250R

During the major re-design of the lower end, Honda engineers took the opportunity to lay out several parts differently. Most notably, they relocated the kickstart lever shaft to allow a better position for the shift lever. It's still one of the few bikes around with a left-side kickstart lever, but now with a very little practice you can easily start it first kick with your left leg.

To complete the changes to the 1981 CR, Honda engineers altered all of the transmission's gear ratios: primary, all five speeds and the final drive. They changed the final drive from 3.500:1 to 3.857, while they altered all the other ratios to produce slightly taller overall ratios in all five gears, and those new ratios match the 250's wider powerband.

It's hard to imagine a manufacturer being more successful with a major redesign. Honda built in power everywhere. The CR develops more horsepower at its peak than any 250 motocrosser *Cycle* has ever dyno tested. It produces 34.92 horsepower at the rear wheel at 8000 rpm. Until now, the strongest 250 we had tested was the 1978 Can-Am 250 MX-4, which pumped out 33.28 horsepower.

If you're thinking, "Great, but a 250 motocrosser needs mid-range," don't despair. The CR develops about one horsepower more than the Suzuki RM250T, which 'til now was the king of mid-range punch. Only at one rpm level—5500—does the CR suffer in comparison, producing about one horsepower less than the RM at that point.

Understandably, the CR flexes its top-end muscle only when you ride in good traction. We drag-raced our CR against a Yamaha YZ250G. Where the traction was lousy, on an unprepared start area, the CR and YZ were dead even by the first turn, regardless of the weight of the rider. (Their weights varied from 140 to 165 pounds.) Each bike had a Bridgestone 5.10 x 18 rear tire (the CR with an M-22 compound, the YZ with an M-20), and we suspect each bike could transfer only "X" amount of power to the ground; the rest was lost in wheel spin.

When the traction is better, though, on a prepared course, the Honda most definitely out-accelerates last year's YZ. Granted, running a 1980 YZ against a 1981 CR is unfair to the Yamaha; this year's YZ is likely to be improved. But since we don't yet have access to a new YZ, we offer the comparison simply as an indication of the CR's ability so our comments about its performance don't exist in a vacuum.

On smooth courses you can spin the CR near its rpm ceiling and then really appreciate the Honda's top-end power. There's no shortage of power below the peak, so you don't have to worry about keeping it right at 8000. The CR builds and loses revs relatively slowly—not as slowly as a Husky or Maico, but not as quickly as a Yamaha—so you always feel as if you have its horsepower well under control. On rougher courses it's best to rev the 250 at a less frenzied level; it carburets cleanly so you're not losing precious instants while the 250 accelerates. When you want to burst out of corners, feather the clutch. The Honda has one of the best dirt-bike clutches we've operated. It engages smoothly and accepts abuse without fade.

Our test riders found that they could turn laps about one or two seconds quicker than they could on the best of 1980's 250s. We attribute part of that exceptional performance to the 250's strong powerplant. But much of the credit also goes to the CR's fine handling. To build the CR's chassis, the Honda engineers again turned to their factory racers for basic designs, and imitating the real thing paid off.

Like the factory bikes, the CR uses a frame which has a single downtube descending from the steering head. The downtube ends and two engine-cradle tubes meet it directly in front of the cylinder head to allow the exhaust pipe an uncomplicated route from the cylinder. There's no other radically different aspect to the frame. It produces a 29.5-degree steering-head angle, slightly less steep than that of last year's 250.

More noteworthy is the CR's suspension. Honda has traditionally relied on Showa for suspension units. This year Honda turned to KYB for the CR's fork, their spokesmen citing Kayaba's experience with producing large-diameter fork tubes as invaluable.

Honda's introduction of their Pro-Link rear suspension system certainly captures any attention you might direct to the chassis. Like the other major Japanese manufacturers, Honda has been prototype testing single-shock systems on the pro' motocross scene, so people are fairly familiar with at least the outward appearance of Pro-Link. It is quite unlike Yamaha's system (for all the obvious reasons) and resembles Kawasaki's Uni-Trak only to the extent that both have one shock mounted between the rear wheel and the swing-arm pivot.

Pro-Link is unique as a production system because its lower shock mount pivots, and Honda has designed the pivoting links to take advantage of the potential for mechanically produced progressive springing. We measured the rear wheel's rate of movement in relation to the shock's rate of compression and found that the linkage does indeed produce a rising-rate effect; that is, for every increment of shock compression, the rear wheel travels progressively less. To be specific, in its first 32 millimeters of travel, the rear wheel compresses the shock five millimeters; in the last 13mm of travel, the rear wheel compresses the shock five millimeters. In other words, the ratio of rear-wheel travel to shock travel becomes progressively closer to one-to-one as the shock compresses. The advantage of a rising-rate system (or mechanically progressive springing) is that initially the rear wheel moves easily—responding to small bumps quickly—because the shock's springing and damping are resisting relatively iittle. Then, when the rear wheel has used nearly all its travel, it takes severe force (a large bump hit at high speed) to compress the shock completely—because the spring is by then resisting tremendously.

In addition, the shock's damping is effectively progressive, also a benefit of the shock-to-wheel movement ratio changing. The shock's internal damping rate does not vary; rather, the damping just seems to be light through the initial inches of rear-wheel travel because the shock is compressing little in comparison to rear-wheel movement. In the final inches of travel the shock moves farther in comparison to wheel travel than at the beginning—and thus must move relatively more quickly, which in effect increases the damping.

Like all state-of-the-art motocrossers, the CR has suspension which is fully ad-

justable. Its fork is air-assisted; the shock has four-way adjustable damping and allows you to adjust the screw-type preload collar about an inch.

After fiddling with all aspects of the suspension, we found the optimum settings for our variety of riders. For our 160- and 180-pound novice and intermediate riders, we inflated the tires to 10 pounds front and rear, charged the fork with five psi air and used five-weight oil, set the shock's damping on "2" and backed off the preload adjusting nut to where one-half inch of threads was showing on the shock body. We changed only the fork air pressure for our lighter expert riders, running either no air or two pounds.

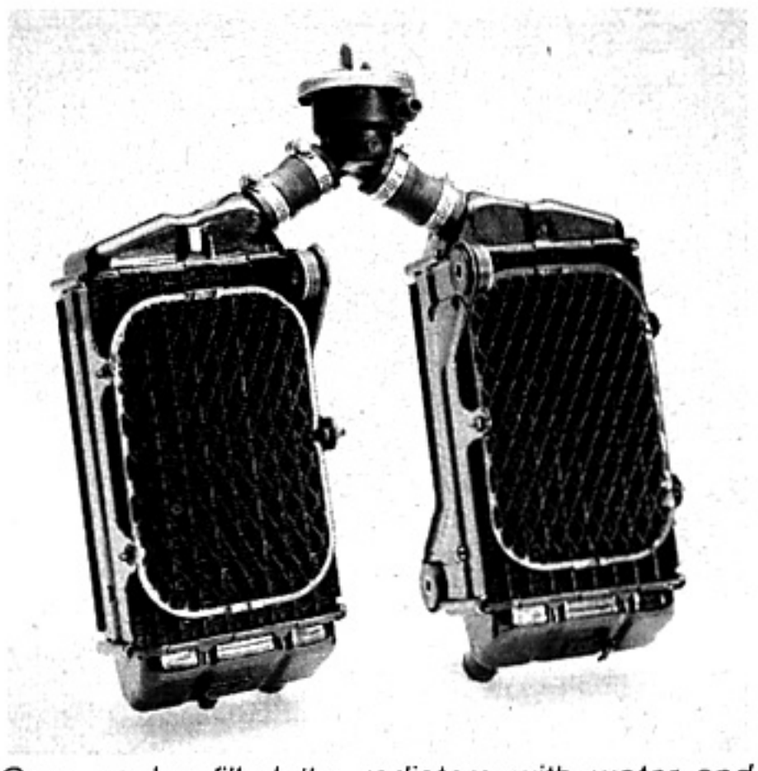
Properly set up for an individual's riding ability and weight, the CR handles as well as any production motocrosser our testers have ridden. In a couple of peculiar sets of circumstances the 250 was less than perfect, but 99 per cent of the time you couldn't ask for a better-handling machine.

Over moderately rippled ground you'll appreciate the fork's progressive air springing and the rear suspension's mechanically progressive system. It's smooth and fluid, allowing you to sit back and ignore the small stuff. Neither should you sweat launching off jumps, which are the bane of an oversprung bike. The CR's rear end soaks up the crowning lip which many jumps have and so the rear end doesn't kick you up or have you staring at the top of your front fender.

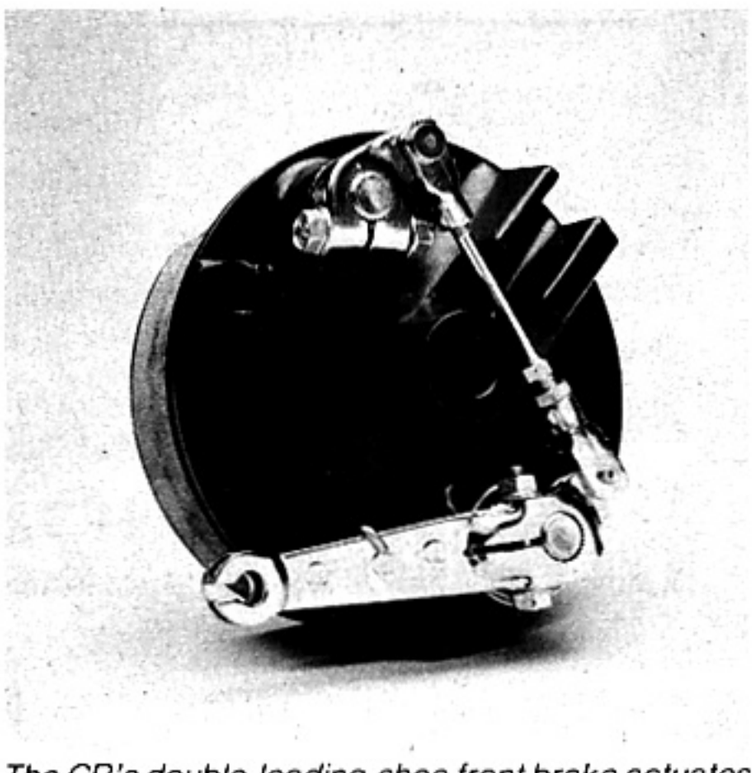
With 12.0 inches of fork travel and 11.5 inches of rear-wheel travel (the rear measured with the shock spring removed, but the bump-foam remaining), the CR rarely bottoms even after landing off of large, high-speed jumps. Over whoops the damping keeps up with the springing, and there's no apparent pogoing effect or damping fade.

Thanks primarily to its chassis geometry and weight distribution, the CR steers precisely and in general handles unlike a 248-pound motocrosser. In tight corners, rough or smooth, the Honda tracks exactly where you point it. Because of its fairly long wheelbase, though, it helps to pivot the CR with the help of the throttle in

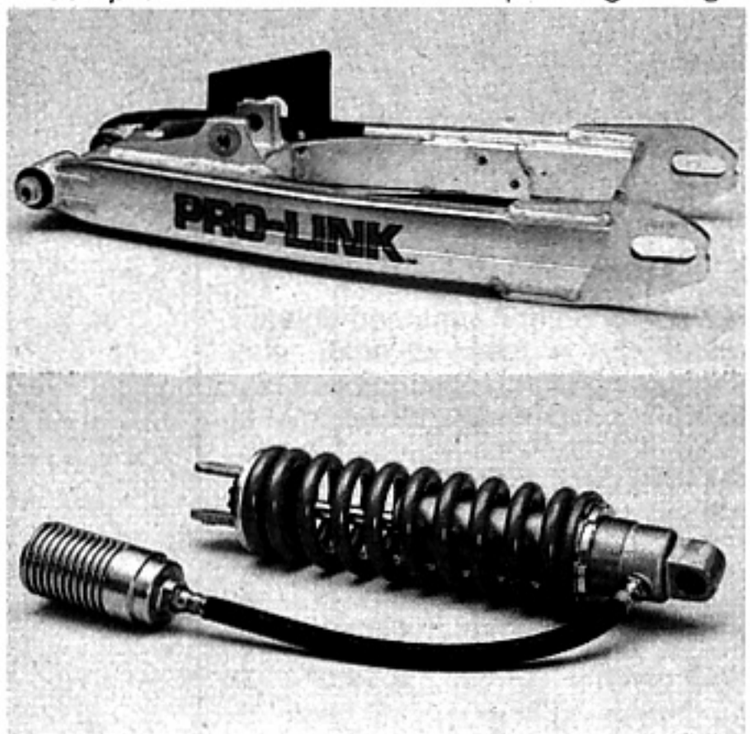

*A straightforward system: as the swing arm rises, it compresses the shock via a pivoting linkage.*



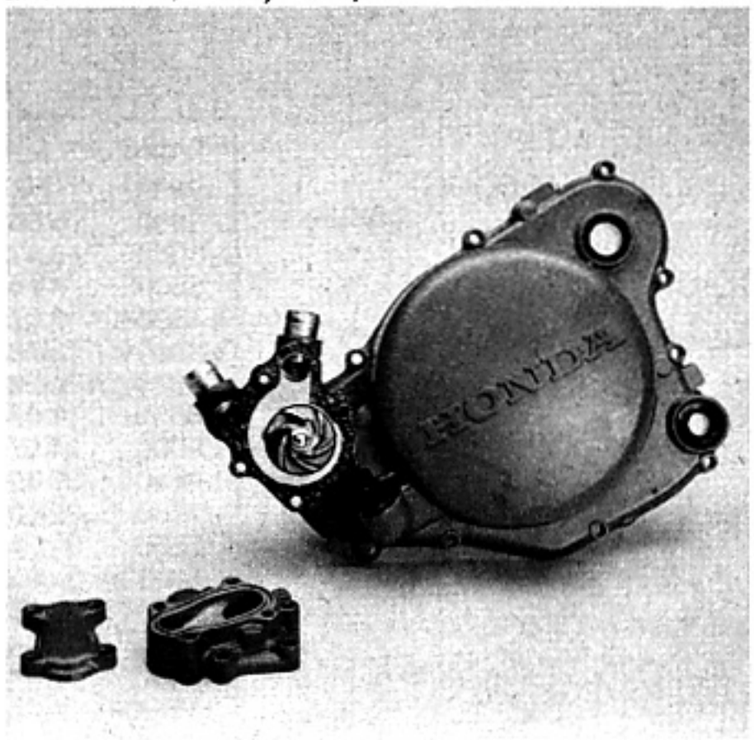
*Once you've filled the radiators with water and anti-freeze, they require little maintenance.*



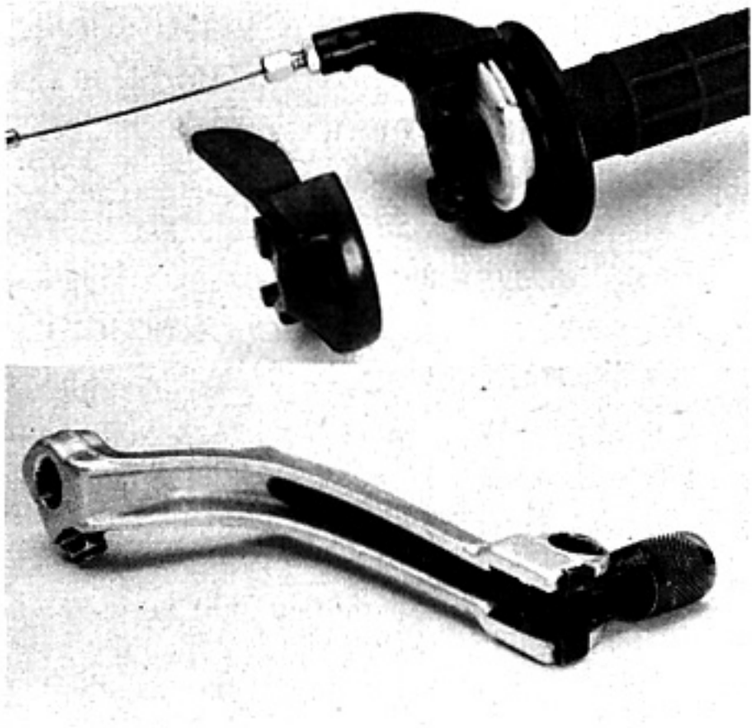
*The CR's double-leading-shoe front brake actuates progressively and easily and stops the bike* fast.



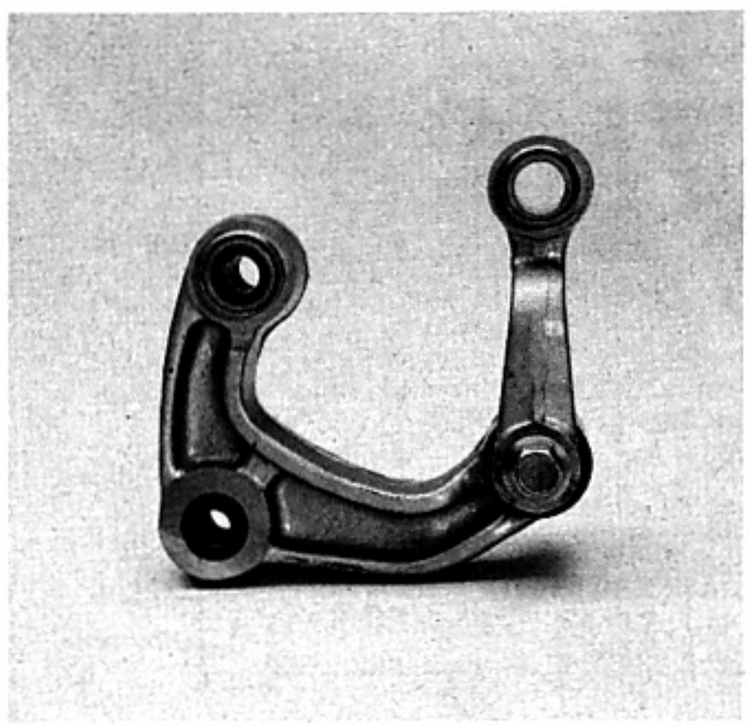

*Pro-Link features an aluminum arm, remote-reservoir shock, adjustable preload, four-way damping.*



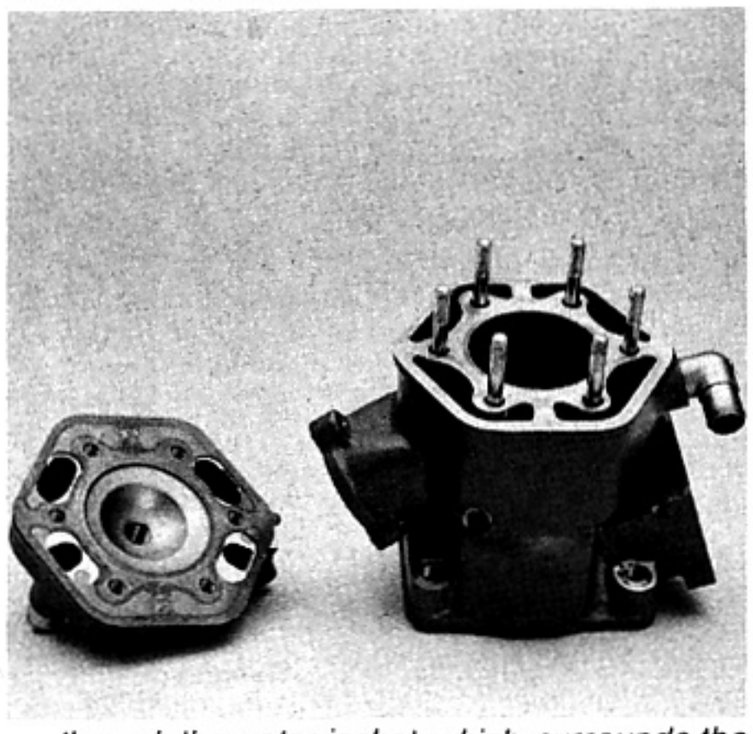

*The pump's impeller is driven via spur gears off the crankshaft at a ratio of 1:1 and circulates liquid . . .*



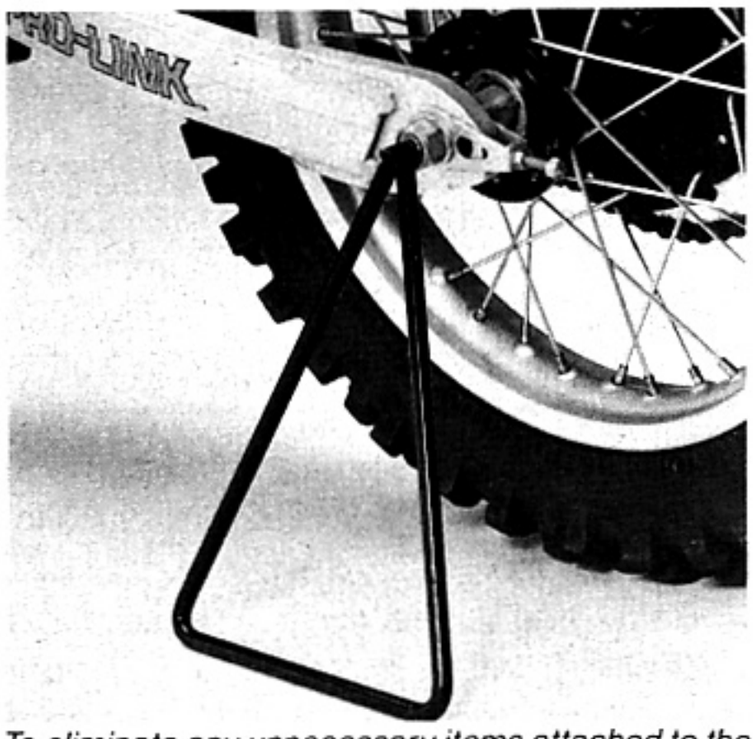
*The throttle cable runs closely along the bar; the folding lever's rubberband spring never clogs with mud.*



*Linkage produces mechanically progressive springing; no heim joints because of minor pivoting.*



*. . . through the water-jacket which surrounds the cylinder and the head's combustion chamber.*




*To eliminate any unnecessary items attached to the CR, Honda uses a stand which plugs into the axle.*

very low-speed corners.

If hitting berms or TT sliding is your specialty, you'll be able to smoke it on the CR250R. Though it has some extra weight mounted high (its radiators), the Honda has a low seat height—36.5 inches—and feels completely controllable when you're hitting berms. Its smooth powerband and longish wheelbase combine to allow ferociously long slides always in complete equilibrium.

In deep sand and over sandy whoops the CR wags its front end slightly and its rear end a little more than that. If you keep the gas on you barely even notice it. During trailing throttle, both conditions are more pronounced: noticeable, but never enough to upset your rhythm.

With its peak horsepower advantage over anything in its class, the Honda has a chance to be the hole-shot king. Nothing about the CR's start-gate handling ability detracts from that potential. With its narrow tank-seat junction you can climb practically up to the radiators, and even when you sit in the middle of the seat, the 250 just lofts little wheelies as you power-shift to the first turn.

A major part of turning fast lap times is the ability to stop fast. That the Honda can do. Its double-leading-shoe front brake could probably stop a bike twice its weight with ease. It also has a nicely linear feel. The rear wheel follows closely and without hopping on the stutter bumps which form at the entry of every turn after a straight, and it rarely chatters or locks up—a benefit of its full-floating design.

Racers know there can be no compromising with race bikes, and Honda has not compromised with this machine. We hope the CR is an indication of what 1981 is going to be all about—manufacturers getting serious about producing functional motorcycles. If you can tell we're excited about this bike, that's the point. It's an excellent machine, and we'd recommend it to anyone who takes his racing seriously, novice or expert. We don't know if it will be the best 250 motocrosser of the new year because we haven't ridden any others. But if it's not, it can only mean one thing: we're in heaven. ◉

Cycle

# Test Specifications
# HONDA CR250R

Make and model ..... Honda CR250R
Price, suggested retail (as of 11/6/80) ..... N/A

ENGINE
Type ..... Two-stroke, water-cooled, reed-inducted single
Bore and stroke ..... 66.0 x 72.0mm (2.59 x 2.83 in.)
Piston displacement ..... 246cc (15.0 cu. in.)
Compression ratio ..... 7.5:1 (trapped)
Carburetion ..... (1) 36mm Keihin
Exhaust system ..... Upswept pipe with silencer
Ignition ..... Capacitor-discharge; internal-rotor magneto
Air filtration ..... Oiled, washable foam
Oil capacity ..... 0.8 liters (0.8 qts.)
Bhp @ rpm ..... 34.92 @ 8000
Torque @ rpm ..... 24.57 @ 6500

TRANSMISSION
Type ..... Five-speed; wet, multi-plate clutch
Primary drive ..... Straight-cut gear; 2.850:1
Final drive ..... 520 DID chain; 14/54 sprockets; 3.857:1
Gear ratios (at transmission) ..... (1) 1.800:1, (2) 1.471:1, (3) 1.150:1, (4) 0.955:1, (5) 0.833:1

CHASSIS
Type ..... Single-to-double downtube chrome-moly frame; aluminum box-section swing arm
Suspension, front ..... Air-assisted, coil-spring fork with 41mm tubes and 305mm (12.0 in.) of travel
rear ..... One shock absorber with adjustable damping and preload producing 292mm (11.5 in.) of rear-wheel travel
Wheelbase ..... 1485mm (58.5 in.)
Rake/trail ..... 29.5° / 123mm (4.8 in.)
Brake, front ..... Double-leading drum brake
rear ..... Leading-trailing drum brake; rod-actuated
Wheel, front ..... Semi-conical hub; DID 1.60 x 21 rim
rear ..... Conical hub; DID 2.15 x 18 rim
Tire, front ..... Bridgestone 3.00 x 21 Motocross M21
rear ..... Bridgestone 5.10 x 18 Motocross M22
Seat height ..... 927mm (36.5 in.)
Ground clearance ..... 305mm (12.0 in.)
Footpeg ground clearance ..... 362mm (14.2 in.)
Fuel capacity ..... 7.6 liters (2.0 gal.)
Curb weight, full tank ..... 112 kg (248 lbs.)
Test weight ..... 185 kg (406 lbs.)

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