

**Tests: Honda CB650, Suzuki RM400N,
Yamaha IT250, Yamaha XS1100 Special**
Computerized Motorcycle Testing

CYCLE WORLD

FEBRUARY 1979
\$1⁰⁰ UK 60p
America's
Leading
Motorcycle
Enthusiasts'
Publication

Suzuki RM400N

*Works Bike Performance
For Open Class Pros*



Backroad Biking In Baja

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CYCLE WORLD

CYCLE WORLD TESTS

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FLYING HIGH ON SUZUKI'S RM400N, *Photographed by Robert Monkton*

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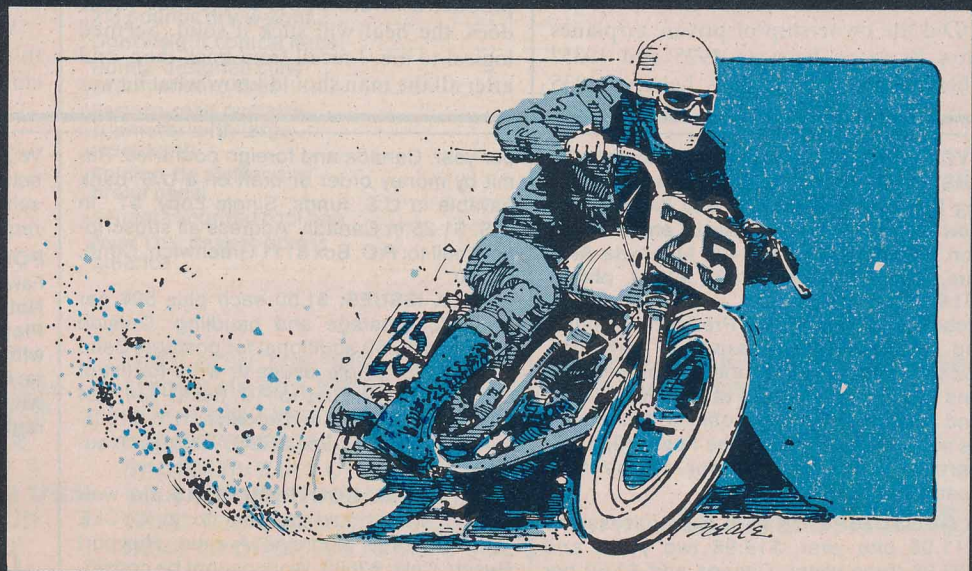
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HONDA CB650

Honda Leaves the Gadgets Out and Designs a Simple Four For Real People

■ New motorcycles have been getting bigger and faster and more complicated and more expensive. They create excitement, glamor and pizzazz and there seem to be many buyers who figure that the dazzling technology and incredible power are worth the price paid in initial cost and in maintenance. For those whose tastes run to the basic, there are Singles and Twins; less money, less hassle . . . and more vibration for relatively modest performance.

And then, in the middle, there are bike enthusiasts who'd like some of both, perhaps a sporting middleweight with smooth four-cylinder engine, the sort of engine a dedicated owner could care for himself. The price should be reasonable and none of this business about buying the special tools and the complete set of shims and having to remove the exhaust system to fix a flat tire.

Enter Honda's CB650.

A reasonable price of course depends on who defines the definition and at first glance the estimated suggested retail of \$2500 for the CB650 is on the high side. But with the twin economic horrors of inflation and fluctuating exchange rates eating dollars as they sit in your pocket, the price of virtually all Japanese motorcycles will rise or has risen this model year. Taking a look at the price tags on the competition puts the CB650 Four's cost into the proper perspective. Yamaha's Twins cost less or about the same as the Honda, depending upon model: the XS650F (standard) is \$2198; the XS6502F is \$2298; the XS650SF (special) is \$2499. The Kawasaki Fours cost the same or more: the KZ650B3 (standard) is \$2499; the KZ650C3 (custom) is \$2629; the KZ650D2 SR is \$2749.

Reasonable initial cost was one of the two main marketing targets for the CB650. The other was that the machine be inexpensive to own and maintain. Honda had the CB550 Four, but with the introduction of the V-Twin CX500, didn't want to stay at that displacement. Honda needed a bike to compete with Kawasaki's successful KZ650. Building a scaled-down version of the dohc, 16-valve CB750 was considered, but that would have resulted in a more complex engine, more weight and higher initial purchase and maintenance expense. So the company decided to base the new bike on the CB550, and use the same machinery and tooling. Since the cost of new tooling wouldn't have to be amortized and included in the 650's cost, Honda could keep the price down.



That doesn't mean that the 627cc, sohc, two-valves-per-cylinder Four is a punched-out 550. The new engine has a bore and stroke of 59.8 x 55.8mm; the CB550, 58.5 x 50.6mm. In fact, the 650 shares only seven interchangeable parts with the old 550. The CB650 has a new cylinder head, camshaft, cylinders, valves, pistons, cases, crankshaft, transmission, clutch, frame, wheels, styling—almost everything. It's a new motorcycle.

Honda engineers put a lot of development time into the CB650 cylinder head and piston shape. The objective was to get as much power as possible out of the two-valve combustion chambers, and, according to Honda's claimed 60 crankshaft horsepower, the goal was met. That power output approaches 100 horsepower per liter, a power level difficult to achieve with a two-valve head in street tune.

A 9.5mm-wide Hy-Vo chain drives the single camshaft off the center of the crankshaft. The 31.5mm intake and 26mm exhaust valves (compared to 27.5mm intake and 23mm exhaust on the 550) are opened by rocker arms adjusted conventionally. The camshaft runs directly in the aluminum cylinder head; no bearing inserts are used, but experience has shown that none are needed. Dipper wells underneath the camshaft hold pools of oil beneath each cam lobe. Because the lobes run through the oil every revolution, the cam is lubricated immediately upon engine start up, and there is no momentary wait for oil pressure to build up before the cam is oiled.

As per usual Honda practice, the crankshaft rides on plain bearings, as do the rods. The rod bearings are Kelmet, a material specified for applications where 100 bhp per liter is approached or exceeded.

Power flow is similar to that of the 550: a 43mm Hy-Vo chain runs from the crankshaft to the primary shaft, which in turn drives the clutch via straight-cut gears. Common practice is to drive the clutch with spur-cut gears to hold down mechanical noise, but Honda engineers have found that an engine the size of the 650 is quiet enough internally to make use of spur gears unnecessary. Straight cut gears lose less power to friction.

Power is transmitted through the clutch to the transmission mainshaft, through the transmission to the countershaft, and from countershaft to rear wheel with a conventional (not O-ring sealed) endless 530 roller chain.

Both mainshaft and countershaft ride on double-row ball bearings on their thrust sides. The Hy-Vo primary chain is constantly oiled by a spray fitting tapped into the main oil gallery; a stream of oil is directed onto the inside run of the chain

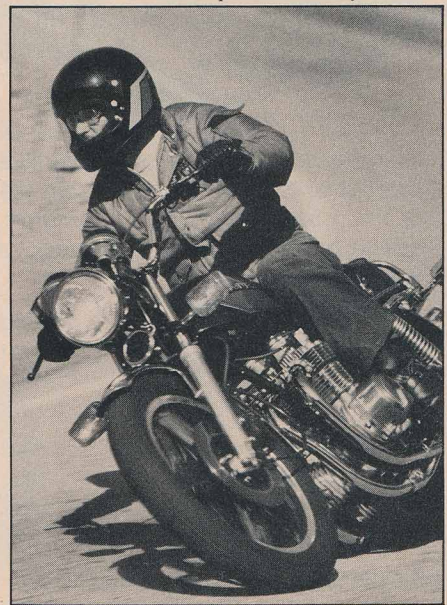
just before it reaches the primary shaft. Primary chain tension is maintained by a spring-loaded shoe.

The seven-plate wet clutch has two innovative features. First, the outer friction plate is shouldered to prevent lateral movement, serving, in essence, as a fixed plate with the other clutch pieces bearing against it, and helping to ensure immediate clutch release. Second, two concave spring steel expander rings fit between the friction plates and the back of the clutch basket to serve as dampers and smooth out clutch engagement.

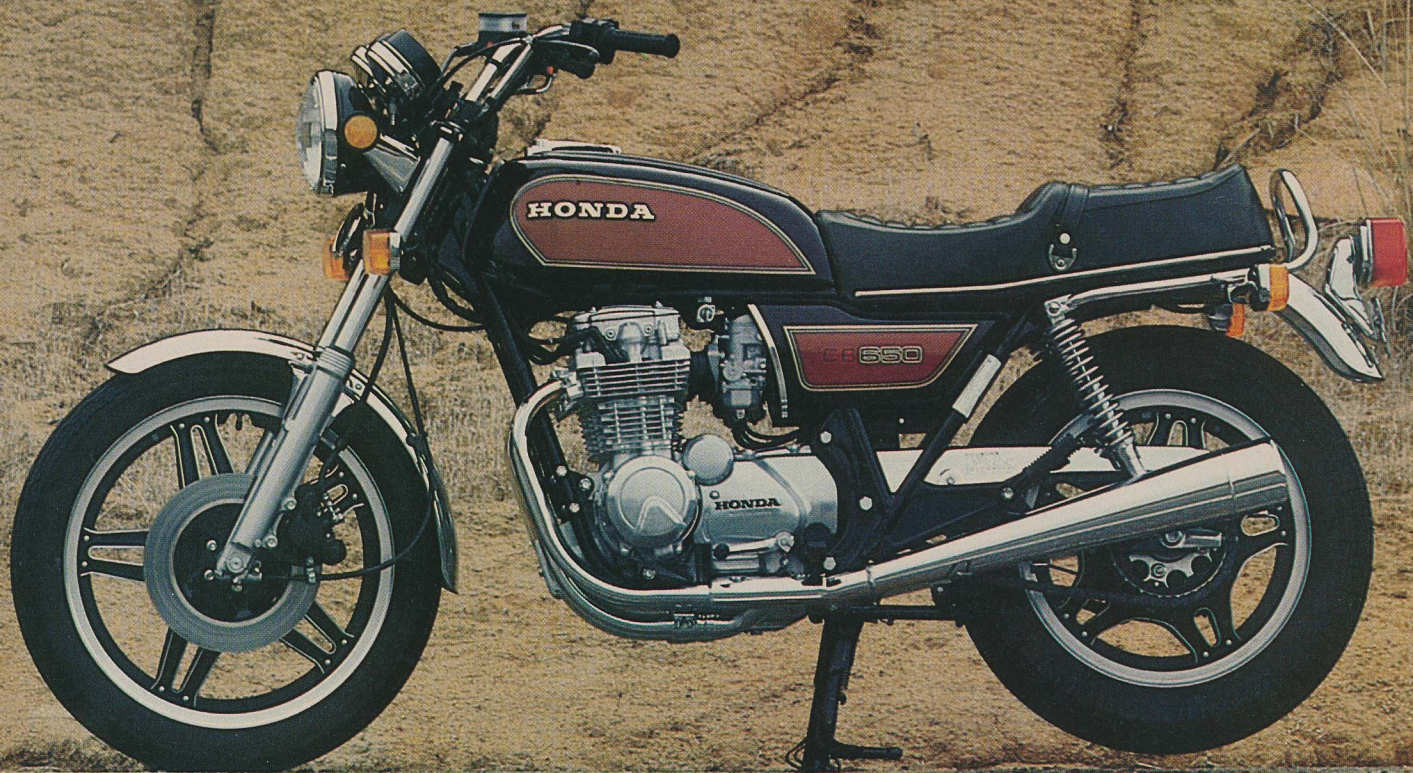
A new shift drum inertia stop prevents overshifts. A small tang buries itself into the shift drum with each shift, indexing the drum and making it impossible to miss shifts by shifting past the desired gear. The result is that no matter how quick and hard the 650 is shifted, the rider gets the gear he wanted, not a false neutral between gears.

To handle the extra heat produced by more displacement inside what is basically the exterior of a CB550 engine, Honda engineers increased the oil capacity of the wet sump and the oil filter housing. The sump pan is deeply finned inside and out to conduct heat from the oil to the airstream. The enlarged filter housing still accepts the familiar pleated paper Honda oil filter, with a spacer positioning the filter properly. A huge 37mm trochoid pump circulates the lubricant, and a baffle plate inside the sump prevents oil cavitation around the pump pickup during hard acceleration. Total oil capacity is increased 0.4 qt. compared to the CB550, 3.8 qt. for the 650 versus 3.4 for the 550.

Electrical power is provided by a 260-watt alternator (versus 130-watt on the CB550) located on the left side of the crankshaft. Honda spokesmen say the al-



Photos by John Ulrich





ternator produces power from idle and utilizes a solid state regulator/alternator assembly. Extra metal was added to the rear of the alternator to increase flywheel effect. But in spite of the added meat on the alternator, the CB650 is only about one inch wider than the CB550. That's because the alternator itself is recessed and fits over and around the outboard main bearing and oil seal. Thus the larger alternator does not significantly reduce cornering clearance of the 650, relative to the 550.

Honda is so confident of the high-output alternator's ability to keep the 12 ampere-hour battery charged that no kick starter is fitted to the 650. Along with other small touches like lightweight cast alloy header clamps, the deletion of the kick starter made it possible for the CB650

engine to weigh four pounds less than the CB550 engine, 154 lb. versus 158 lb., dry.

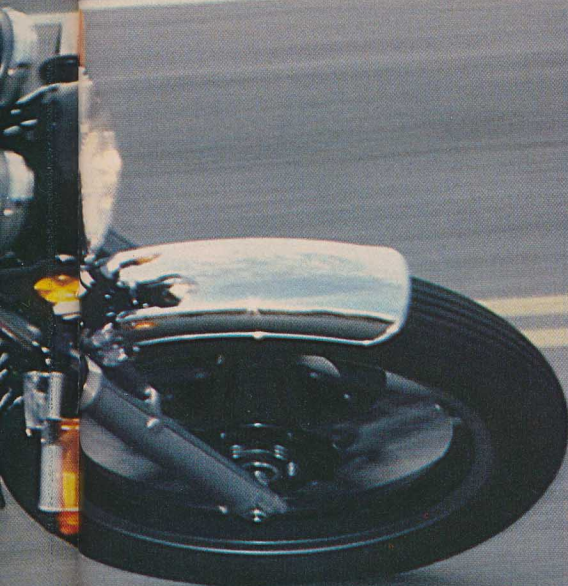
A pointless, inductive electronic ignition system on the right side of the crankshaft sparks the 650 and requires no regular maintenance.

Carburetion is handled by four 26mm slide-throttle Keihins; one accelerator pump mounted on the number two carb also feeds the other three. The accelerator pump eliminates any off-idle hesitation which might otherwise occur due to lean slow-speed jetting required to pass emissions certification. Many Honda models are fitted with constant velocity, vacuum-piston, butterfly-throttle carbs these days in the name of good mileage and throttle response and less pressure at the twist grip (to avoid a sore arm, wrist or shoulder

during long rides). One reason the CB650 doesn't have CV carbs is probably because a bank of four wouldn't fit in the available space, where the narrower slide throttle carbs fit fine. Be that as it may, the CB650's carburetors work well, deliver good mileage and do not require excessive twist grip pressure, a fact Honda representatives say is due to design work on the bell crank assembly which links all four carbs to the push/pull throttle cables.

The exhaust system is 4-into-2 with no balancer tube or power chamber. Mufflers are upswept and well tucked in for ground clearance.

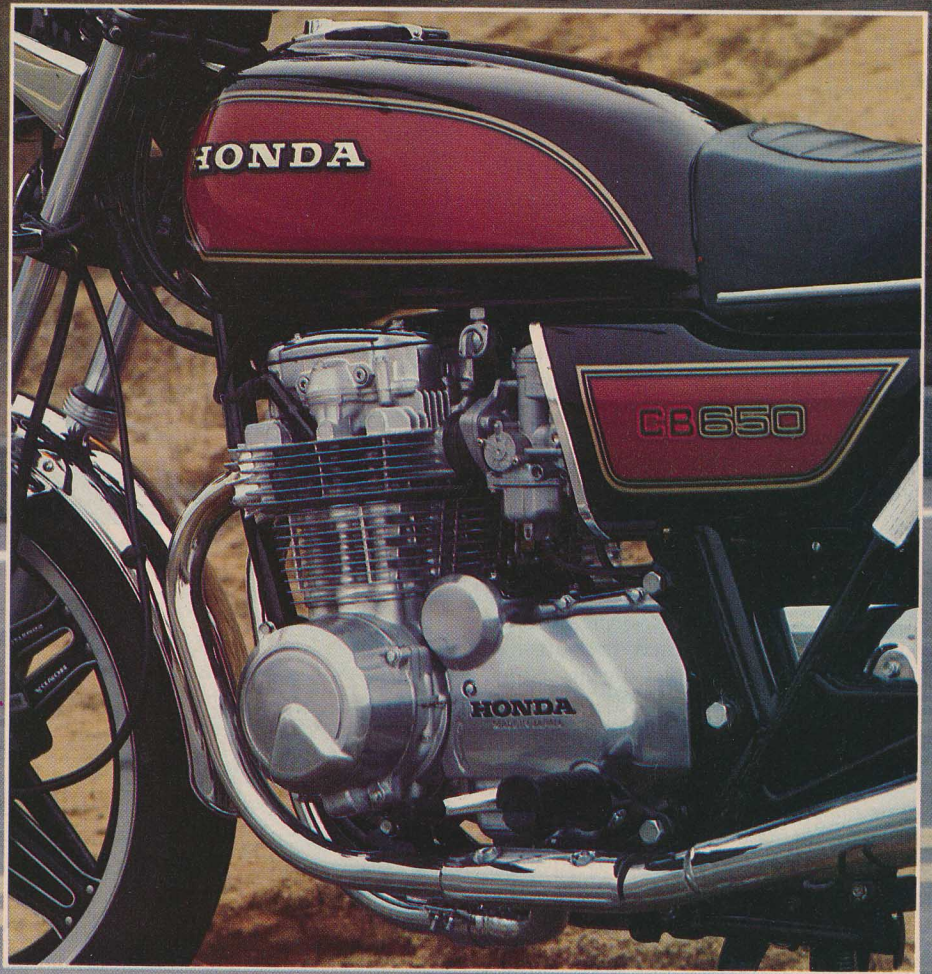
The new 650's frame is similar to the old 550 frame, but there are significant differences. The 650 has 27.5 degrees of rake, compared to the 550's 26 degrees. Both



have 4.1 in. of trail. As in the case of the 550, it is possible to remove the 650's top end without pulling the engine out of the frame. But a new feature is the bolt-on right frame rail—the downtube unbolts for easy engine removal.

Wheelbase and suspension is different as well. The 650 has a 56.3 in. wheelbase, longer than the 550's 55.3 in. The CB650's forks are very similar to the forks found on the new CB750. Beveled stanchion tube edges allow fork oil to move in between the tubes and sliders, reducing static friction and improving small-bump compliance. The 650 has more front wheel travel as well, 5.6 in. compared to the 550's 4.8 in. The usual FVQ (full variable quality) Showa shocks are found on the rear of the 650.

Honda ComStar wheels with reversed, high-lighted black spokes are mounted front and rear with either Bridgestone Mag Mopus 3.50H-19 and 4.50H-17 or Dunlop F11 3.50H-19 and K87-4.50H-17 tires. For this test, we rode two CB650s. The first bike, used for photos and for the dragstrip, was fitted with the Bridgestone tires. The



second bike, used for street and high performance handling evaluation, was fitted with Dunlops. Not surprising, in light of our recent tire tests, we found that the Bridgestones cornered better but didn't stop or accelerate as well as the Dunlops. Which tire a given bike is fitted with will affect both dragstrip times and high-speed handling.

The 650's front brake is an 11-inch hydraulic disc with the calliper mounted behind the fork leg. Brake feel, action and stopping distances were very good, but the disc discolored quickly—and squealed during stops. The discoloration and squeal can be traced in part to the high metallic content pads used by Honda in recent models to improve wet weather braking. Since the rear brake is a conventional mechanical drum, well-sealed against water, the CB650 won't leave the rider without adequate brakes in a downpour. What's more, the rear drum brake is controllable and exhibits no tendency to lock up and skate the rear end under heavy braking, a problem encountered with many machines equipped with disc brakes front and rear.

As usual, the instruments found on the new Honda are excellent—easy to read day and night, with stable needles and improved accuracy. It used to be that we'd find Honda speedometers with errors of up to 10 percent. In the case of the 650 the speedometer read 60 mph at an actual 57,

which isn't bad. And along with the expected, the 650 has several new and interesting touches. The instruments and headlight are shock mounted via supports that fit into rubber donuts in the upper and lower triple clamps. The fuses are located underneath a plastic cover right on top of the upper triple clamp, easy to get at when necessary. Because the fuses aren't under the seat, Honda engineers were able to enlarge the airbox, an important factor, we're told, in increasing engine performance while meeting noise and emissions requirements.

Controls are good and easy to find with gloved hands. Staffers were divided over whether or not they liked the irregularly-shaped turn signal switch, which demands a long throw to turn on the blinker. In actual practice, the switch did its job.

The turn signals themselves have plastic, chrome-plated semi-rectangular bodies, are rubber-mounted and secured by a single screw each to tabs welded on the rear frame and bolted to the lower triple clamp.

Of course, what really counts is how the total package works. At the dragstrip, the CB650 turned 13.29 seconds at 98.36 mph. That's slower than the standard Kawasaki KZ650 tested in February, 1977, which turned 13.19 at 98.46. But the 627cc sohc CB650 weighs 474 lb. with half a tank of gas, compared to the standard 652cc dohc Kawasaki KZ650's half-tank weight of 493 lbs. That 19-pound difference can be felt. >

To fully appreciate the weight-saving ingenuity Honda's engineers have shown, consider that a standard Yamaha XS650E Twin weighs 4 lb. more than the CB650, 478 lb. When the CB650, which has a fat rear tire and ComStar wheels, is compared to a similarly-equipped Kawasaki KZ650SR, the weight gap widens and the performance comparison reverses—the KZ650SR has cast wheels, a fat rear tire and a half-tank weight of 501 lb. Tested in August, 1978, the KZ650SR turned the quarter mile in 13.40 seconds at 96.87 mph. Other factors which may have influenced the comparison of times are standard equipment tires (as noted earlier) and the fact that the 1977 KZ650 didn't have to meet as stringent noise or emissions control laws as did the 1979 CB650.

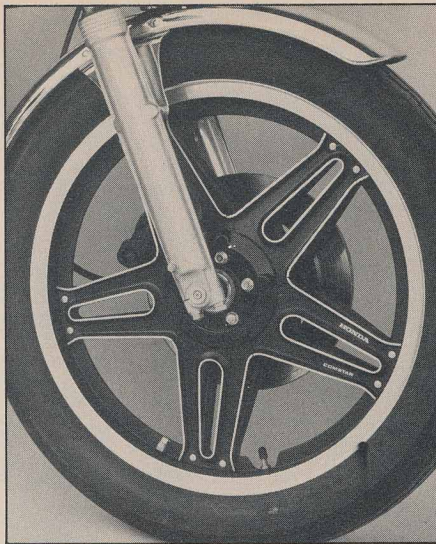
Where the CB650 shines in a comparison is in top speed, reaching 110 mph as clocked by our calibrated radar gun after a half-mile run. In comparison, the KZ650SR went 105 mph (at the time the standard KZ650 was tested, the half-mile top-speed run wasn't used during testing, so no comparison is possible.)

Few people buy motorcycles for drag-strip use, however. Happily, the Honda CB650 makes a great street bike. The engine makes its best power after a noticeable kick at 7000 rpm and screams to the 9500 rpm redline. But there is adequate power below 4000 rpm and good power from 4000 to 7000. The engine feels perfectly comfortable when shifted at 4000 rpm in city traffic, and leaves lights smoothly and reasonably quickly at 2000 rpm and above. But while the Honda runs contentedly below 5000 rpm, it doesn't have the kind of punch and acceleration the KZ650 does at those engine speeds. Probably because the Honda has 26mm carburetors and the Kawasaki has 24mm carbs, the KZ650 seems to get serious about accelerating at a lower rpm, and has more apparent torque than the CB650 below 5000 rpm.

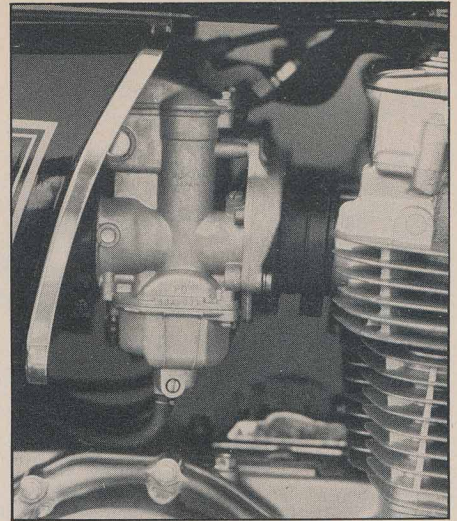
On the highway, about 5000 rpm in fifth equals an indicated 65 mph. At that speed the engine sends a slight vibration buzz through the bars and seat and blurs the mirrors. The mirrors, like the ones found on the new CB750K, are unusual, the stems are hollow and the heads precisely weighted to alter their resonant frequency. In theory, the mirrors don't vibrate at the same resonant frequency as the handlebars, and so stay clear in a speed range of 50 to 75 mph. The only time that theory didn't work on our CB650 was at 5000 rpm, an indicated 65 mph—which happens to be our favorite cruising speed.

The transmission is nearly perfect. It's silent, slick and shifts smoothly, with throws that aren't too long and aren't too short.

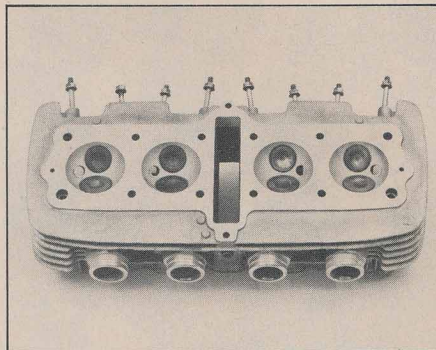
Suspension compliance, as usual with new-model Hondas, is excellent, soaking up large and small surface irregularities as well as the suspension units on any motorcycle now available. With the rear shocks



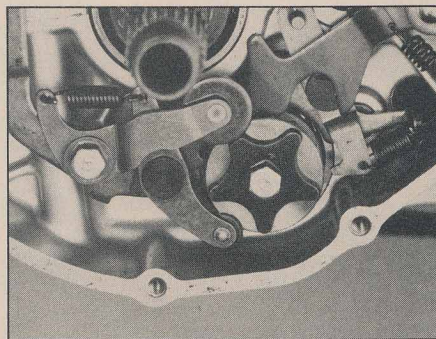
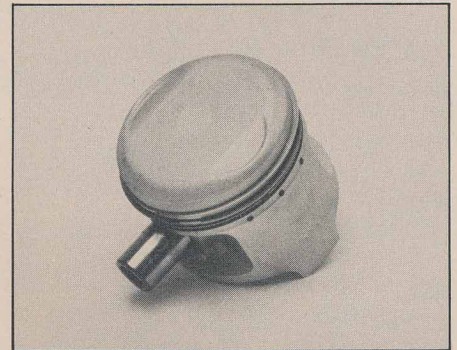
Aluminum ComStar wheels have reversed, high-lighted spokes.



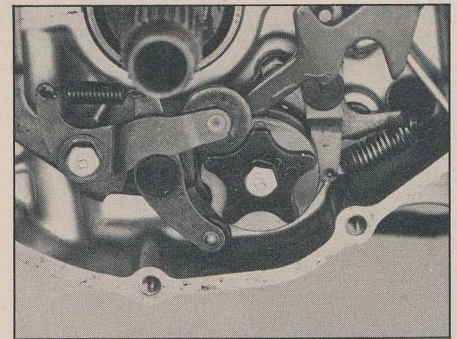
Keihin 26mm slide-throttle carbs work well. Float bowl can be drained by loosening screw; gas runs out through drain hose.



Careful cylinder head and piston design bumped up CB650 power without requiring four valves per cylinder. Output approaches 100 bhp per liter level.



A spring-loaded tang buries itself into the shift drum with each shift, preventing overshifts.



set on the lowest preload, however, a 140-lb. staffer riding solo could bottom the shocks at the slightest road dip, even at moderate speeds. Setting the preload at the middle setting worked well around town, with the stiffest setting used for faster riding.

We don't particularly care for stepped seats, but that's what people are buying, and that's what the CB650 has. It is better than most. The possible seating positions are more limited than on the older type of single-level seat, but at least the Honda's passenger grab strap is located up on the passenger's section of the seat, so the rider doesn't have to sit on it when traveling solo. Seating comfort is often affected by a rider's size and physical configuration, as well as what's in his hip pockets. In our use,

the seat became noticeable after 100 miles in the saddle, but it took three times that before we were uncomfortable. It depends upon the person.

On the open road, the CB650 can travel about 155 miles at an indicated 65 mph—with bursts to higher speeds—before demanding reserve, yielding 42.0 mpg. On our usual mileage test loop, a mix of street and highway riding, the CB650 delivered 48.5 mpg at mostly legal speeds.

Like the 550 before it, and in spite of the oversize rear wheel and tire, the CB650 is at home on twisty roads. It wants to turn, so the rider doesn't have to wrestle the machine down into a curve and then pry it back up after the apex. Steering is neutral and precise. Cornering clearance is good—

continued on page 142

HONDA CB650

SPECIFICATIONS

List price\$2499

Engine.....sohc Four
 Bore x stroke...59.8 x 55.8mm
 Piston displacement627cc
 Compression ratio9:1
 Carburetion...(4) 26mm Keihin
 Air filtration.....paper element
 Ignition.....pointless inductive
 Claimed power...60 bhp @ 9000 rpm
 Claimed torque.....na
 Lubrication system...wet sump
 Oil capacity.....7.6 pt.

Fuel capacity.....4.8 gal.
 Recommended fuel.....any gasoline
 Starter.....electric
 Alternator.....12v260w
 Headlight.....65/50w tungsten

Clutch.....multi-disc wet
 Primary drive.....Hy-Vo chain
 Final drive.....# 530 chain
 Gear ratios, overall:1
 5th.....6.04
 4th.....7.34
 3rd.....9.12
 2nd.....11.78
 1st.....17.10

Suspension front.....telescopic fork travel.....5.6 in.

Suspension rear.....swing arm travel.....3.0 in.

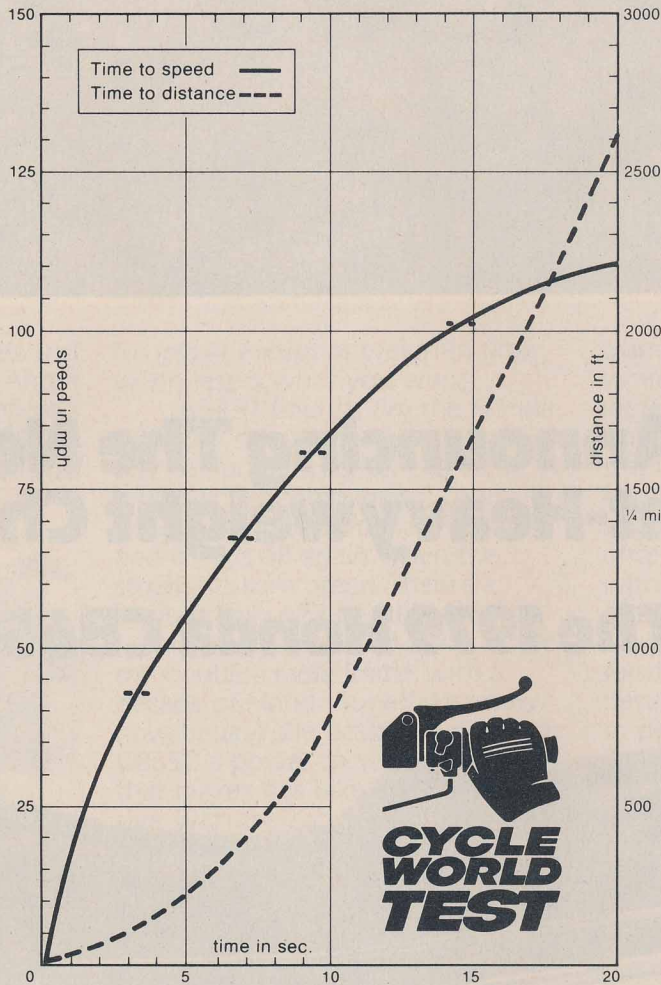
Tire, front...3.50H-19 Dunlop F11
 Tire, rear...4.50H-17 Dunlop K87

Brake, front.....11 in. disc
 Brake, rear.....7 in. drum
 Total brake swept area.....120.2 sq. in.
 Brake loading (160-lb. rider).....5.3 lb./sq.in.

Wheelbase.....57 in.
 Fork rake angle.....27.5°
 Trail.....4.1 in.
 Handlebar width.....30 in.
 Seat height.....32 in.
 Seat width.....10.5 in.
 Footpeg height.....12.5 in.
 Ground clearance.....6.5 in.

Test weight (w/half-tank fuel).....474 lb.
 Weight bias, front/rear, percent.....46.6/53.4
 Gross vehicle weight rating.....835 lb.
 Load capacity.....361 lb.

ACCELERATION



PERFORMANCE

Engine speed @ 60 mph4685 rpm

Power/weight ratio (160-lb. rider)10.6 lb./bhp

Fuel consumption.....48.5 mpg

Speedometer error:
 30 mph indicated28 mph
 60 mph indicated57 mph

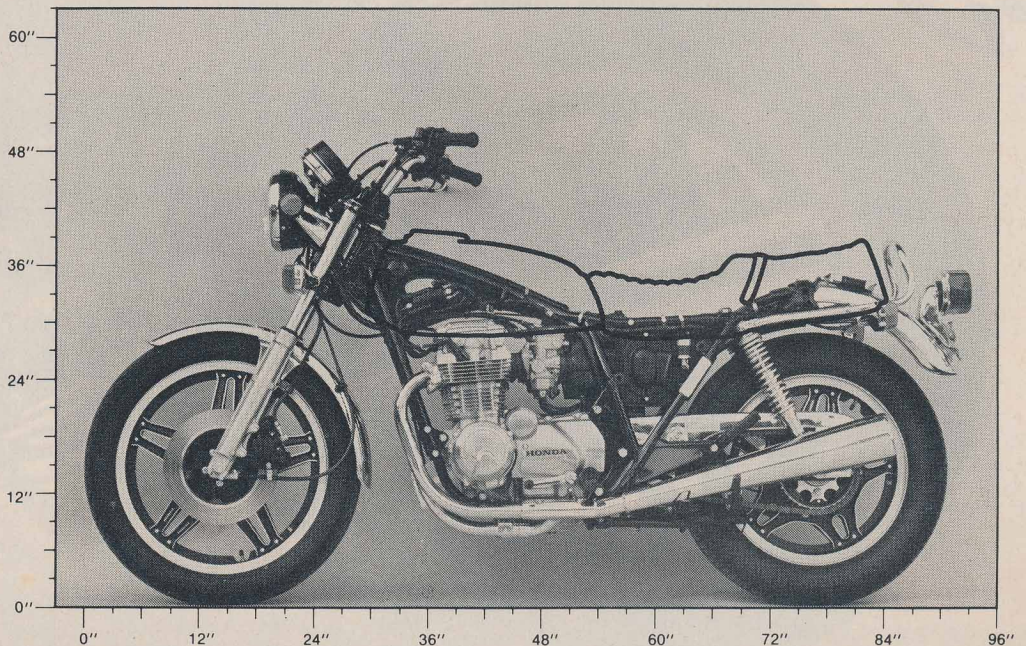
Braking distance
 from 30 mph34 ft.
 from 60 mph140 ft.

Standing start ¼-mile13.29 sec. @ 98.36 mph

Speed after ½ mile...110 mph

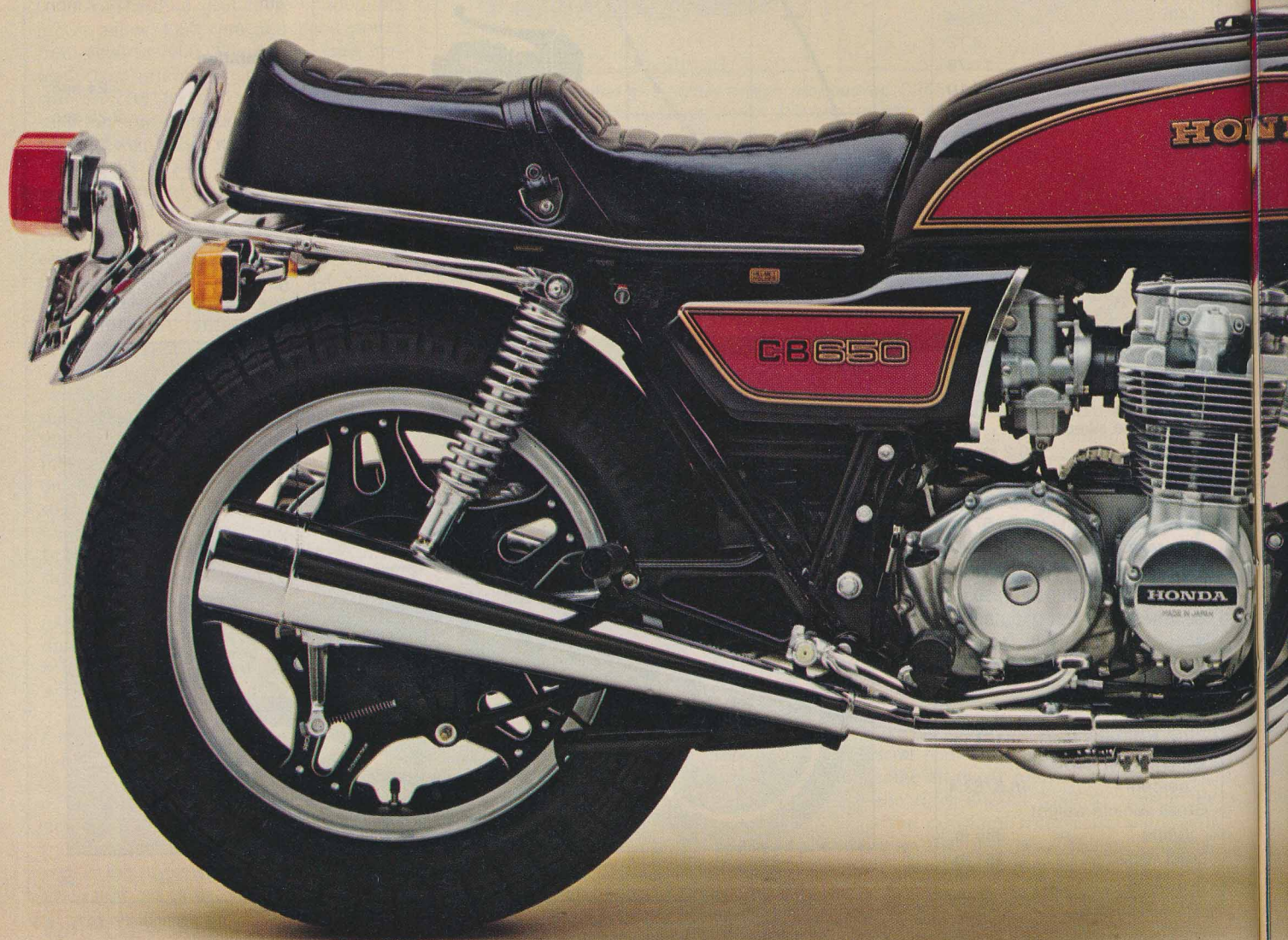
Maximum speed in gears
 1st.....43.0 mph
 2nd.....62.4 mph
 3rd.....80.6 mph
 4th.....100.1 mph
 5th.....121.7 mph

Acceleration
 0-302.24 sec.
 0-403.25 sec.
 0-504.30 sec.
 0-605.72 sec.
 0-707.20 sec.
 0-808.73 sec.
 0-9011.12 sec.
 0-10014.05 sec.





**Announcing The New
Light-Heavyweight Champ.
The 1979 Honda CB650.**





Middleweight moves and agility. Heavyweight punch. And a price that won't knock you out. Honda's new CB650 gives you more

for less— except at weigh-in time, when less is what you want.

At 437 pounds dry, the Honda CB650 is sinewy and lean, more than 25 pounds lighter than its four-cylinder competition. Low weight pays off in manageability—and it pays off again when the stoplights turn green. There's a smooth new 627 cc OHC four-cylinder engine tucked away inside the double-cradle frame, with a decade of Honda superbike know-how behind the design. It gives the CB650 a power-to-weight ratio that makes this bike eagerly responsive, with the cat-quickness that marks a true champion.

The CB650 is no lightweight when it comes to good looks. Check the highlighted black

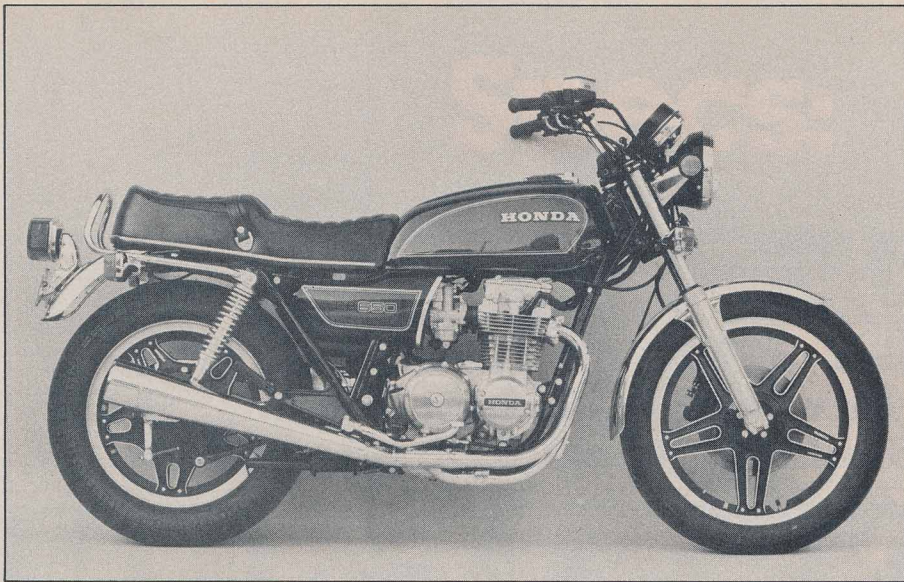
aluminum-alloy ComStar™ wheels, contoured saddle and large, stylish rectangular turn signals. In its rich colors and gold striping, the CB650 is a class act for class riders—riders who can appreciate superbike performance in a mid-size package, without breaking the rules of the road.

So ride smart, watch out for the other guy and go see the new light-heavyweight champ. In performance, styling and price, it's gonna KO the competition. It's at your Honda dealer now.

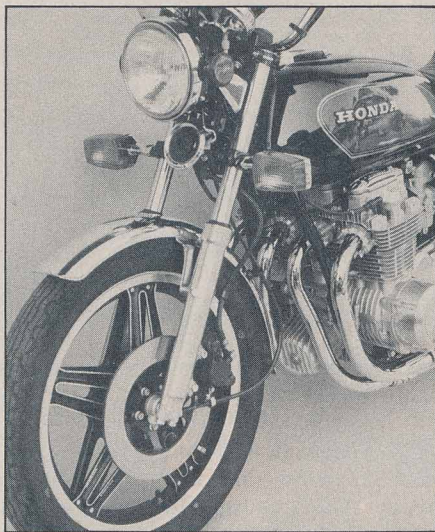


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HONDA
GOING STRONG!



Honda only makes one version of the CB650. To compete with Yamaha Specials and Kawasaki Customs and SRs, the standard CB650 comes with aluminum ComStar wheels, step seat, 17-in. rear tire.



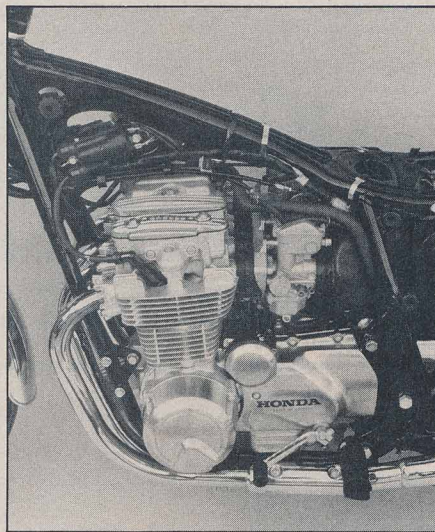
Forks are compliant and plush, yet handling is stable and secure on the twisting roads. Turn signal bodies are plastic.

continued from page 60

metal tips on the footpegs touch down and sound a warning first, followed by the stands on the left side. We didn't get anything to grind except the footpeg on the right side in spite of spirited street riding on twisty roads.

Because there was a road race handy, the 650 was entered in the Box Stock class, where it did well (winning its class) and revealed an interesting (if terrifying) handling characteristic.

On the warmup lap before the Box Stock race, the CB650 went into a terrible wobble on the long straightaway at about 90 mph, tankslapping—the bars moving back and forth almost to the limits of available steering lock—so badly that the expert rider had no control of the machine momentarily and at one point thought he was going to crash. The bike had exhibited less serious wobbles during practice, but not all the time and not always at the same points on the racetrack. During the race itself the



CB650 frame is based on CB550 frame, but with some geometry changes. Removing just six bolts allows access to valve tappets.

bike was generally stable on the straight-away.

The answer to the riddle came in two simple, yet easy to overlook, parts. Our rider normally sits upright during the first practice session and on pre-race warm-up laps while he checks out the track and bike, but tucks in during races. The wobble occurred only with the rider sitting up.

Yet with the rider sitting up at similar speeds on the street, the bike hadn't wobbled. The key lies with the mirrors. The CB650 was designed and tested by Honda with two mirrors—one on each side—in place. Mirrors are removed for racing, and unlikely as this sounds, the bike wobbled at speed with the rider sitting up and the mirrors off; didn't wobble with the rider tucked in and the mirrors off; and didn't wobble with the rider sitting up and the mirrors on.

Odd. Something about wind pressure, or the damping effect, or a change in ride height fore and aft because of rider profile

or the drag coefficient of the mirrors has a marked effect on stability.

We have read about this in the technical literature, and we've experienced it with other bikes, although we didn't know then what it was and we don't know yet why it is. We will experiment further.

The stock 650 shocks, though, did disappoint. For high performance use, the first thing a rider should replace is the rear shocks, which heat up quickly and fade during hot laps, especially on a bumpy track. More pre-load on the front fork—which is perfect for a nice, compliant, cushy street ride—would also improve high-speed handling. As is, the bike shook its head in fast, sweeping turns, especially after hitting a bump, even with the rider tucked in. Suspension must take some of the blame for that behavior, while the 17-inch Dunlop rear tire's huge, flexible sidewall must take its share as well. For cornering, we believe that the Bridgestone Mag Mopus tires would work better than the Dunlop F11 and K87 tires. There may be additional choices soon, as several tire manufacturers are building high-performance tires in the 4.50-17 in. size. At least one of those manufacturers—Metzeler—says that its development of an all-new 17-in. rear tire was done on the racetrack with road racers doing the testing. None of the new aftermarket 17-inchers were available for use on the 650, so we'll just have to wait and see.

For street use, the CB650 handles well as it comes out of the box. If we hadn't taken the bike to the racetrack, we never would have discovered its flaws—it's that good on the road. Perhaps more impressive, though, are specific features designed to make the CB650 easier to maintain for the average owner. Removing six bolts releases three covers and provides access to the valve tappets. Those three covers are sealed with T-shaped neoprene gaskets that should—barring pinching during installation—last forever. So much for buying a new cam cover gasket every other adjustment.

Of course, the inductive, electronic ignition has no points and requires no maintenance. In the case of the dohc CB750K, removing the spark plugs is just about impossible without removing the gas tank. But accessibility to the CB650's plugs is excellent.

Those are small things, perhaps. But it's refreshing to note that a motorcycle manufacturer has kept in mind such things as initial purchase price, weight and the ability to be serviced by the owner. Honda's engineers could have made the 650 more complicated and faster and heavier and more expensive. Instead, they built a motorcycle which works overall as well as or better than its competitors, costs less for the features delivered, and is easier to maintain.

The CB650 is a good motorcycle, and anybody in that size market should check it out. □