1969 Cycle World: Honda CB750 Road Test

"The Finest..Must Be Somewhat Extravagant, To Surpass Basic Need, Yet Be Incredibly Functional, To Enhance, Rather Than Merely Satisfy The Riding Experience"

TIRED OF PEOPLE not noticing? In past years, motorcycling marked you as a man apart. Not a freak. You didn't start riding to be contrary. But when you started, you discovered a feeling, a free, physical joy, privy to yourself. You glowed inside, glad that you had something that the common man didn't share. But now everyone rides a motorcycle, and you've stopped waving to the other guy, and things don't seem the same anymore. The only thing that could relight your fire is the very best road bike in the world. It would have to be extravagant, so that the envious bystander would be forced to say, "But who really needs all that," proudly thumping the tank of his leaky Twin. It would also have to be extremely functional. Roadable. Comfortable. Responsive. You want a meaningful mechanical entity, not a bejeweled pig.

Owning a bike like this, you could thumb your nose at the Honda Motor Company, which is most responsible for seeing that hordes of nouveau riders crowd you on your private road. But if you had the finest of all production machines, this two-wheeled answer to Ferrari-Maser-Vignale-Porsche-Lusso-Lambhorgini-Super-Pesante, you would be riding a Honda 750cc four-cylinder. Soichiro-San would have the last laugh.

It is so clear as to be beyond argument. Some will say that it is too heavy, or the suspension is too stiff, or it is too quiet, or that four cylinders is too many for a motorcycle. But the total is greater than the sum of its parts. If the Four didn't run faster than 120 mph, if it didn't turn a 100-mph standing quarter-mile, it would still be the finest.

This superlative covers many factors. Most people take it for granted that you can't lean a 500lb behemoth around turns like you can a good Single or Twin. Fact: it is nearly impossible to ground the 750, which allows as much, or more, banking than the Superhawk. Further, the weight seems to provide little handicap to proper handling. The springing is stiff, so the chassis is traveling in the same direction as the rolling gear most of the time. Cornering at speeds from 60 to 110 mph, the Four shows very little tendency to "pogo" or shake its head.

Heart of Honda's new masterpiece is the engine, of course. It's easy to fawn over as a modern-day marvel, but it would be more appropriate to say that the motorcycle industry, in its present stage of development, deserves nothing less. What is surprising about the 750 is that development of the complete motorcycle took less than a year. Honda had not even decided the basic engine configuration by summer of 1968.

The choice of the four-cylinder design and its basic features was based, not upon pure drawing board theory, but upon Honda's experience with other racing and production engines. Even Honda's Grand Prix formula car plays a part in the heritage of the 750. That it would be a Multi was obvious—for greater efficiency. That it would be an in-line Four was based on the firm's seven-year experience with four-cylinder racing motorcycles, as well as more recent experience with production car engines.

The 750 follows the classic four-in-line pattern, with the outer crankpins opposed to the inner two by 180 degrees. There is a spacer between the center cranks to allow room for twin single-row chain drive sprockets, as well as the drive sprocket for the single overhead camshaft. The five-mainbearing crank is forged in one piece, turned on a lathe, heat treated and then finish ground. Firing order is 1-24-3 (cylinders numbered from left to right). Power is taken by chain from the center of the crankshaft to the clutch by way of the mainshaft. Center drive allows the clutch to be positioned inboard, reducing engine width. There is relatively little difference between crank speed and clutch speed, so the clutch size may be reduced, as it does not have to bear the brunt of a severe gear multiplication. This does, however, cause engagement to be rather sudden in relation to the amount of movement the rider makes with the clutch lever. Practice will overcome this one idiosyncrasy of the 750, so that smooth starts will be a matter of course.

Use of chain, rather than gears, for the primary drive has clear advantages. It simplifies crankshaft construction, for one thing. The chain transmits power more efficiently, and presents yet another way to reduce engine weight. While power transfer by chain offers the possibility of snatching, Honda seems to have eliminated it with the use of a spring-loaded rubber tensioner for the twin primary drive chains.

Unusual (or unexpected, we should say) is Honda's use of plain bearings in all major engine bearing surfaces including crankshaft mains, connecting rods and camshaft. The public has always associated Honda motorcycles with constant high rpm running, to which the use of rolling bearings is also associated. However, there is much argument in favor of the plain bearing, and Honda's departure from its "usual" practice does not seem so radical if it is viewed in the light of the company's use of plain bearings in its production car engines— and even in its latest 12-cylinder air-cooled Formula One car. Compared to a rolling bearing of equivalent load capacity, a plain bearing is lighter in weight, costs less to assemble, and is smaller in size—all important factors in a multi-cylinder engine that must be crammed into a roadable bike chassis. The plain bearing is also quieter. In a Multi, where a greater number of bearings are required, they contribute greatly to Honda's desired goal of silent engine operation.

As for load capacity, the arguments are also in favor of plain bearings. The maximum load capacity of a rolling bearing is at zero rpm, and decreases as rpm increases due to flexing of its components and fatigue. But a plain bearing has relatively little flexing problem. It is hydrodynamic (it rides on an oil film and metal surfaces do not touch at all) and as the "hydro" action increases with bearing speed, so does its load capacity.

The rolling bearing is commonly thought to be a friction-free bearing. This is a myth. Rolling bearing components roll, which creates friction, and the balls or rollers also have a tendency to throw oil from their path. When properly lubricated, a plain bearing tends to retain its cushion of oil and the cushion becomes more effective with engine speed, a factor which produces less friction.

Naturally, lubrication must be optimal with plain bearings, so oil in the new Four is pressure-fed at 60 psi (it never drops below 30 psi even at low engine speed). It is worth noting that Honda didn't "mix" rolling bearings in with plain bearings; Honda engineers reason that, as long as a high pressure system has been created to lubricate plain bearings somewhere in the engine, it makes sense to unify the system as much as possible. This explains the presence of plain bearings throughout camshaft, connecting rods and crankshaft.

Yet another reason for a unified pressure system is the heat factor. Oil carries away heat, and flow must be optimal in these critical engine areas. For the converse reason, the transmission, which shares engine oil, is on the scavenge side of the system; heat is less critical there. Naturally, rolling bearings are used for the main transmission components, as they work best under lower pressure conditions. Both the engine and transmission are dry-sump, for minimal oil drag. For the first time, Honda has employed a separate oil reservoir, the main reason being to make the engine package tidier and slimmer.

Another departure for Honda is the CB750's "undersquare" bore/stroke ratio (63 by 67 mm, to give a displacement of 736 cc). No other bike in the Honda line has a long-stroke configuration, and, at first glance, there seems to be no advantage to engine efficiency in going undersquare. But, the CB750's 8500-rpm redline and power peak isn't all that high (compare this to the 10,500-rpm redline of the CB350). So, evidently, Honda has eschewed being at the top of fashion in favor of narrowing the bore, to ultimately reduce engine width. At 8500 rpm in a production engine, the narrower bore makes little difference in efficiency or piston speed; in fact, the engine seems capable of being turned at much higher speeds, with appropriate valve train modifications.

The 750 is in. an extremely mild state of tune, with intake/exhaust valve overlap being not much more than that of a good touring car. One of the reasons for this mild tuning is to achieve tractability. Honda was successful in this tack, as the 750 may be pottered around town between 2000 to 3000 rpm. The other reason for mild overlap is to achieve good gasoline mileage, which was one of the three most important criteria set up for the 750 before the engineers went to their drawing boards. In one of our testing sessions, we subjected the 750 to a six-hour "70 percent run," which would correspond to a combination of fast touring and frequent sporting bursts from 65 to 110 mph through the swervery. We achieved a figure of 29.9 mpg, which was extremely impressive under such agitated throttle conditions. In steady freeway touring, the CB750 rider could expect 25 to 30 percent better mileage, which would net about 150 to 180 miles on a tank of gasoline.

There is nothing unusual about the CB750's valve gear layout. The valves are operated by rockers, and paired inner/outer valve springs. The tappets are easily accessible for adjustment through rocker box caps, although the fuel tank must be removed to reach them. There is one innovation in that the intake and exhaust valves are offset slightly to minimize the possibility of collision. While it may seem curious that Honda didn't go all-out with a double overhead cam layout, it must be remembered that the benefit from the extra cam would be doubtful for a large-bore touring engine. Honda considers the reduced head size of an sohc engine to be of greater advantage, as it may fit more compactly into the frame. There is also the consideration of a dohc engine's greater weight; the CB750 head, being sohc, weighs hardly more than the dohc head of the smaller CB450.

The cylinder block is, in effect, split into two halves—two left-side cylinders and two right, with a gap in the middle for the cam drive. The finning is generous and each cylinder is separated from the others by large air passages for optimum cooling. The great flexibility of shaping is made possible by shell mold casting. Honda engineers found that air cooling the Four presented no problems at all. In testing of early production models in high speed runs on the open-limit Nevada roadways, cylinder head temperature was the same on the inside cylinders as it was on the outside.

The CB750 pistons appear run-of-the-mill, with two compression rings and an oil scraper ring. But they possess minute features that are the product of many hours of testing. On examination, the first thing you notice is the greenish Teflon coating on the face of the scraper ring blades. Its purpose is to eliminate excess wear during the first few, and critical, operating hours of the engine. The coat soon wears away, having accomplished its purpose. (Honda also removes the burr at the bottom of the cylinders, a by-product of cylinder honing, to prevent piston scuffing.) The top of the piston looks flat, but actually has a slight dome, for the sole purpose of increasing the compression ratio. A true flat top piston would be preferable to avoid the dome piston's tendency to collect oil mist blow-by at its peak, which makes itself evident with a light puff of smoke from the exhaust as the throttle is rolled off and turned back on.

In laboratory testing, Honda engineers tested the pistons by running them for 200 hours at 70 percent power (at 6000 rpm), then 20 hours at full throttle (8500 rpm). Piston scuffing from metal-to-metal contact, and excess heat, proved a problem in the first prototype designs. This was eliminated by reducing thickness of the piston top so that heat would be transferred away to the walls at a more rapid rate. It was also necessary to taper the piston in progressive stages. There are four stages of taper (five, counting the ring area) to provide the right combination of looseness (for maximum power output) and tightness (for low engine noise).

The Four uses a new type of electrical system for Honda - an excited field alternator with a contact point type voltage regulator. This is an automotive approach, and is necessary because of the heavy demands made on the system, which must support sealed beam headlight, taillight, turn signals, instrument lights, horn, electric starter, and ignition for four cylinders. The effect of the system, in which extra output is gained by exciting the main source of power with another small current, is to provide more than enough power to meet the Honda's needs (apparently word got back to Japan that some of us are so mad as to install extra lights and radios on our machines).

Carburetion is handled by four separate Keihins, one to a cylinder. These are piston valve, double float items with no difference from the standard fare, other than a provision for a vacuum gauge. They share a common gigantic air box with replaceable paper filter element. The four separately adjustable throttle cables meet in a junction over the engine which is operated by single cable from the throttle grip. Choke levers on each are connected by a rod; the length of rod between each carburetor is changeable to allow individual adjustment of each unit.

The five-speed transmission is hefty and the size of its gearsets appear well up to handling the CB750's maximum rated torque (44.12 lb.-ft. at 7000 rpm). In basic design, it differs only slightly from previous Honda practice. Where the shifting drum, in other models, acts as fork carrier, it is used only for locating the forks in the 750. The forks actually pivot on two large pins. The seven clutch plates are of a semi-neoprene material; Honda has used metal plates but found them troublesome. Provision for automatic final drive chain oiling is made through the drive sprocket; oil passes through a drillway in the shaft and is thrown out onto the sprocket by centrifugal force. There is an extra shaft in the transmission—a transfer shaft, which picks up power from the countershaft to deliver it to the final drive chain.

Of most interest in the effective, but mostly conventional chassis/rolling gear assembly is the hydraulically operated single-caliper disc front brake. One of its most welcome features is that the disc is cast stainless steel, which does not rust, as do the non-stainless discs on other disc brakes preponderantly available. As the disc is exposed to view, it is nice to know that it will look as nice after a few years use as when it came off the showroom floor. There is a chance of more brake noise due to the use of stainless, which has mediocre sound dampening quality. To counter this, Honda has made the puck, or brake pad, slightly spherical over its gripping surface. The puck is self centering.

Unlike several other double and single disc brakes we have sampled, the Honda unit is not at all touchy. It is reasonably fade-free for a 120-plus-mph machine and possesses enough stopping power to break the front wheel loose at any speed. However, the lever action must be firm to do so, and there is a responsive, broad zone of gradation between full-off and full-on—a decisive safety factor. This excellent feel and broad gradation may be a by-product of rounding the brake puck friction surface. When the brake is applied mildly, only part of the puck may come into full contact with the disc. Full contact and full stopping force is achieved gradually because the puck must be highly compressed before the entire surface of its face comes into full-pressure contact with the disc.

The CB750 frame is hefty, consisting of a full double cradle and maintube, bolstered by two smaller auxiliary top rails. These rails, joined to the maintube by triangulating struts, extend straight back from the front downtubes to function as the top rails of the rear subframe assembly. The swinging arm assembly is mounted inboard of the cradle. The swinging arms are two-piece welded stampings, rather than the usual tubing; due to the wall thickness and overall size of the arms, they should do the job properly. Hard power-on cornering gave no evidence of weakness.

As mentioned before, the suspension gives a comfortable, but decidedly firm ride. Evidently the rear spring/damper units (nitrogen-sealed non-serviceable De Carbon shock absorbers) are at the peak of stiffness for a single rider weighing 160 lb. It is best to leave the springs at their soft setting for one-up sporting endeavor. On the two harder settings, spring travel is reduced enough to inhibit damping action and cause slight rear wheel chatter under hard acceleration, braking and cornering.

The front fork springs also are stiff and travel is restricted enough to prevent the machine from giving a violent heave forward under heavy braking, or upward and downward in fast corners. The only unpleasant aspect of the front suspension is its reluctance to recoil immediately with minor road deflections. Thus the bike may begin a light up-and-down oscillation at certain speeds when the deflection is periodic in nature - i.e., over regular tar joints, or the junctions of repeating strips of concrete. The cause seems to be the rather high breakaway friction of the front fork bushings and seals, and studies are being made in Japan to find bushings and seal materials with a lower friction coefficient. For the time being, the rider will have to adjust by increasing or lowering speed. There is a chance that the problem could correct itself after a few thousand miles, as the seals and bushings wear in. At any rate, this is a small detraction from what must be regarded as the finest handling machine in its weight class.

Many points about a machine other than the cold (but in this case enervating) statistics of its performance come to light during the CYCLE WORLD performance tests. The most obvious, during the tire-scorching 100-mph quarter-mile acceleration runs, was the excellent placement of a gorgeous pair of instruments - the 11,000-rpm tachometer and the 150-mph speedometer. Their faces are broad and easy to read. More important, they are positioned upright so that they may be read from a racing crouch with no difficulty at all. They are illuminated for night riding and give off a beautiful, reassuring glow. Another important feature is found on the throttle grip - a two-way ignition kill switch. Flip the switch with an easy movement of the thumb in either direction from center and the engine is turned off; in moments of panic, which could come if the throttle jammed on such a big machine, it is impossible to flip it the wrong way. In this respect, it is superior to a kill button, which requires constant pressure to keep the fire out.

The seat is broad, padded, great for two-up riding and looks good with its pleating. The handlebars are "Western" style, but not overly wide, and are comfortable against the wind. The bike is tall, overly so for the short rider, but the footpeg position is high enough to suit most riders, short or tall.

It is hard to keep from raving at the way the hardware on the chassis has been arranged to allow what must be the ultimate angle of lean for any big-bore. Nothing grounds. The four separate megaphone-style silencers, which are joined by balancing tubes, are turned upward, well out of the way. The side and center stands have no projections to ground. The crankcases are narrow and have hardly any overhang. One CW staffer was exiting from an unwinding 50-mph left-hander, and found a portion of his sole touching the ground, even though he had the tip of his boot touching the gear lever.

It is amazing that the tires—standard Japanese Dunlops with ribbed pattern front and block pattern rear - hold that well under such treatment. Japanese tire quality has greatly improved over the past few years. Choice of the rear tire makes us curious, though, as it is not made of one of the special long-wear compounds chosen by the manufacturers of other high-powered Multis from Japan and England. Prognosis for good rear tire mileage can hardly be optimistic.

But maybe some positive thinking is in order. Like the old saw about buying a yacht. If you can afford to buy the finest production road machine available (which also happens to be a bargain in its displacement category), you're not going to ask how much it costs to keep it in tires.

HONDA CB750

SPECIFICATIONS

List price	approximately $1495
Suspension, front	telescopic fork
Suspension, rear	swinging arm
Tire, front	3.25-19
Tire, rear	4.00-18
Brake, front, diameter x width, in.	10.0 x 2.0
Brake, rear, diameter x width, in.	7.1 x 1.6
Total brake swept area, sq. in.	92.6
Brake loading, lb./sq. in.	7.1
Engine, type	four-stroke Four
Bore x stroke, in., mm	2.40 x 2.48, 61 x 63
Piston displacement, cu. in., cc	44.9, 736
Compression ratio	9.0
Carburetion	(4) 28-mm Keihin
Ignition	battery, coils
Claimed bhp @ rpm	67 @ 8000
Oil system	dry sump
Oil capacity, pt.	7.0
Fuel capacity, U.S. gal.	4.8
Recommended fuel	premium
Starting system	electric, kick, folding crank
Lighting system	battery, alternator
Air filtration	dry paper element
Clutch	multi-plate, wet
Primary drive	(2) single-row chain
Final drive	single-row chain
Gear ratios, overall:1	
5th	5.26
4th	6.14
3rd	7.45
2nd	9.54
1st	13.99
Wheelbase, in.	57.2
Seat height, in.	31.5
Seat width, in.	12.0
Handlebar width, in.	34.7
Footpeg height, in.	12.2
Ground clearance, in.	6.3
Curb weight (w/half-tank fuel), lb.	499
Weight bias, front/rear, percent	44/56
Test weight (fuel and rider), lb.	654

TEST CONDITIONS

Air temperature, degrees F	82
Humidity, percent	34
Barometric pressure, in. Hg.	30.01
Altitude above mean sea level, ft.	1632
Wind velocity, mph	8-12
Strip alignment, relative wind:	

PERFORMANCE

Top speed (actual @ 8426 rpm), mph	123.24
Computed top speed in gears(@8500rpm),mph:	
5th	123.5
4th	106.3
3rd	87.6
2nd	68.4
1st	47.2
Mph/1000 rpm, top gear	14.55
Engine revolutions/mile, top gear	4130
Piston speed (@ 8500 rpm), ft./min.	2848
Fuel consumption, mpg	34.3
Speedometer error:	
50 mph indicated, actually	50.1
60 mph indicated, actually	60.2
70 mph indicated, actually	70.3
Braking distance:	
from 30 mph, ft.	32.9
from 60 mph, ft.	135.7
Acceleration, zero to:	
30 mph, sec.	2.9
40 mph, sec.	3.3
50 mph, sec.	4.6
60 mph, sec.	5.2
70 mph, sec.	6.5
80 mph, sec.	7.7
90 mph, sec.	9.8
100 mph, sec.	12.9
Standing one-eighth mile, sec.	7.90
terminal speed, mph	82.56
Standing one-quarter mile, sec.	13.38
terminal speed, mph	100.11