MOTORCYCLIST

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PETERSEN PUBLISHING COMPANY

APRIL 1982

Full Test:
HONDA 750 V-4!
One Giant Step

First Test:
SUZUKI 1100 SHAFT

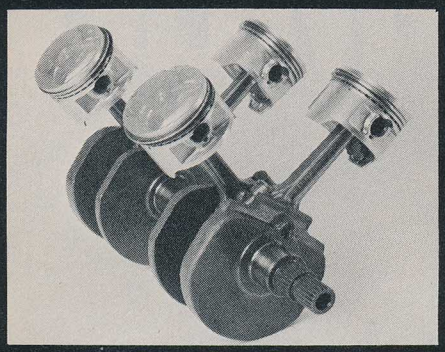
YAMAHA IT175

1982's 10 BEST BUYS

MOTOR CYCLIST

APRIL 1982, PUBLISHED MONTHLY, ISSUE 1018

SPECIAL HONDA V45 SECTION



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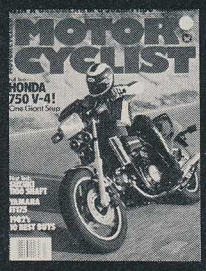

If you think that Ken Vreeke had an exciting ride as he piloted the new Honda V45 Sabre around this turn, you should have seen Dexter Ford, Steve Hunter, and Chad Chumpright as they struggled to focus, aim, and shoot our cover photo while they were thrown from side to side in the back of a speeding pickup truck driven by Krusher Karr. But it was worth it; the new Honda 750 is the most important bike to arrive since the original Honda 750 four changed motorcycling in 1969.

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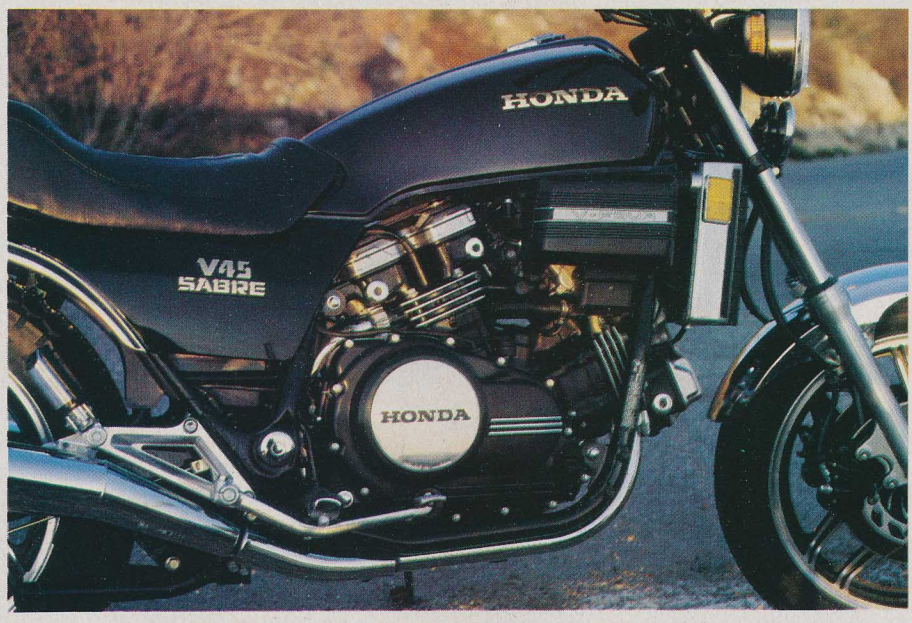
BELL
HONDA

HONDA V45 SABRE 750

The Most Important Motorcycle Since 1969



PHOTOS: DEXTER FORD

From time to time, at press previews, technical conferences, and trips to their factories, representatives of motorcycle manufacturers ask the motorcycling press for suggestions about what kinds of bikes they should build. For about 10 years now, when asked about big street bikes we've been saying the same thing: "Build a V-4. Lay it out like a Ducati at 90 degrees. That will make it narrow and smooth. It should also be light and fast. Put in a wide powerband, and make it handle. Give it a special chassis and some unique features. Don't worry about the profilers, the footdraggers, and the nose-pickers. Build a bike for enthusiasts. They'll recognize it, and it will be a success."

Members of the enthusiast press repeated that message in half a dozen countries on three continents and in dozens of meeting rooms. Engineers, planners, and corporate officers smiled, nodded, shook our hands, and thanked us, and we went back to our typewriters and waited.

We are not quite vain enough to believe that any company would produce something solely on the recommendations of ourselves and our colleagues, but we hoped that someone would listen to us and the voices of other enthusiasts and build such a motorcycle. We were sure that, even without our prompting, bikes to fit our criteria existed on the drawing boards and in the prototype rooms of most if not all of the major companies. We just hoped someone would find a reason to dare to manufacture such a motorcycle.

Honda dared. With the V45 Sabre, the first modern motorcycle V-4, they have produced a machine which is every bit as significant and even more exciting than their original 750, the harbinger of the era of in-line fours. Their latest creation offers the power potential of a 45-cubic-inch (750cc) four, an engine width barely greater than a twin, and natural smoothness exceeding any previous four's. It's neatly packed in a chassis that's equally as exciting and sophisticated. In fact, most gawkers comment on the styling and features before they talk about the engine. However, handling is the prime topic after a first ride.

The liquid-cooled V-4 is the centerpiece for a list of up-to-the-minute features: rising-rate Pro-Link rear suspension, TRAC anti-dive, dual-piston brakes, hydraulic clutch actuation, shaft drive, air fork, F.O.I.L. anti-theft system, self-cancelling turn signals, space-age instrumentation, cast wheels, and rectangular QH headlamp.

But everyone forgets the peripheral goodies when they ride the bike. When they finally climb off, the subject is handling. Almost to a man, the riders who partook of the Sabre during our test used the same word to describe the handling: "neutral." The Sabre doesn't fall into a turn or make you fight to keep it there when you get on the gas or brakes. Steering is neither heavy nor overly quick. The bike is easy to turn and nimble at all speeds, probably because it's not too hefty (539 pounds wet) and because it doesn't feel at all top-heavy. The long wheelbase keeps it from reacting too suddenly to rider inputs, however, so the Sabre is very predictable. Simply point it where you want to go, and it seems to read your mind. During fast street riding the chassis was very controllable and precise.

Predictably, the Sabre has lots of cornering clearance, but not for predictable reasons. The engine's slim profile accounts for some of the banking capabil-

ity; it is 1.8 inches narrower than Yamaha's 750 Seca, the narrowest in-line 750 four, and 6.6 inches narrower than the Suzuki GS750E, the widest current in-line design. However, the V45 engine—measured at crankshaft level—is also set an inch or two higher off the road than the in-line models. Whether this engine position was chosen to provide more banking angle or just to increase stability and resistance to side winds by raising the center of gravity is unclear. In any event, the Sabre offers both plenty of clearance and straight-line stability.

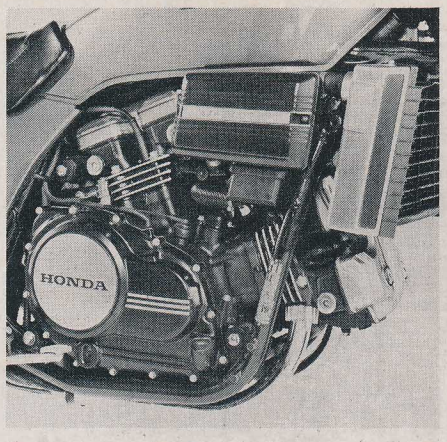
The Dunlop tires (an 18-inch front and a 17-inch rear) are a new type designed to provide maximum tire life. As a result, even though they are quite wide and mounted on very wide rims, their hard compound doesn't always inspire confidence when you're experimenting with maximum lean angles. They break away gently and predictably, but they begin to slide sooner than would something like a set of Sport Elites. Even so, we did drag the pegs and stands occasionally.

Those big, wide, cast alloy wheels are a change for Honda, which has previously stuck to its unique ComStar composite wheels. Officially, the reason for the acceptance of cast wheels on certain 1982 models is that "cast wheels are finally good enough for Honda," meaning the problems with porosity have been solved. Honda reps also admit that customer demand was an important factor. ComStars are about a pound lighter, however.

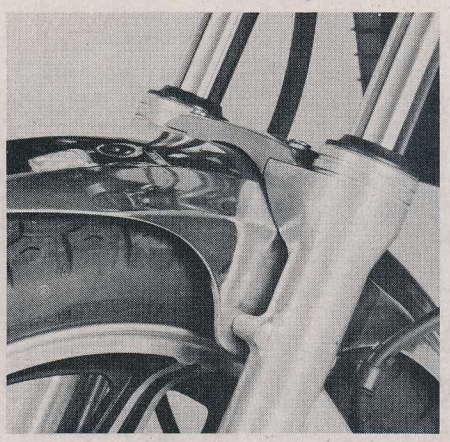
Like other big Hondas, the Sabre has dual-piston brake calipers up front. The more we use these, the more we like their power and feel. The same seems to be true of the TRAC anti-dive system. We normally kept it set on the number three or four position and found that braking control and feel were excellent. Despite all this trick hardware, the front end does chatter during very hard braking. We are inclined to blame the hard tires, although a change in the fork's damping rates might help. Changing fork and tire air pressures and TRAC setting made no significant difference.

During fast street riding, the Sabre is an impressive handler. Although we thought we might detect a hint of instability when we were doing some serious scratching in the turns, we couldn't be sure. Taking the bike out to Willow Springs Raceway, however, confirmed that there really is some high-speed instability. Running it into turn eight at 120 mph or so uncovered a moderate wobble, one that wasn't there on the stock CB900F which we had brought along. Changing suspension air pressure and the rear shock's damping setting didn't help. Although this may concern riders who intend to roadrace the Sabre, it won't be noticed by street riders who have even the vaguest concern for their own skins. You have to be cornering at over 100 mph before it shows up.

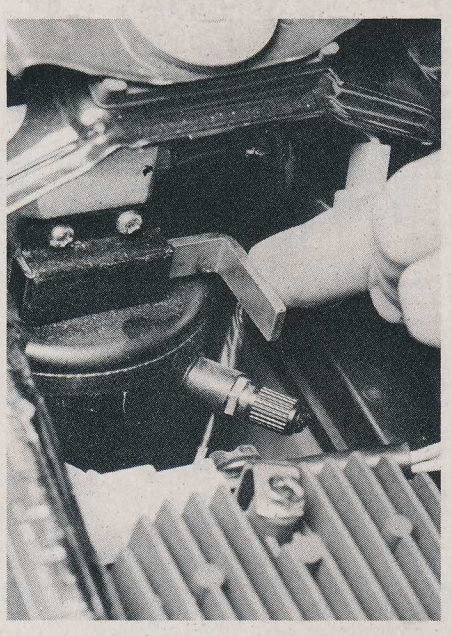
PHOTOS: ART FRIEDMAN



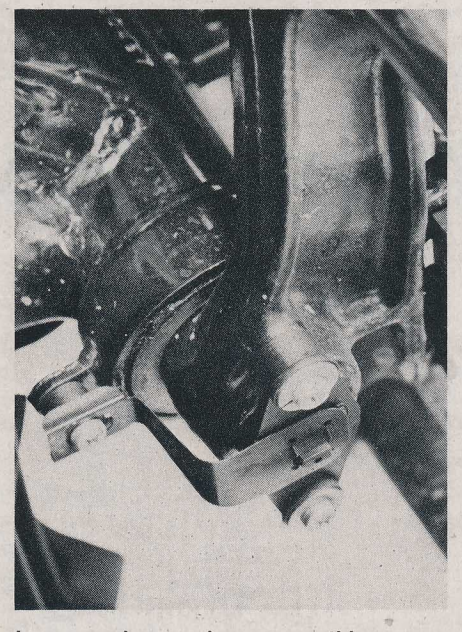
Among fours, the V45 sets new standards for narrowness, flywheel effect, low-end power, and potential lean-angle.



The fork brace increased front-end rigidity and enabled Honda to save money and weight with TRAC in just one fork leg.

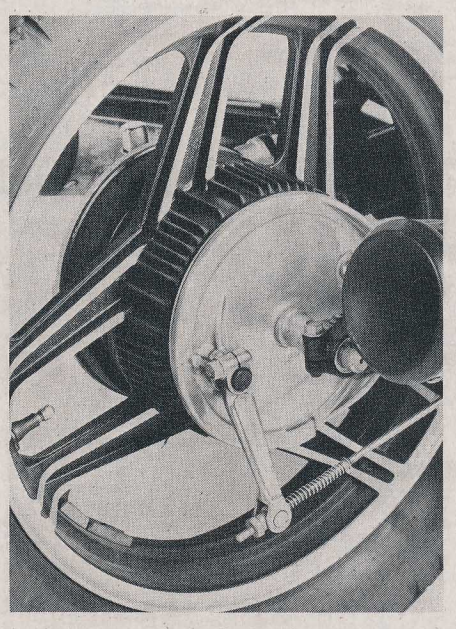


You can pick one of three rear-suspension rebound-damping settings by moving this plunger under the seat.



Low-speed cornering moves this sensor at the bottom of the steering head, cancelling turn signals when you straighten up.

Honda damped vibration—and therefore brake squeal—with paper gaskets placed between the front disc carrier and the hub.



Several '82 Honda models use cast wheels. The Sabre's rear is a wide 3.00-17 with a tubeless tire. Drum brake stays dry.

PHOTOS: JIM BROWN

Our day of hot-lapping at Willow did confirm certain positive things about the bike. For example, the brakes *will not* fade. Willow also made it plain that the bike is fast. It will reach a top speed of over 130 mph at 10,500 rpm in fifth gear. (It won't go over 8500 in the overdrive sixth gear.) Its broad powerband also gives a strong, exciting drive out of turns. The engine will pull from idle and runs smoothly at 2000 rpm and strongly before 3000. It will happily rev right past the 10,000-rpm redline to 11,000 without any indication of valve float.

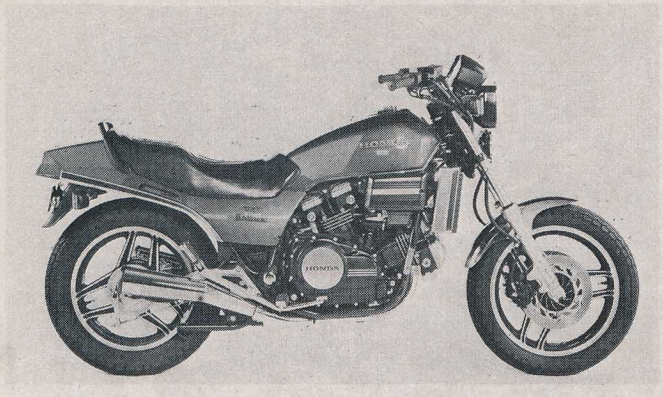
We were a little surprised when the dragstrip figures revealed that the Sabre is just a mid-pack performer in terms of acceleration. Although quicker than Honda's in-line 750 fours and the Yamaha 750 Seca, it is slower than Kawasaki's GPz750 and the Suzuki GS750E. Its dragstrip confrontation with the other brands of 750s is discussed in an accompanying sidebar.

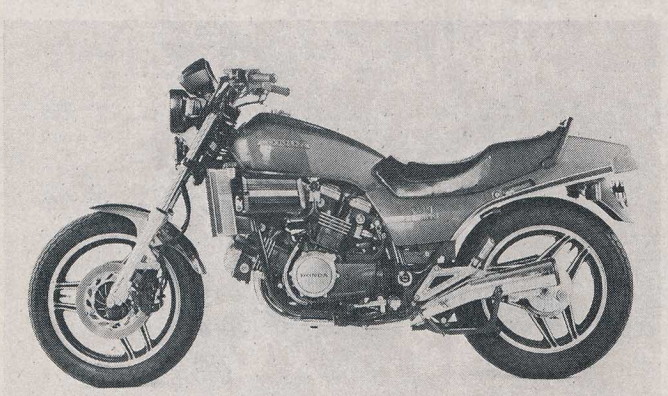
We were curious about how the hydraulic clutch would behave at the dragstrip, where the clutch is put to its most punishing test. On the street, clutch operation is smooth but just a little mushy, as if there is a damper built into the throw-out system. At the strip, this mushiness made it difficult to feed the clutch out precisely, often resulting in wheelies, bogs, or wheel spin leaving the line. After 10 runs or so, the clutch got grabby, but it returned to normal when cool. As promised, the hydraulic actuation always kept it properly adjusted.

Despite some fancy machining which Honda performs on the gear dogs, we experienced a bit of the almost-traditional Honda shifting maladies. Casual, low-effort shifts sometimes ended in unexpected neutrals or permitted the gearbox to pop out of gear a moment later. When shifted forcefully and deliberately, the Sabre stayed in gear. There is a small amount of lash in the drive train, but it presented no problems or annoyances. Neither did the shaft drive. There's very little rise-and-fall torque reaction to worry about during cornering.

The shaft will be appreciated most when you're touring, but it isn't the only item to like on long rides. The bike is exceptionally smooth, thanks to the 90-degree layout (which offers perfect primary balance) and rubber engine mounts (which absorb any secondary imbalance). Whether you're chugging at 1800 rpm, shrieking it at 10,500, or cruising anywhere in between, the engine simply does not shake, vibrate, buzz, or tingle to any degree worthy of mention. It is *smooth.*

The only complaint we have about comfort concerns the ride. The suspension does not work compliantly over small bumps, so rides on California's freeways keep you bouncing as you hit the seams at the edges of the concrete slabs. No amount of adjustment to suspension air pressure or rear-shock re-





HONDA V45 SABRE 750

Suggested retail price $3398
Warranty ..... 6 months, 6000 miles
Recommended maintenance intervals ..... 8000 miles

ENGINE

Type ..... Liquid-cooled transverse four-stroke 90° V-4
Valve arrangement ..... DOHC, 2 intake valves and 2 exhaust valves operated by forked rockers, threaded adjusters
Displacement 748.0cc
Bore x stroke ..... 70 x 48.6mm
Compression ratio 10.5:1
Carburetion ..... 4, 32mm Keihin constant-velocity
Ignition ..... Battery-powered transistorized, 2 magnetic pickups
Lubrication ..... Wet sump, 3.1 qt
Charging output ..... 300 watts AC
Battery 12V, 14AH

DRIVE TRAIN

Primary transmission ..... Straight-cut gears, 1.736:1 ratio
Clutch ..... 11 plates, wet
Final drive ..... Shaft, 3.40:1 ratio

CHASSIS

Front suspension ..... 37mm Showa with anti-dive, 5.5 in. travel, adjustments for air pressure and compression damping under braking
Rear suspension ..... Honda Pro-Link, single Showa damper, adjustments for air pressure, rebound damping
Front brake ..... 2, single-action calipers with dual live pistons, 276mm discs
Rear brake ..... Single-leading-shoe drum, rod operated
Front tire ..... 110/80H18 Dunlop or Bridgestone
Rear tire ..... 130/90H17 Dunlop or Bridgestone
Rake/trail ..... 29.5°/4.6 in. (117mm)
Wheelbase ..... 61.4 in. (1560mm)
Seat height, unladen ..... 30.4 in. (772mm)
Fuel capacity ..... 4.75 gal (17.8L)
Wet weight ..... 539 lb (245kg)
Colors ..... Black or red
Instruments ..... Electronic speedometer and tachometer; odometer, LCD tripmeter, clock/stopwatch, water temp. display, fuel gauge, and gear indicator/6-function warning system; lights for turn signals, neutral, warning system, and high beam

PERFORMANCE

Fuel consumption ..... 33 to 48 mpg, 40.6 mpg avg.
Average touring range ..... 193 miles
Best ¼-mile acceleration ..... 12.32 sec., at 106.3 mph
200-yd. top-gear acceleration from 50 mph ..... 71.8 mph terminal speed
RPM at 60 mph, top gear 4050
Calculated speed in gears at (redline) ..... (10,000) 1st 47 mph; 2nd 68 mph; 3rd 88 mph; 4th 105 mph; 5th 127 mph; O.D. 149 mph
Speedometer error ..... 30 mph, actual 28.5; 60 mph, actual 58.3

PRICE	2900	3100	3300	3500	
1982 Honda VF750S					$3398
1982 Yamaha XJ750R					$3299
1982 Kawasaki GPz750					$3299

QUARTER-MILE TIME	10.0	11.0	11.5	12.0	12.5	
1982 Honda VF750S						12.32 sec., 106.3 mph
1982 Yamaha XJ750R						12.59 sec., 104.7 mph
1982 Kawasaki GPz750						11.98 sec., 110.8 mph

MAINTENANCE INTERVALS	3000	5000	7000	
1982 Honda VF750S				8000 miles
1982 Yamaha XJ750R				5000 miles
1982 Kawasaki GPz750				3000 miles

ENGINE WIDTH	12	14	16	18	20	
1982 Honda VF750S						15.9 in.
1982 Yamaha XJ750R						18.1 in.
1982 Kawasaki GPz750						20.8 in

WET WEIGHT	300	350	400	450	500	
1982 Honda VF750S						539 lb
1981 Yamaha XJ750R						523 lb
1982 Kawasaki GPz750						NA

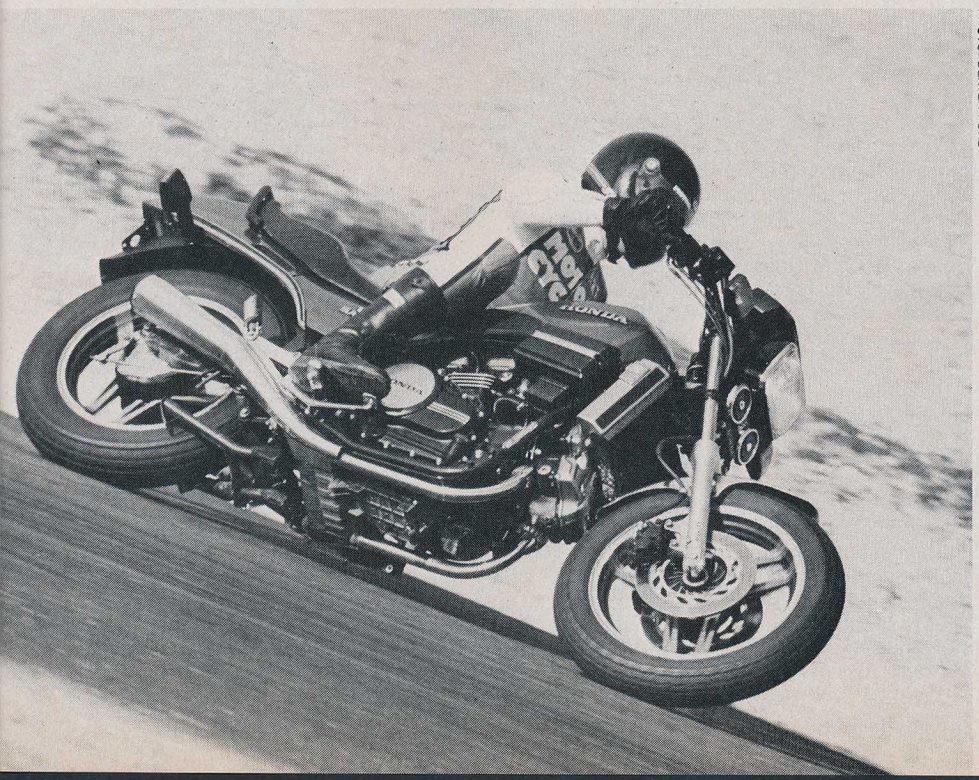


PHOTO: DEXTER FORD

bound setting would make it ride as smoothly over cracks and seams as its competitors. On the the other hand, the suspension is better than most at absorbing big bumps. We attribute this to the progressive nature of the rising-rate Pro-Link system and air suspension. After being jarred slightly but continuously by the small stuff, it's surprising to feel the big kidney-flatteners go by so smoothly.

We were skeptical of the narrow looking, sloped saddle, but our skepticism disappeared after several long rides. Although the passenger section of the seat is a bit hard and cramped, the rider shouldn't be at all saddle sore when he arrives at his day's destination.

A comfortable riding position is another of the Sabre's offerings to the touring rider. We found the position natural and flexible. The forged clip-on bars may be rotated some to suit the rider's chassis, and lower bars from the European model will probably be available

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THE V45: A NEW ANGLE ON FOURS

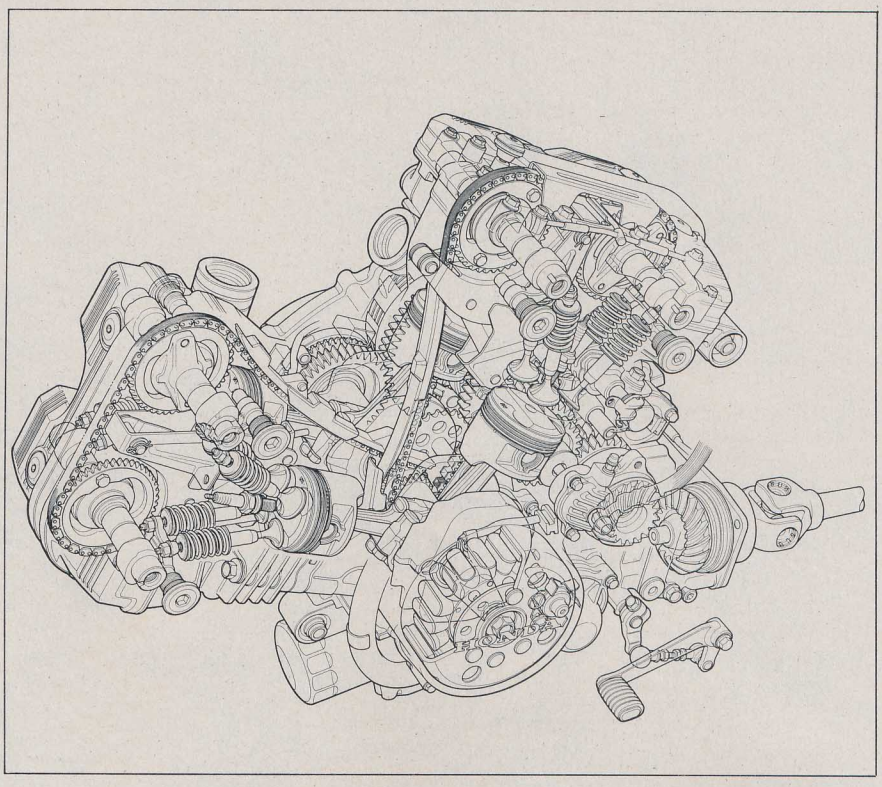
When you consider the many virtues of the design, it's surprising that no one has built a V-4 motorcycle engine like the Honda V45 before. Sure, there have been previous V-4 motorcycles—George Brough and Matchless introduced them in the 1920s and '30s—but they were air-cooled with narrow V angles. Honda's V-4 is water-cooled and is laid out at 90 degrees, which benefits weight placement, vibration control, and intake plumbing.

Despite its tremendous popularity, the transverse in-line four has some pretty major drawbacks because of its width. It increases frontal area—to the detriment of speed and fuel consumption—and to get satisfactory cornering clearance it must be placed fairly high in the chassis, which tends to make the bike tall and hard to manage. A V-4 of the same displacement is significantly narrower and offers approximately the same potential power output. A 90-degree layout keeps engine weight particularly low because the front cylinder bank may be placed horizontally in front of the crankshaft. According to Honda's calculations and measurements, the Sabre can bank a few degrees farther than any in-line 750 four—and its crankshaft center is lower in the frame.

Other considerations help make the 90-degree layout a natural choice for a motorcycle. The most obvious asset is its perfect primary balance, which significantly diminishes vibration. On the V45, rubber engine mounts soak up any tingles that remain from the slight secondary imbalance, making the motorcycle as smooth as anything on the road.

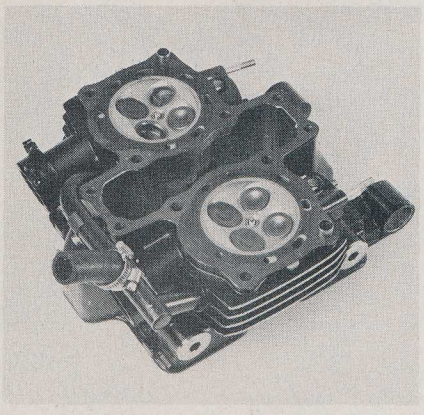
Another advantage of the 90-degree angle is the large amount of space between the cylinders for carbs and plumbing. If the cylinders are too close together, you end up with tight bends in the intake manifold. Even with the big gap between cylinder banks, Honda had to come up with some fancy carbs to get the desired straight-in shot at all four intake ports. Normal sidedraft motorcycle carbs resulted in unwanted bends in the intake tract, so Honda devised 32mm constant-depression (i.e., constant-velocity) carbs with offset float bowls and the jets placed at an angle to the needles. These features permit the carbs to be placed at the extreme angle necessary, making them something between sidedraft and downdraft in classification. The angled needles and float bowls prevent starvation during hard acceleration or braking. In order to keep the carbs short, diaphragm-type throttle valves of the variety first introduced on the CB350 twin are used. However, the diaphragms are made of a new material that's more durable and compliant. In fact, it's so responsive, even at low rpm, that Honda says no accelerator pump is necessary to provide crisp throttle response. A unique enriching circuit is used to provide a rich mixture for cold starting and warm-up.

Even with the wide V angle, it was necessary to use space efficiently. One way Honda did this was to place the automatic cam-chain tensioner inside the cam chain's run. Nothing protrudes externally, there's nothing to adjust, and only otherwise empty space is used. The two cam chains are link-plate types, and they are driven at the crankshaft's center. Each one drives two massively supported camshafts, which in turn operate each cylinder's four valves (26mm intake, 23mm exhaust) via forked rockers and screw-type adjusters. As in Suzuki's TSCC models, Honda has employed rockers in order to get the steepest valve angle (38 degrees) that will still leave room between the valves for cooling. The steep valve angle permits a very shallow combustion chamber and a high (10.5:1) compression ratio. Unlike Suzuki's TSCC combustion chambers, the V45 heads have a squish area. Honda representatives tell us the valve angle, combustion chamber design, and V angle were the results of lessons learned with the NR500 roadracer, which is also a V-4.

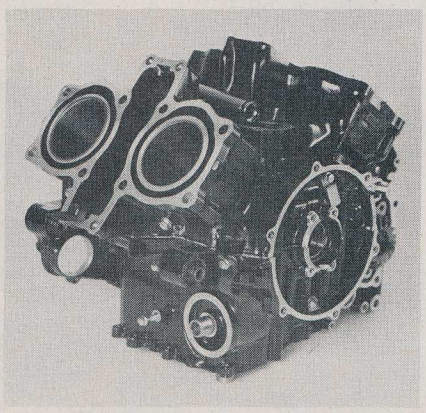


The high compression ratio caused some other problems. Since the cases split horizontally, the forces of the front bank's piston strokes were directed against the main-bearing bolts at right angles, and Honda was concerned about these bolts breaking. They developed strong, very precise main-bearing bolts. To prevent skirt cracking, another potential problem with high compression, the piston pin holes are slightly oval; they're 15 to 20 microns wider than they are high.

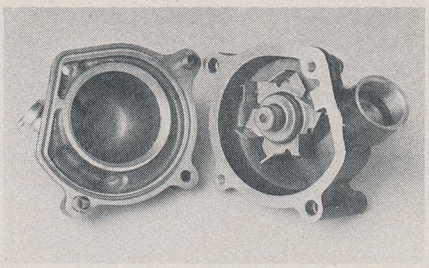
One of the potential drawbacks to a 90-degree transverse-crankshaft V is engine length, since one cylinder bank grows out of the front of the crankcases. That's why Ducati V-twins have such long wheelbases. The Sabre is long (61.4-inch wheelbase), but not because of the engine, which is actually on the short side. Honda kept it compact by using a very short stroke (just 48.6mm, with a 70mm bore) and only two transmission shafts. There is no primary shaft; the clutch is driven by the end of the



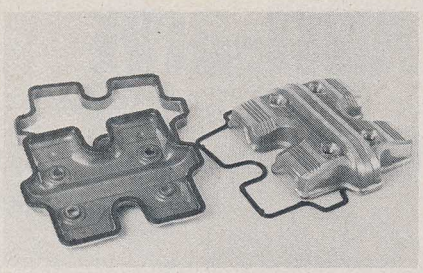
The V45 head uses steep valve angles and rocker arms, like Suzuki's TSCC models, but has a squish band to prevent detonation, even at 10.5:1 compression.



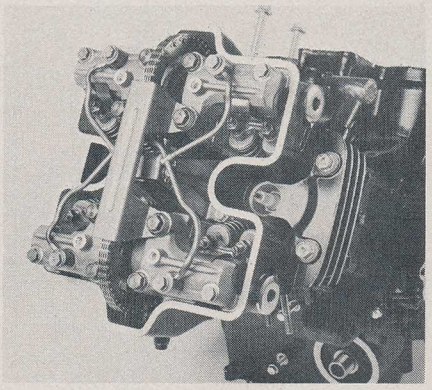
Horizontally-split cases stress the main-bearing bolts, so stronger, more precision-made bolts are used. Lower front case holds spin-on oil filter.



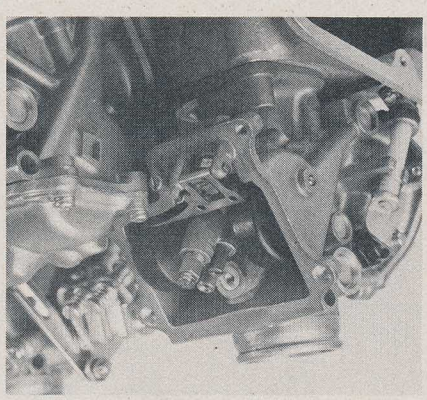
This water pump and the oil pump are both driven from the same shaft behind the crank. To minimize hoses, Honda used the left cradle tube as a water pipe.



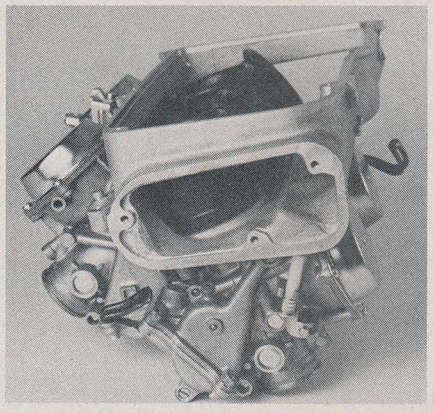
Although the front cylinder-bank's valve cover (right) is one piece, rear cover is two pieces to facilitate removal. Gaskets are reusable neoprene type.



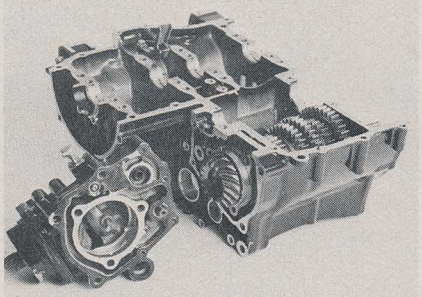
External lines deliver oil to various engine shafts, including the cams, which have huge supports. Screw-type valve adjusters simplify home tune-ups.



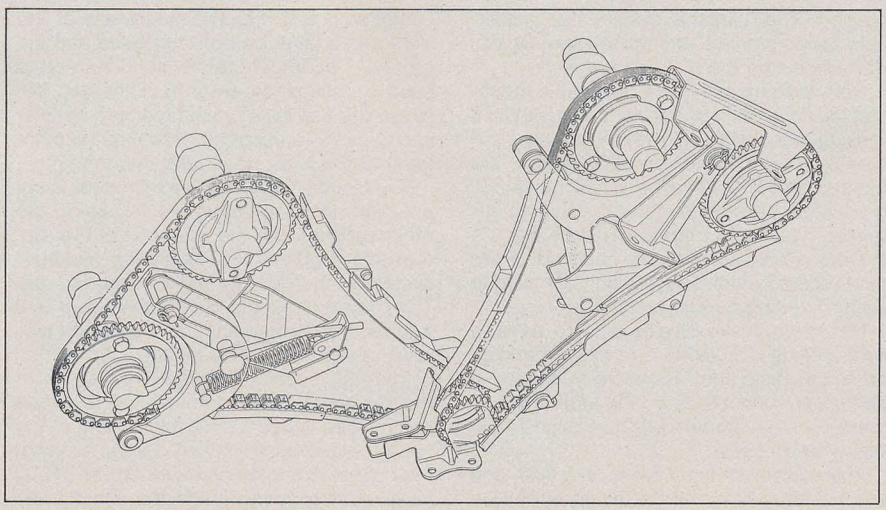
To make the carburetors work at the required angle, Honda's carb-builders at Keihin had to design jets angled in relation to the needles and slides.



All the carbs, which are set at approximately the angle shown here, breathe through a common airbox which has filters placed on each side of it.



Driving the shaft's bevel gears directly off the countershaft reduced weight, cost, and power loss. Chain-drive racing engine turns in opposite direction.



one-piece forged crankshaft. The final drive's bevel gear is set directly on the end of the six-speed gearbox's countershaft. This setup, which requires the engine to turn opposite the direction used by most Hondas, not only reduces bulk and complexity, it saves the weight, cost, and mechanical losses of the extra gears and shafts often used in bikes with transverse crankshafts and shaft final drive.

To help shorten the engine cases, the cam-type shock damper usually placed in the crankcases of shaft-drive bikes was located at the rear of the driveshaft. The shaft itself is the reason for the long wheelbase; since a long swingarm reduces the torque reaction experienced on shaft-drive machines, Honda wanted a long swingarm. It's probably not coincidental that this also left room for the Sabre's Pro-Link rear suspension. (On the chopper-styled Magna, which has conventional dual-shock rear suspension, the space is used by the twin fuel tanks.)

Cooling can be a problem on V designs if the flow of air to the rear cyclinder(s) is blocked by the front cylinder(s) or other hardware. Honda has sidestepped this problem with water-cooling. The fins on the engine are there, in one Honda spokesman's words, "to keep it from looking like an air compressor." The cooling system holds just 2.8 quarts, including 0.4 quart in the overflow reservoir behind the left side panel. A temperature gauge and a coolant-level indicator in the instrument panel warning system keep the rider apprised of the coolant's condition. An electric fan turns on automatically to cool the system if it gets hot during low-speed operation.

The water pump and the oil pump share a common shaft behind the crankshaft. This shaft is driven at its right end by a chain from the rear of the clutch. The water pump resides at the opposite end, and the oil pump is driven from the middle of the shaft, near the spin-on oil filter cartridge. Most of the oil lines are external type, which are much less likely to leak or get blocked by gasket goo during assembly than built-in internal passages. Oil is pressure-fed to all the transmission, shift fork, cam, and rocker-arm shafts.

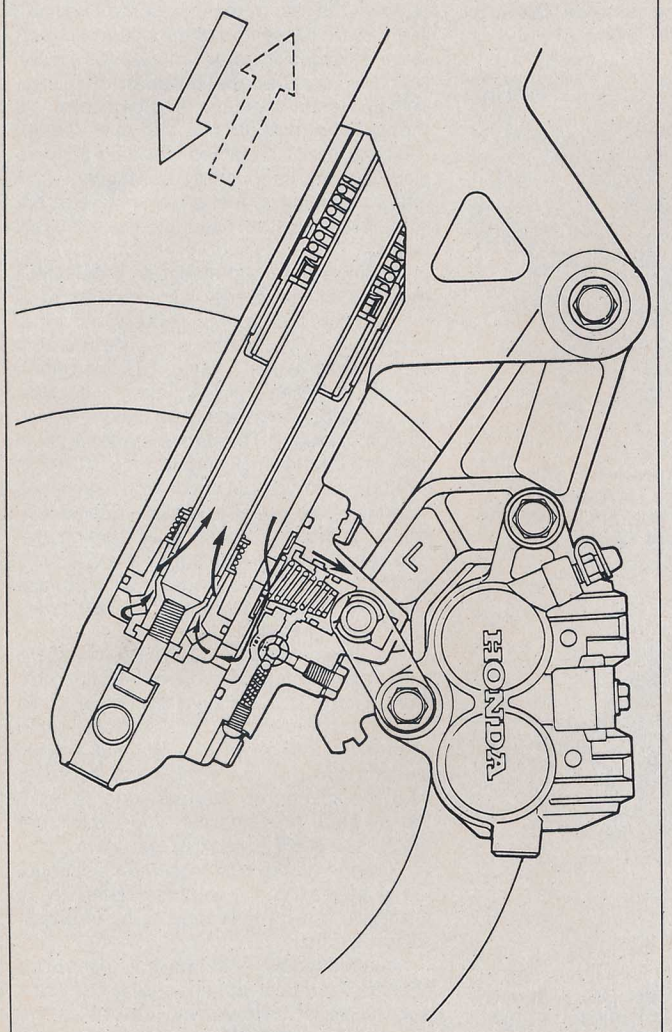
The clutch drive gear has a spring-loaded anti-backlash gear attached to it, but that's not the most noteworthy feature of the clutch. It's hydraulically operated; that's why there's a second master cylinder on the handlebars. It operates a piston—similar to the piston in a brake caliper—located in the left side of the cases. The piston presses against a pushrod, which moves the clutch pressure plate. The benefits of hydraulic clutch operation are the same as for brakes: self-adjustment and no cables to break, bind, or seep oil.

If you thought Honda devised a V-4 just to be different and attract some attention, look again. What Honda has created is an engine with all the advantages of a four in a package that's as narrow as a twin (15.9 inches at the crankcases), weighs less than an inline four, makes less vibration than the already smooth Gold Wing, is easy to maintain and work on, looks as strong as a Motown V-8, and makes a truckload of power. We regard it as the best engine ever built for a big road bike, and we hope it turns out to be the same sort of trend-setter as the first Honda 750. *M*

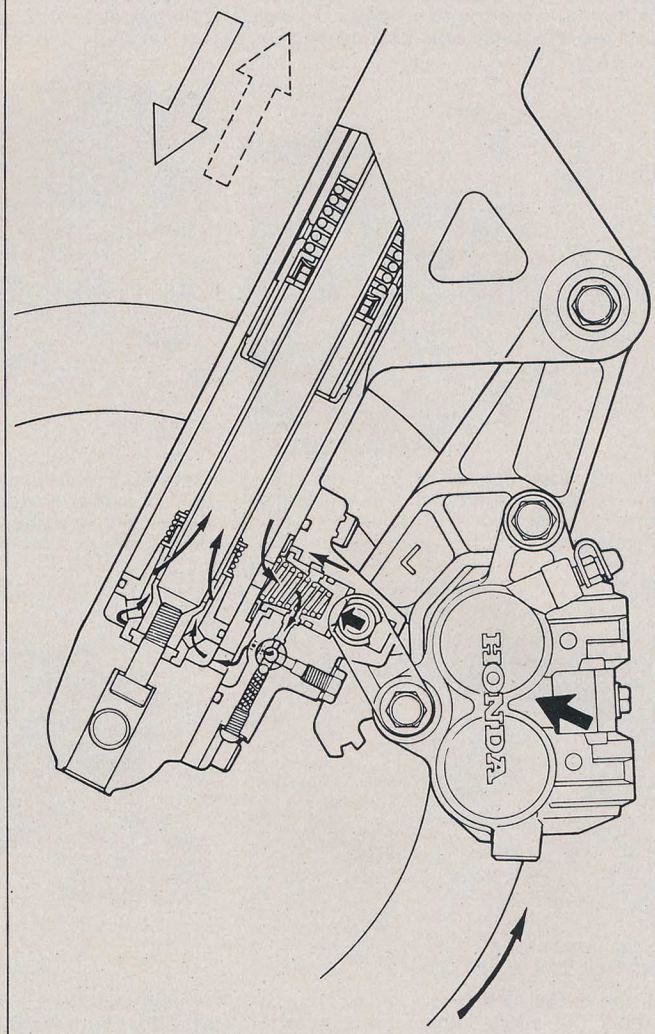
PHOTOS: JIM BROWN

HONDA'S TRAC ANTI-DIVE

Compression damping oil flow:
In normal running



Compression damping oil flow:
Under braking



With Suzuki and Yamaha offering anti-dive braking systems on selected sport-oriented street machines, it was only a matter of time before Honda came up with its own variation on the theme. The system offered on the V45 (and the CX500 Turbo) is called TRAC, Torque Reactive Anti-dive Control, and it differs substantially from anti-dive systems we've sampled to date.

The Yamaha and Suzuki systems we've tried, on the Seca 750 and the Katana, respectively, both operate on the same basic principle. Hydraulic pressure in the braking system is used to move a valve which restricts an orifice in the compression-damping circuit of the front fork, providing increased resistance to dive when the brakes are applied. Both the Yamaha and the Suzuki systems use a spring-loaded blow-off valve in the circuit to allow the front wheel to respond to bumps encountered under heavy braking. The Yamaha system has adjustable spring-preload settings to allow the rider to modulate the blow-off pressure.

Both systems provide a noticeable reduction of nose dive under light and medium braking conditions. However, during hard braking it is possible to nearly bottom the forks of the 750 Seca because the forces generated cause the pop-off valve to release. The performance of the Katana's system is hard to evaluate because of the extraordinarily stiff compression damping in the fork during normal running.

Minimized brake dive is nice to have in light braking conditions. But heavy braking, on rough pavement, is where you *need* a compliant, unbottomed fork, and it's just there the Yamaha and Suzuki designs have their weaknesses.

The addition of extra brake line, fluid, and the moving valves in the early systems also contributed to increased mushiness at the front brake lever on both the Seca and the Katana. Two-finger brakers soon learned to keep excess digits away from the gap between the Katana's brake lever and handlebar to avoid running out of brakes (and fingers) at the least opportune moments.

The Honda TRAC system increases compression damping during braking as do the other systems, but the actuation of the system is totally different. The brakes' hydraulic system is completely independent of the TRAC system, so the outstanding lever feel and braking performance of the Honda twin piston calipers remains intact.

Instead of using hydraulic pressure to move a compression-damping valve, Honda has chosen to use a small movement of the brake caliper itself. During normal running, the caliper exerts no pressure on the TRAC valve, and a spring holds the valve away

from its seat on the lower fork leg. As the front wheel encounters a bump, fork oil, pressurized by the encroaching volume of the descending fork tube, is free to flow through the open valve and back into the bottom of the fork leg unimpeded.

When the brake is first applied, though, the torque exerted on the caliper by the spinning brake disc pushes the valve home on its seat, forcing fork oil into a separate circuit of passages in the TRAC unit body. The oil must pass through a hole drilled in the body of the adjustment screw before it can make it to the low-pressure area in the bottom of the fork leg. The movement of the oil through that hole provides the additional compression-damping force needed.

If the pressure of the hydraulic fluid in the upper chamber of the fork leg exceeds the mechanical pressure put on the valve by the brake caliper, the caliper will swing back slightly to allow oil to bypass the orifice. Thus, the system is self-adjusting: the braking force is always balanced against the pressure of the fork oil in compression. Under light braking, even relatively light bumps will move the caliper back enough to let the front wheel respond easily. But under heavy braking, the force exerted by the caliper is much greater, and it takes a much higher pressure in the fork to bypass the system.

The system is adjusted by rotating the marked screw to one of four positions. Position one routes the oil through a relatively large passage drilled in the screw; positions two and three represent progressively smaller passages. Position four blocks the oil passage completely. In order for the fork to compress at all with the screw set on position four, the caliper must be pushed back to allow oil to bleed past the TRAC system.

Honda's anti-dive system was first seen on the NR500 and Formula One racing machines; it appears to be a simple, rugged, well-thought-out solution to the problems of brake dive we've been facing since the advent of telescopic front suspension. Controlling brake dive through compression damping, however, is not the final solution, as even the head of Honda's roadrace team admits. What's really needed is a system that controls the front end's *spring* rate with respect to braking force; even restricted compression damping will allow a slow and steady drop of the front end during hard stopping, where a variable spring (or a mechanical linkage like Preston Petty's No-Dive) would not. For now, however, given the technology available (and the public's ability to pay for that technology), Honda seems to have done a masterful job of identifying the characteristics of the ideal 1982 anti-dive system—and building it.

There's one surprise in Honda's use of the TRAC system on the V45: it's only used on one of the two fork legs. The CX500 Turbo has a TRAC system on both sides of the fork, but Honda engineers thought the massive fork brace used on the V45 made a pair of the units unnecessary. When the TRAC unit is functioning, the left fork leg provides much more compression damping than the right, and one would think this would tend to twist even a well braced fork assembly.

Honda's engineers seem to have done their homework, however. The TRAC-equipped V45 demonstrates noticeably less front-end dive than the Yamaha Seca under hard braking and shows no signs of excessive fork twisting or flexing. —*Dexter Ford*

WHICH 750 IS FASTEST?

The first two questions everyone asks about a new bike are: "How much does it cost?" and "How fast is it?" In the case of the Honda Sabre, this second question took the form of three other questions: "Is it faster than a Suzuki GS750?", "Is it faster than a Yamaha Seca 750?" and "Is it faster than a Kawasaki GPz750?"

Since we'd never even sat on a GPz750, and since Suzuki has pumped an additional dose of power into the GS750, we decided to gather all the Sabre's major competitors for a mini-shoot-out, just to compare performance at the dragstrip.

So, on a cloudy Thursday morning in January, we rode the V45 to Orange County International Raceway to face its rivals and the quarter-mile. Waiting for it at the strip were a brand new GS750E, a well-worn GPz750, and a slightly used Seca. The Suzuki was first into the fray, and its first two runs proved to be its quickest of the day: 12.25 seconds at 107.8 mph and 12.24 at 108.8 mph. The gauntlet was thrown.

Dragstrip tester Karr then proceeded to the Kawasaki, which started out with one of its slowest runs of the day: 12.33 seconds at 107.9 mph. But it quickly got up to speed: 12.10 at 109, 12.15 at 110.4, and a sizzling 12.02 at 110.4.

Third up was the Yamaha. It started out slowly (if you can actually call 12.7 at 103.7 mph slow) and didn't show much more urge during its next three runs: 12.65, 12.67, and 12.67 with speeds in the 103-to-104 range. Its fifth run proved to be its most rapid, but a 12.59-second elapsed time and a 104.7-mph terminal speed turned out to be just off the pace.

The catalyst for this whole exercise came to the line last. After one warm-up run, Jeff and the Sabre did four runs back to back, all within 0.03 seconds of each other. They were 12.34, 12.33, 12.35, 12.32. Terminal speeds were in the 106-mph range.

Unless the Suzuki could come up with something dramatic in the second round, the Kawasaki looked like the 750 performance champ. The Suzuki did do some dramatic wheelies, but then, wheelies just slow you down. On the rest of its runs in this second set, the GS either smoked its rear tire or refused to shift properly.

The GPz, however, was just warming up. On its second run it became the first production 750cc motorcycle that *Motorcyclist* has ever put into the 11-second bracket. This run was 11.99 seconds at 110.8 mph.

The Yamaha and Honda couldn't improve on their earlier runs. The Seca stayed locked in the 12.6-second bracket, and the Sabre couldn't get under 12.43.

On its third try, the Suzuki calmed down again and put together four more runs to back up, but not surpass, its earlier low ET. The two best of these were 12.28 and 12.26. The Seca and Sabre couldn't match their earlier times either, and we thought the warming air might be slowing them down. But the GPz proved that theory wrong. On the third run of its last series, it howled through the quarter-mile in 11.982 seconds.

The GPz had one more nasty surprise for its competitors when we started our top-gear acceleration comparison. In this test we start from an actual 50 mph and accelerate. We measure the bike's speed as it rolls through the traps 200 yards away. This is a pretty good approximation of what happens when you try to pass a car without downshifting. It demands the kind of power you want every day.

Once again the Kawasaki proved fastest with an average trap speed of 77.4 mph. Even when shifted to fifth, the Sabre could only manage 76.5 mph, the second-highest speed recorded. In its overdrive sixth, the Sabre puttered through at 71.8 mph, the slowest top-gear average of the four. The Yamaha actually put in the second-best top-gear speed, 75.2 mph, and the Suzuki was third at 74.5 mph.

We hasten to point out that this is not a comprehensive evaluation of the bikes. We simply wanted to compare speed. A complete 750 comparison is scheduled for an upcoming issue. However, if pure speed is your primary concern, and the first question you ask about a bike is, "How fast is it?", you can't ignore the Kawasaki GPz750. *M*

continued from page 65

through Hondaline. Even though we're normally fans of low handlebars, we'd be reluctant to change, especially since the price of the low bars will probably be pretty stiff.

We rode the Sabre hard, and gas mileage reflected it, often dropping to 38 mpg or less. However, what highway cruising we did resulted in fuel consumption figures of 45 to 47 mpg. Our 40.6-mpg average includes a bunch of twisty-road riding plus our sessions at Willow Springs and the dragstrip. Even at that rate, you'll get almost 200 miles out of a tank. And the instrument panel won't let you forget you're running low on fuel.

Sporting riding and touring aren't the Sabre's only strengths; it's also very useful for the commuter. The low-speed manageability is very good, and seat height is fairly low. It starts readily and warms up quite quickly using the handlebar-mounted choke lever. Riding in the city will make you appreciate the good low-end power and the absolutely glitch-free carburetion. We've come to expect smooth carburetion from Honda, a company which seems to be able to take the abruptness out of constant-depression (CV) carbs. The V45 lives up to our expectations, and even though there's no accelerator pump for this engine, there's no sign of leanness either.

Another feature of the V45 engine is more flywheel effect than most fours. Combined with the torquey powerband, this permits you to leave a stop at lower rpm with minimal clutch slipping. Whether idling or running at redline, the V45 has a unique cadence that's unlike the sound of any other bike, and mechanical noise is virtually nonexistent.

THE ALL-ELECTRIC INSTRUMENT PANEL

Those cable-driven gauges we grew up with on our bikes' instrument panels are almost a thing of the past. Electric instruments are lighter, more reliable, more precise, and much easier to maintain. They are also potentially cheaper, although that's not the case with the Sabre. We were told that its LCD clock/stopwatch, fuel gauge, water-temperature gauge, tripmeter, and elaborate warning-and-gear-indicator system are responsible for the extra $100 that the Sabre costs above the Magna, Honda's chopper version of the V45 with more conventional instruments.

Electronic tachometers have been popping up on street bikes for several years now, so the Sabre's is no surprise. However, it also has an analog electric speedometer like the GPz1100. A sensor mounted to a fork leg detects the pulses of a passing magnet which rotates with the hub. A computer counts these pulses to determine speed. As with the tach, which counts pulses from the ignition system, the speedo system does away with the maintenance, routing problems, lube seepage, weight, and breakage associated with a cable drive. Wires are lighter, cheaper, cleaner, and more dependable.

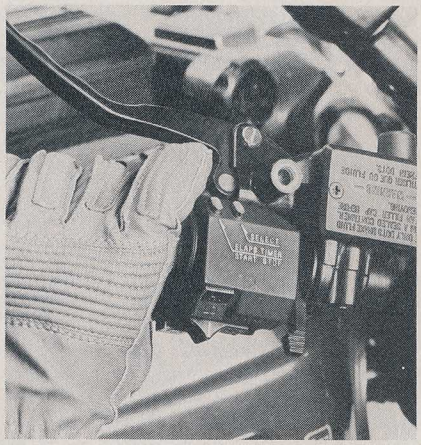
The liquid crystal display (LCD) tripmeter was a natural addition to the electronic speedo. The odometer, however, is an electronically driven mechanical type using a pulse motor. This is apparently done for legal reasons.

Anyone who does a lot of riding, especially commuting, will appreciate the LCD clock on the left side of the instrument panel. It's much easier and safer to read than your wristwatch, and can double as a stopwatch. Two small index-finger-controlled buttons on the left handlebar enable the rider to stop, start, or reset the stopwatch, and to select the stopwatch or clock function.

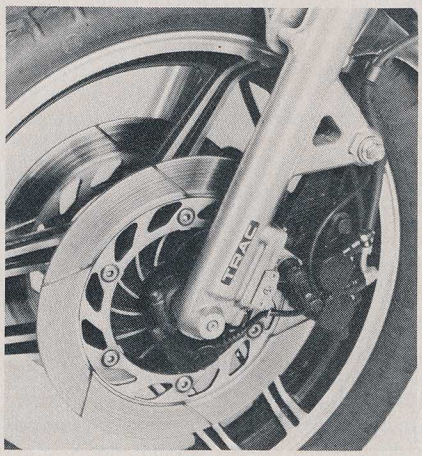
Including the stopwatch may seem like an invitation to set faster and faster times down a favorite section of winding road, but there is a practical side too. It lets you time different routes to work or other frequent destinations, learn how long a traffic signal takes to cycle, or other factors that can make your daily riding easier. You can also use it to take a rider's lap times at the track. It only measures in seconds, however.

One of the four buttons in the panel atop the fork crown enables you to set the clock, even while riding. Another resets the tripmeter. Although the clock and tripmeter displays continue to operate when the ignition is off, the buttons don't work. This prevents anyone from resetting things while the bike is parked.

On the right side of the panel are LCD fuel and water-temperature gauges, each with an eight-dot scale. These dots disappear as you consume fuel or as water temperature drops. It's almost like having an on-board Pac Man game. As with most fuel gauges, the increments are not proportional to the actual amount of fuel used. The dots disappear slowly at first, then more quickly as you near empty. Each dot on the temperature gauge represents about 20 or 30 degrees Fahrenheit. The first dot appears at 111 degrees, and the last two (which come on together) indicate 248 degrees.



Get your own lap times: your index finger can work the dash's stopwatch.



Magnets and wires replace gears and cables in the Sabre's speedometer drive.

The fuel gauge is tied into the central instrument-panel LCD warning system. This system actually combines the features of Yamaha's Seca 750 warning panel with Suzuki's gear indicator. When the Sabre is started, the system runs through its six checks: "T.LGT, H.LGT, WATR, BATT, FUEL, OIL." Then, if everything is as it should be, the LCD indicates gear position with a number, N for neutral, or OD for the overdrive sixth gear.

When something on the checklist develops a problem, a red light at the top of the panel flashes several times, then stays on steadily. The gear-position indicator is replaced by the display indicating the problem. If the light bothers you, simply push the "lamp reset" button on the fork crown, and the light will go out. However, the LCD display will remain until the problem is corrected or the ignition is turned off. When the ignition is turned on again, the system turns the light and the LCD display on again if the problem hasn't been corrected. If a problem in a second area arises while the system is already indicating one, the light flashes again and both indicators are displayed, alternating every second or so. The final button on the fork crown panel prompts the display to run through its checklist sequence. It's a good way to amuse your friends.

One nice thing about the Honda system is its decisiveness. Once it decides that you're low on fuel, the FUEL display stays on until you add some or turn off the ignition. It doesn't go on and off as fuel surges around in the tank during acceleration and braking.

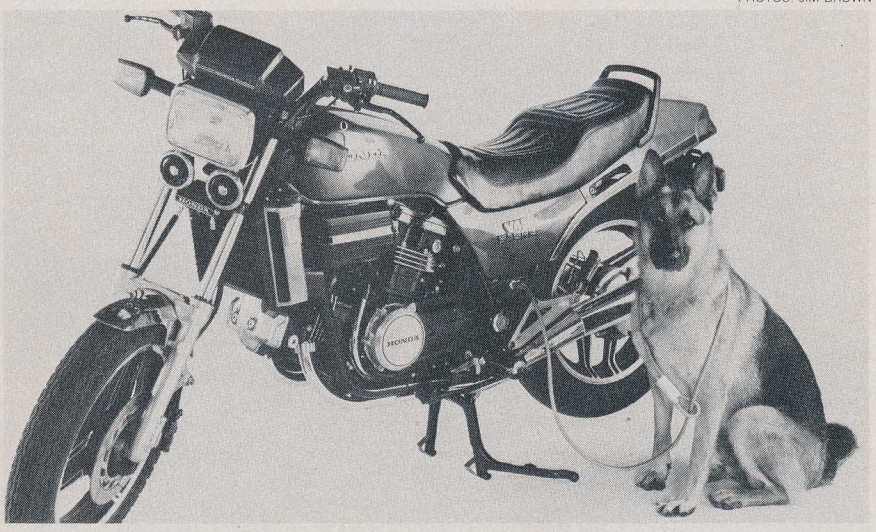
Besides the light for the warning system, the instrument panel includes lights for each turn signal, high beam, and a redundant (but legally required) neutral light. The panel is extremely readable at night, but glare occasionally obscures it during daylight. The whole pod pivots and may be adjusted to whatever angle suits the rider.

If you don't like gimcracks and gizmos, you may dislike the Sabre's instrumentation. But most criticisms are not particularly valid. It *is* expensive, and it may be vulnerable in a crash. However, it is benign; that is, any failures won't affect other operations. It is also readable, lightweight, convenient, and—if the performance of all the LCD watch/calculator/space-game combinations hanging from millions of wrists is any indication—more reliable than conventional instrumentation. As the price goes down, electronic gauges, LCD displays, and other gadgets will probably become the norm. In a few years, the Sabre's instruments may seem primitive. *M*

PHOTOS: JIM BROWN

TO F.O.I.L. A THIEF

PHOTOS: JIM BROWN



As motorcycles become more expensive, they become increasingly interesting to thieves—and also bigger losses for owners and insurance companies. Preventing theft has thus become a more pressing concern. Some insurance companies offer a discount on theft policies if a bike is equipped with an anti-theft device. And, of course, an anti-theft device is the only insurance for an owner who chooses not to pay for a theft policy.

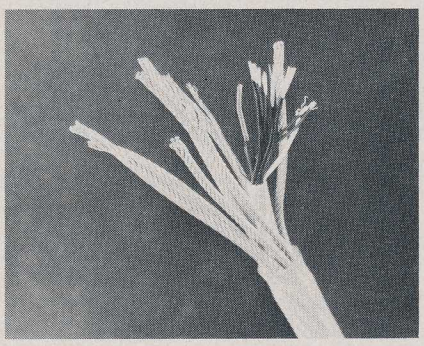
Partially because manufacturers want to make their motorcycles more affordable and secure to own, various cable-lock configurations have appeared as standard equipment in the last few years. However, Honda has gone one step further with their Fiber Optic Integrated Lock (F.O.I.L.) system. This is essentially a self-contained system with a special armored cable which, if cut, sounds an alarm.

The alarm, which contains its own high-pitched beeper and gets power from two AA batteries (instead of the bike's battery), is located beneath the left side panel. The 78-inch cable plugs into the alarm box's face, and the ignition key releases it when it's time to ride away. Contacts in the plug-in end of the cable direct power to an infrared light source in the same end of the cable and through wires to a receiver in the other end. The light passes from its source, through a fiber-optic conductor, to the receiver. If this light is cut off or interrupted, the receiver recognizes it and triggers the alarm. The batteries will sound the alarm for much more time than it takes for the owner to respond—or for a thief to load the bike in a truck. However, the sound is piercing and hard to muffle.

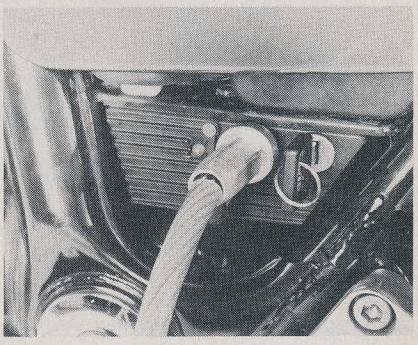
Even cutting the cable is a chore; at the very least you'd need a stout set of bolt cutters to get through the stainless steel strands which coil around the wires and fiber-optic conductor. This inner core is protected from the steel cable's chafing by plastic tubing, and the entire cable is shrouded with plastic to prevent scratching.

Operation is simple. You remove the cable from its own compartment in the top of the locking toolbox (behind the left side panel). Pass it around a light post, German shepherd, or whatever makes you feel secure, and through the loop in its end. Plug it into the alarm box, and an L.E.D. in the box's face will glow for a moment, indicating the system is activated.

We did it for the first time in a pitch-black alley, so it's not difficult. The toughest parts are coiling the cable tightly enough to fit in the box and lining up all the different tabs on the side panel when you're done. Then you can sleep soundly, knowing that even if your bike isn't theft-proof, it's at least going to cause some crook a lot of trouble to turn into Midnite Motorcycle Parts. *M*



Inside the cable: The light conductor and wires from the receiver are shrouded by fiber strands, plastic tube, stainless steel strands, and an outer plastic sheath.



Just ahead of the cable's plug is the light-emitting diode which glows briefly when the cable is plugged in, signifying the system is on and ready to F.O.I.L.

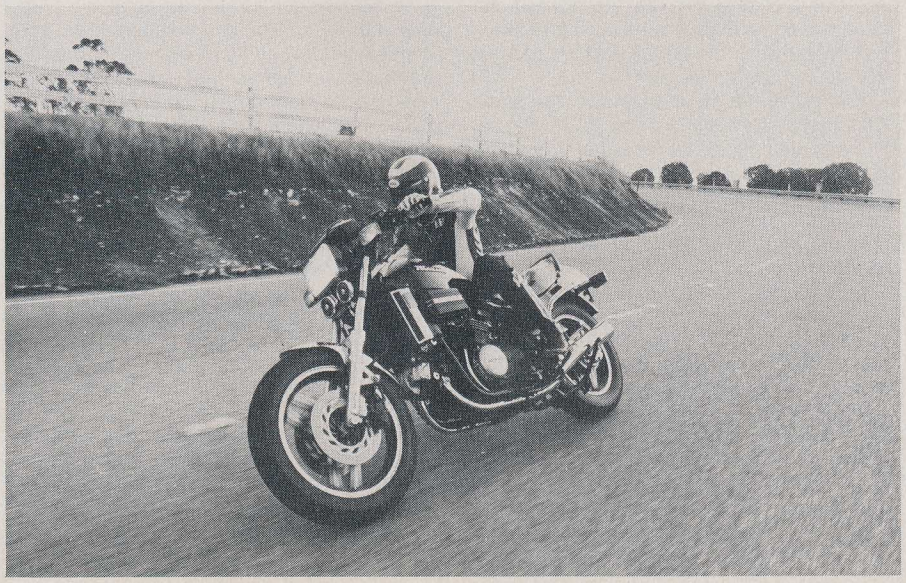


PHOTO: ART FRIEDMAN

The clock, F.O.I.L. anti-theft system, easy-to-use centerstand, and a tail-section storage compartment for gloves or rainsuit are other conveniences for urban riding. The alloy grab rail makes a useful perch for bungee cords. City riding will also make you appreciate the turn signals' self-cancelling feature, which uses a sensor in the steering head to turn off the signal after you turn a corner. Since you don't actually turn the front end when making a lane change or other high-speed directional change, the system will also cancel the signal after you've gone a certain distance *and* a preset time has elapsed. Honda's switch, which uses a solenoid in the cancelling system, may also be cancelled manually by centering the knob.

Other interesting and useful electrical bits include a dual-bulb taillight, front

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RUSS COLLINS ON THE V45

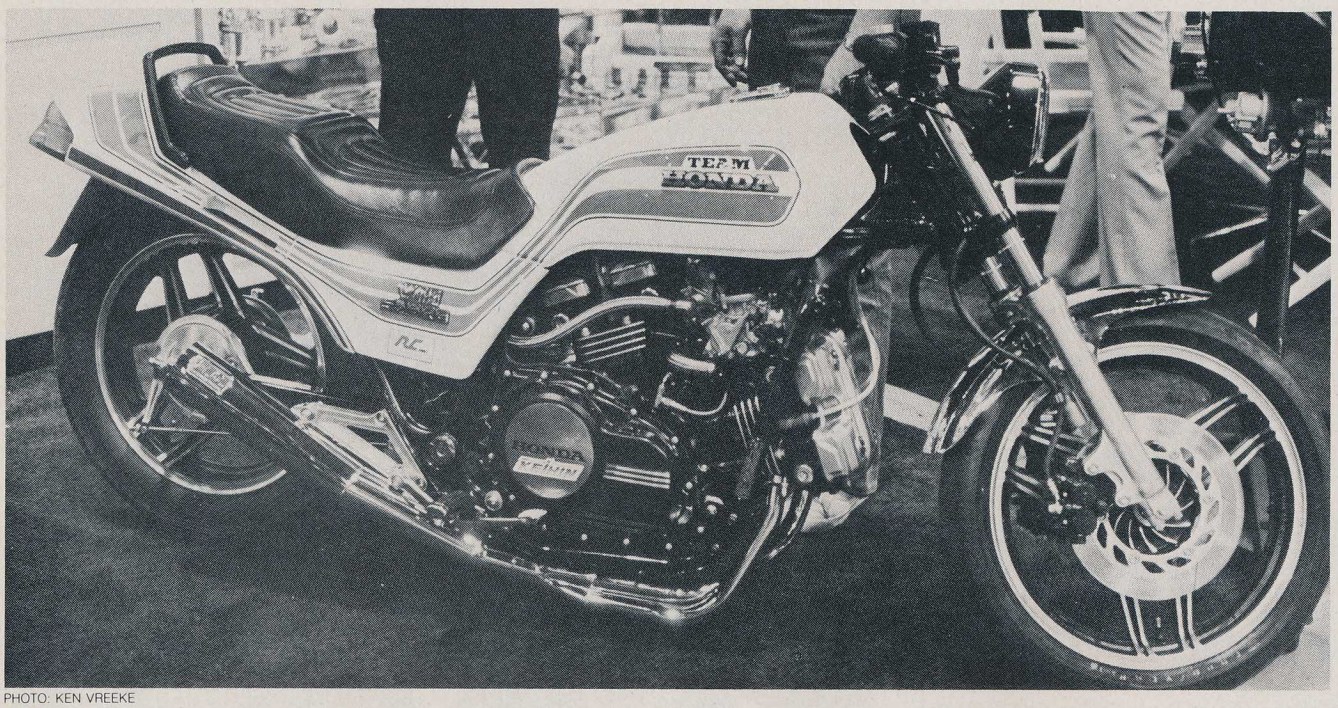


PHOTO: KEN VREEKE

The Sabre, by Collins. No gauges, no air filters, and no ground clearance.

Russ Collins is not a man to mince words. He sits behind his quarter-acre desk in his twelve-acre office, bar included, and talks about the new V45. Collins' business involves tearing the guts out of stock motorcycle engines to see just how far they can be pushed. He's impressed with the Honda, and he says so.

"For the street I've always wanted a 1000 or an 1100—and now macho Russ Collins wants a goddamn 750!"

Back in the R&D section of the RC Engineering complex, there seem to be V45s all over the place. Two complete motorcycles sit in the middle of the room, and there are pieces of V45 motors spread in an even layer over every horizontal surface. David Ray, one of Russ's engine experts, has been going over each part with a micrometer, analyzing, with Russ, the engine's ultimate power potential.

Collins plans to race the V45 in the Super Modified class in dragracing. To do it successfully, he figures he'll need to double horsepower from the stock 80 to over 160. This will necessitate reground cams, bigger valves, an all new carburetor setup, a large-diameter four-into-one exhaust system, and lots more compression. RC hasn't been working on the V-4 long enough to have tried any of their modifications on the strip as yet, so they may run into weak spots in the motor as they twist it up tighter and tighter. The thing that amazes both Ray and Collins now, though, is the number of things in the motor they're *not* going to change.

Ray waves a V45 crankshaft in the air as he talks about it. "This is one of the strongest bike cranks I've ever seen. For the power the engine is designed to put out, it's stronger than most *car* cranks. A lot of time and effort went into it."

The crank spins in four main bearings, each held in place with a four-bolt cap—the first four-bolt mains on a motorcycle in Russ's memory. According to Collins,the connecting rods are beefy enough, after heat treating and shot peening, for the wildest roadracing motor, but for dragracing RC may have to fabricate stronger pieces. The engine has shown an almost uncanny ability to rev *way* past its redline without damage. Broken tach needles are the most serious failures to date.

Collins is enthusiastic about the cylinder-head design: "Honda really did its homework here. The cams are very well supported, and the head flows nearly as well as the GS1100 Suzuki's." They plan to increase the sizes of the valves slightly in their motors, from the stock 23mm intake and 26mm exhaust valves to custom-made Manley pieces measuring 24.5mm and 27.5, respectively.

"As it is, it's a really clean combustion chamber," says Russ. "They're using a 10.5 to 1 compression ratio with unleaded gas, and that says something right there. We'll use a test bike to see just how far we can take the compression with our race bike—just keep milling the heads until we can get something bad to happen."

For the Super Modified motor, the stock EPA carburetors will have to go, of course. RC is contemplating two options. "We might build up two intake manifolds, one for each bank of cylinders, and use one carb for each side. If that doesn't work well enough, we'll probably have to fabricate a downdraft carb for each cylinder."

Collins is no stranger to exhaust pipe fabrication; he built the first four-into-one pipe for the Honda 750 back in 1969. Stock pipes use a metric equivalent of 1.25-inch tubing; Collins will make his new pipe using 1.375-inch tubes.

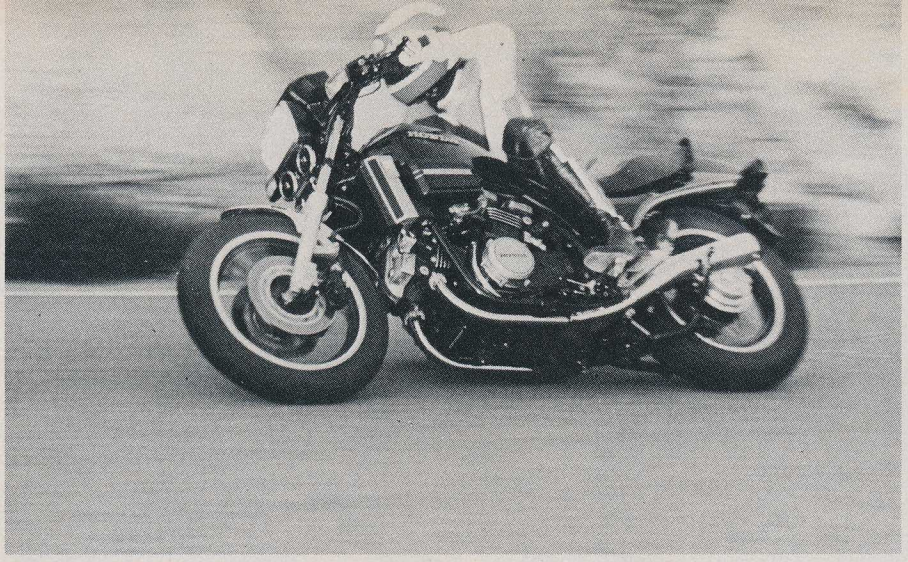
He likes the idea of the hydraulic clutch. "It'll be great for dragracing. It adjusts itself when the clutch plates get hot and expand, and you can get a light pull at the lever even with very stiff clutch springs. The thing will work almost like a slipper clutch—just feed it out nice and easy." RC will use eight of their own CB750 clutch plates, using copper plates instead of steel between the friction plates. The transmission will remain relatively stock, with the gear dogs undercut for positive engagement and the shift drum modified to keep the lower gear engaged until the higher gear's greater speed ratchets the lower gear out of engagement.

The stock shaft-drive assembly will be used on the race bike as it is. Ray was especially impressed with the lack of friction in the drive unit as he spun the wheel with the bike up on its centerstand. "The shaft is plenty strong for Super Modified. We'll run it like it is and see what happens."

Water-cooling is something Collins has been awaiting a long time. "You can only pull so much heat out of an air-cooled engine, but you can stretch the limits a lot further with water. The air-cooled fours in Japanese bikes will go 40 or 50 thousand miles on the street before they need rebuilding; this thing should go 70, 80, 100 thousand miles, just like a Gold Wing." A customer walked up to Collins at a recent trade show and asked him when Honda was going to come out with an air-cooled V-4. "Never, I hope," was Collins' reply.

"Every manufacturer is going to follow Honda with this bike," he says. "Nobody has the power of this thing, the water-cooling, the neutral handling, the low center of gravity, or the progressive rear suspension. And it will be relatively easy to modify for racing. The low CG and small frontal area should make the motor great for roadracing. There are no major problems with the design at all. The engine is very much understressed. If you turbocharged it, I'd estimate you could run 18 pounds of boost without changing anything but the compression ratio."

—Dexter Ford



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running lights, and a position in the ignition switch which allows you to lock the fork with the taillight turned on as a parking light.

Until we took it to the dragstrip and roadrace track, we were prepared to give the Sabre our strongest endorsement ever. We've heard reports that Honda hadn't planned to introduce the bike until 1984 or '85, but other companies' V-fours prompted them to move up their timetable. In some ways the bike confirms that report; it is two or three years ahead of its competition in some respects. The V45 engine is the smoothest power plant we've sampled. It has no blemishes or warts, but it isn't quite as strong as some other 750s. It is also the ideal engine for a motorcycle: besides being smooth, it's short, narrow, torquey, and carries its weight relatively low. It

OFF THE RECORD

PHOTO: DEXTER FORD

Willow Springs saved me. Until we took the Sabre there, I had an acute case of motorcycle lust. Beg, borrow, or steal, I had to have one. I was desperate for one. Its slightly lumpy ride and the occasional missed shift made no real difference to me. I was in love with the engine, the feel, the smoothness, the power, the braking, the dead neutral handling, and even the little extras like the sound, the instrumentation, and the F.O.I.L. system. It seemed to me an unblemished motorcycle, and I had to have one—immediately. If I had to hock a few other possessions, that was tough.

Riding it at Willow pulled me out of my blind rush to own one because in its slight wobble, I found a flaw, albeit minor, that my sporting instincts balked at. I still intend to buy one, but the desperation is gone; I'm willing to bide my time a bit until the money is there from more rational sources. My house is no longer for sale.

—Art Friedman

The V45 is one slick street bike. There are so many things to like about it, I can't help but love the thing during normal street riding. The engine feels strong and torquey down low—not like any Honda 750 I've ever ridden. At the other extreme, I can run the motor up to and beyond the 10,000-rpm redline to get the top-end snap that most Hondas are notorious for. Either way, the V45 doesn't seem to mind.

The extensive detailing on the Sabre keeps me content too. Everything is finished nicely; all the controls are positioned so that they're easy to use. The bike is a pleasure to ride. The only role the Sabre can't play is that of roadracer. At calmer speeds, though, the bike is an excellent handler. The Sabre isn't the hottest sport bike in its class, but it *seems* like it could be the best overall performance compromise. But I'll wait for our big 750 comparison test in June to make *that* decision.

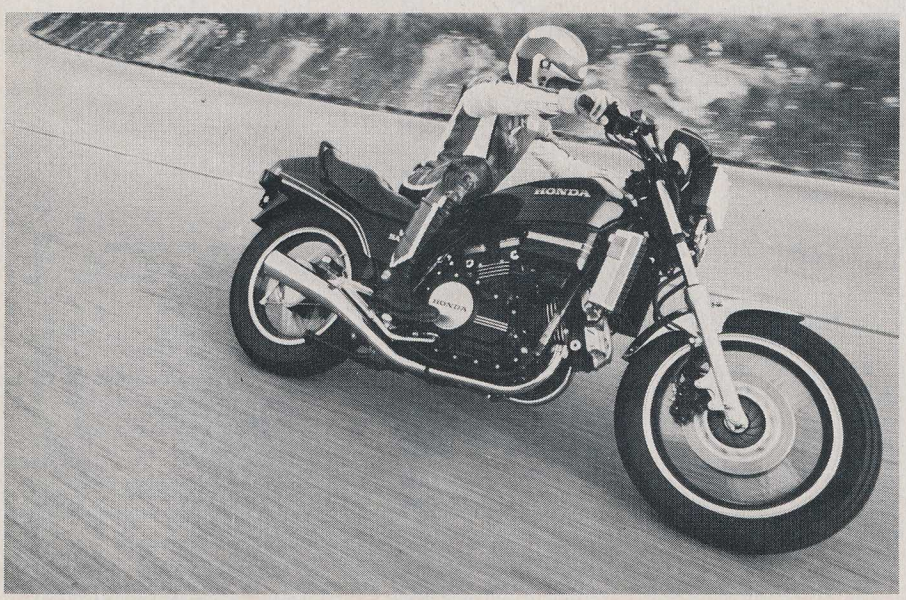
—Jeff Karr

The V45 is obviously the wave of the future. Only problem is, I'm not quite finished riding the wave of the present.

After a few weeks of high-tech delirium, I'm finally coming to the realization that I like the old, conventional, air-cooled Honda 900F better than I like the Sabre. It rides better, doesn't porpoise around on the racetrack, and doesn't require an IBM troubleshooter to tune. With some development time, I'm sure Honda will get it to perform every bit as nicely as the CB900F—and I'm perfectly willing to wait.

There are a V45 and a 900F waiting down in the garage. The V45 is going to stay there tonight.

—Dexter Ford



should be easy to make the chassis for such an engine perform exceptionally well, which is why we were surprised when it wobbled a bit on the racetrack.

Most riders won't take the Sabre to the racetrack or face off with GPz750s at stoplights. For them the machine is an exceptional motorcycle. It's also a terrific bargain. We'd guessed its price would be at or near $3900. We were delighted to hear it is just $3398. You get a lot of technology for that price, which certainly won't go down next year.

Despite our criticisms, the Sabre is a superlative motorcycle. In one stroke, Honda has advanced the state of the motorcycle-building art. In-line fours are not yet relics, but they have certain disadvantages which may soon become harder to overlook. The age of the V is upon us, and we think it's going to be a very good time. *M*