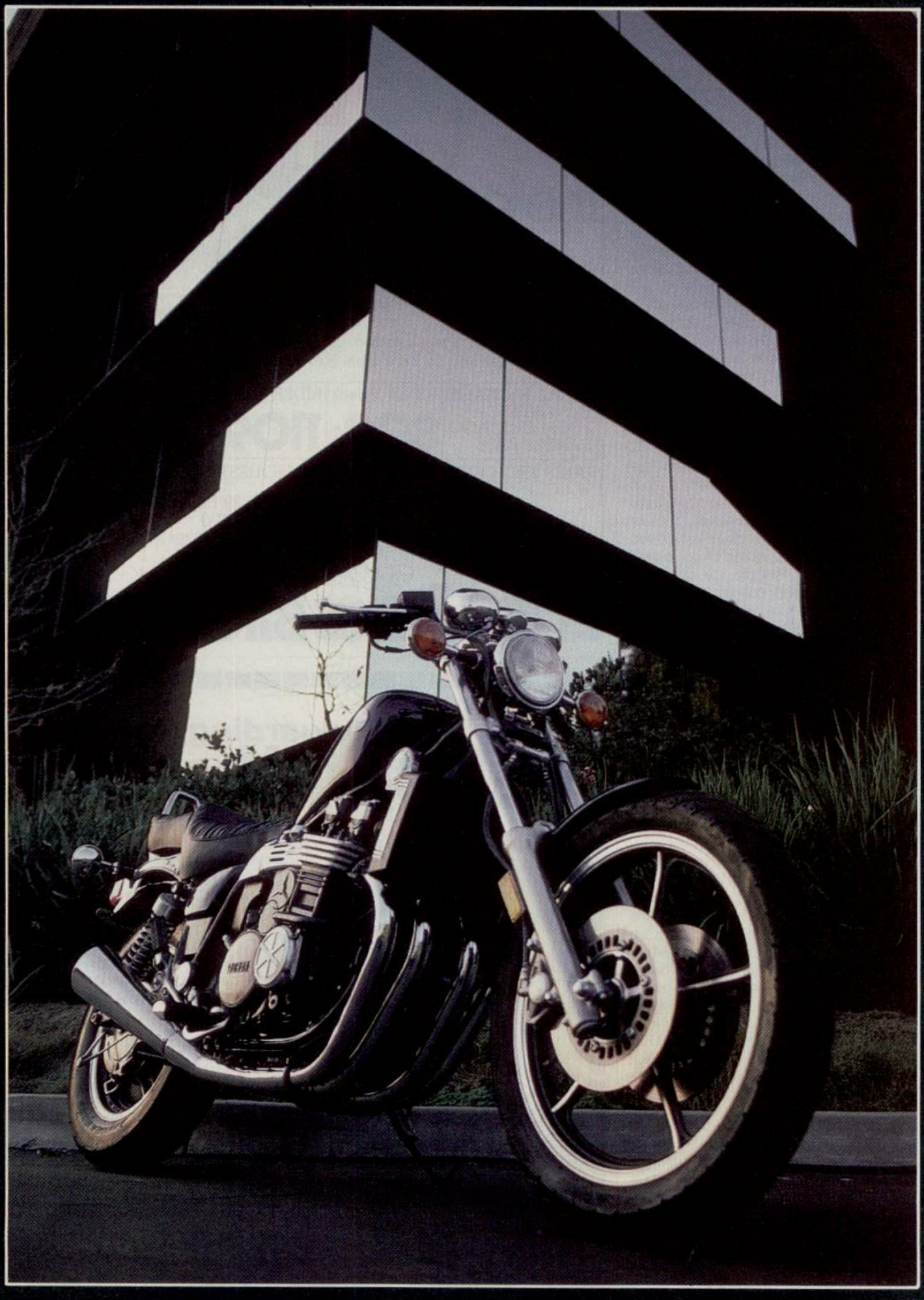
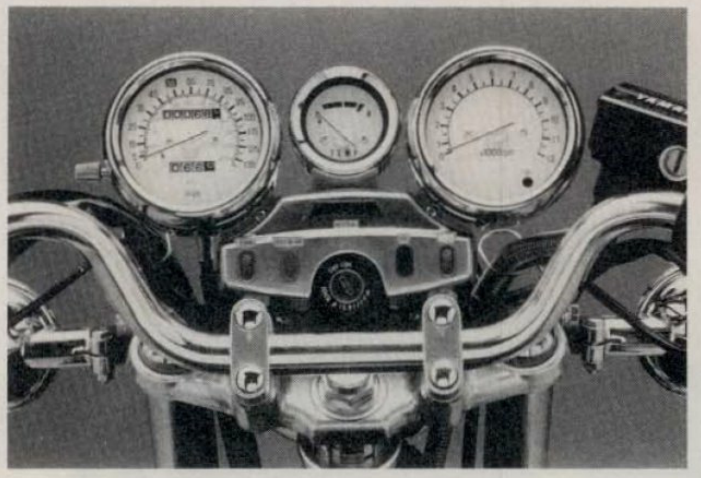
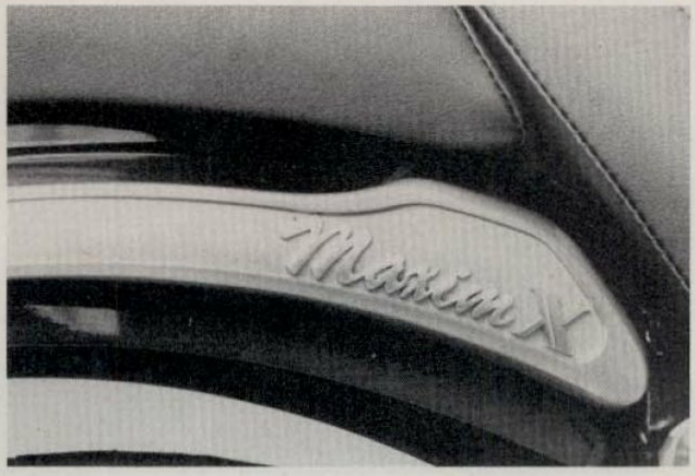


YAMAHA XJ700X MAXIM

You know the policy book on cruisers: celebrations of form. Function missed the party or never got an invitation. Now Yamaha rolls out its new five-valve Maxim X, and this bike says form and function can unite in Peaceful Coexistence. Make that High-performance Coexistence.





☐ Sporting purists beware. It is no longer possible to soft-pedal cruisers as mechanized cosmetology, two-wheeled pompadours as debased of functional integrity as they are possessed of garish filigree. Yamaha's new XJ700X Maxim may sparkle with ornamentation and shimmer with stylish curves, but don't let its luminosity blind you. As a cruiser, it is extraordinary in its ergonomic sensibility and functional leanings, exceptional in its speed and acceleration. The new Maxim's five-valve, liquid-cooled engine delivers performance that absolutely flattens anything in its class and makes it as hot as any sporting 750 ever, save Yamaha's own five-valve FZ750.

The Maxim X lays to ruin the dichotomy of style and function: More significant even than its 20-valve technology and high-performance numbers is its demonstration that trendy fashion need not preclude comfort and versatility and that power and high-style need not be at odds. With the Maxim X, Yamaha has rounded the corner and headed back with function as the central issue, back to the virtues of solid engineering that remain long after the glitter has lost its sheen.

What's more, the Maxim provides an engineering perspective of cruiser evolution. Yamaha's original Maxim, introduced four years ago, marked the end of cruiser adaptations—the practice of bolting high bars and low seats to existing standard models—and the beginning of Japanese cruiser engineering from the ground up. The resulting 650 Maxim emerged as a huge marketing success even though it manifested distinct handling disabilities and set new lows in spatial deprivation. The 650 was a novelty—a bit of style in a single pictorial flash—but its 12-second engine screamed motion loud and clear.

Four years later we have the Maxim X, more stylized and in every way a more accomplished piece than the first-generation Maxim. Five-valve trickery aside, Yamaha trumpets no breakthrough technology in bringing about this metamorphosis; a quick scan of the essentials reveals precious little change from the original article—twin-shock rear suspension, leading-axle fork, full-cradle frame, stepped seat, and a shaft final-drive, crankcases and cylinder block that remain unchanged. So where are the big improvements in the Maxim?

In truth, Yamaha engineers have made drastic changes, visually subtle yet significantly effective. In choosing to improve the Maxim while preserving the traditional cruiser look, Yamaha encountered the single most difficult problem for anyone who makes such an

PHOTOGRAPHY: DAVE HAWKINS, SCOTT DAROUGH

YAMAHA MAXIM

attempt: How do you maintain a profitable silhouette when the components most in need of change are the very ones that dominate the picture? (Could Dolly Parton become an effective sprinter without losing something along the way?) Sweeping handlebars cramp the riding positions, stretched front ends tend to flex, and low seats impose severe limitations in wheel travel. Cruiser engineers concerned with ride quality, cornering ability, stability and general comfort face formidable and unique problems.

Look at the new Maxim's handlebar and see the previous buckhorns wrestled into a more sensible shape: lower, flatter, angled to position the rider's palms down; look at the seat and see a more comfortable perch that places a rider even closer to the ground; look at the footpegs and see them moved forward and down to provide more leg room. Simple enough, but what you don't see are the complex chassis alterations fundamental to the Maxim's reshaping. Yamaha engineered an entirely new frame for the X, one that plays visual tricks with the front end. The steering head is located considerably higher than the old Maxim's to offset the lower handlebar. Since the fork is much longer than the 650's, Yamaha increased the diameter of the stanchion tubes from 36mm to 38mm and linked them with an aluminum fork brace. In addition, the front end kicks out two and a half degrees farther, up from the 650's 29-degree rake figure, and trail has dropped four millimeters. To regain any steering agility lost in the additional rake, new aluminum triple clamps carry the fork with less offset.

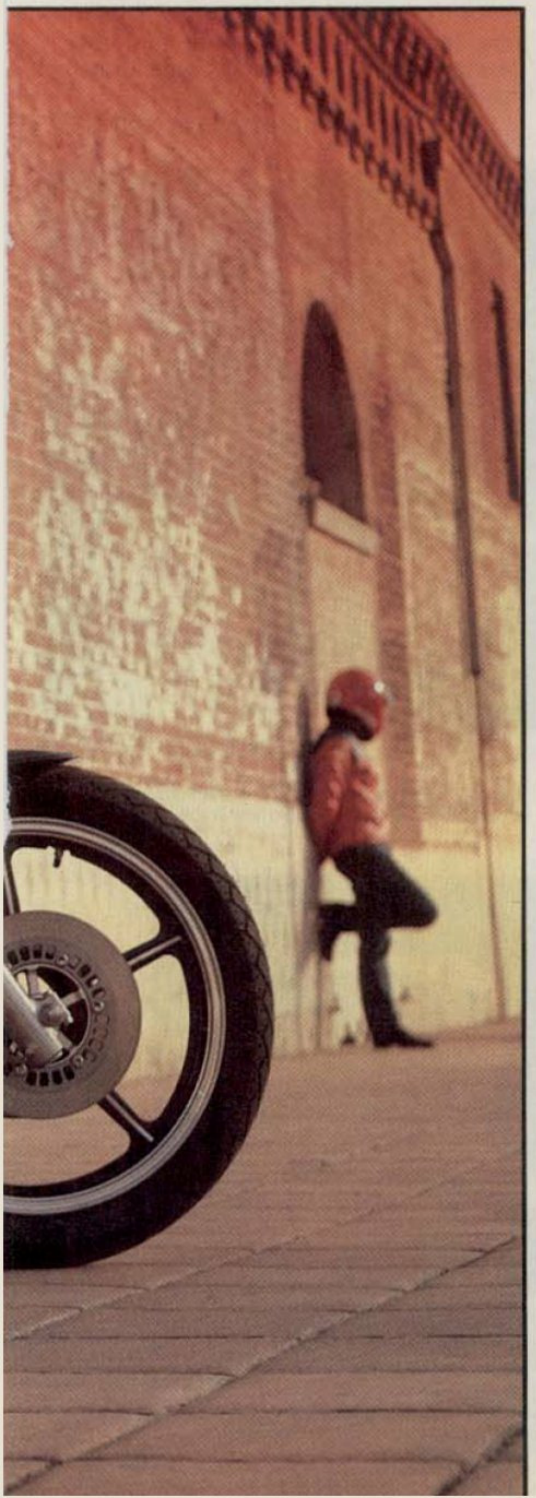
Given the additional fork length, Yamaha was able to increase wheel travel to 5.9 inches, up from 4.7. The extra travel also provides more latitude in suspension calibration: spring rates up front are lighter than before, and rebound damping is slightly increased. To

keep the lighter coil springs from bottoming, Yamaha has provided a single air-valve which links and balances pressure in both fork tubes and makes adjustment easy.

Yamaha engineers also worked style-engineering tricks on the rear. The tail section of the frame is lower, bringing the seat height down, and the dual rear dampers are canted forward. Though shock travel dropped 10mm, wheel travel is up three millimeters. We suspect this change in shock position has more to do with styling than rear-suspension performance; we also suspect the improvement in ride quality is a reflection of more sophisticated damping components and knowledge gained in coordinating spring and damping rates.

Yamaha first sought to control heavy shaft-drive components in limited travel suspension systems with heavy compression damping, light rebound damping and light springs. In the original Maxim, the result was an alternately squishy and harsh ride with enough shaft-induced spasms to initiate high-speed wobbles. In the XJ700X, Yamaha has moved away from heavy compression damping, relying instead on heavier spring and rebound damping rates to control the shaft. The XJ700X's rear suspension is far more responsive than the old 650's—more linear, plusher, and more effective at muting the shaft drive's up-and-down antics.

Yamaha's stylists made the job of recalibrating the rear suspension more complicated by fitting the Maxim with a heavier rear wheel. The 16-inch cast aluminum hoop is solid but for five narrow slots and carries in its hub a drum brake. Tire size and rim width are identical to the old 650's and put a good deal of rubber on the ground. Up front, we see function gaining a clear advantage—in place of the 650's narrow 1.85-inch wheel is a cast aluminum five-spoke, 2.15-inch unit which wears a correspondingly wider tire. With a bigger footprint up front, the Maxim rider can now take advantage of the XJ's additional front disc brake.



Here's good advice to the 750 sporty-bike crowd. If you see a Maxim X lurking at the stoplights, don't be baiting this 20-valve wonder.

YAMAHA MAXIM

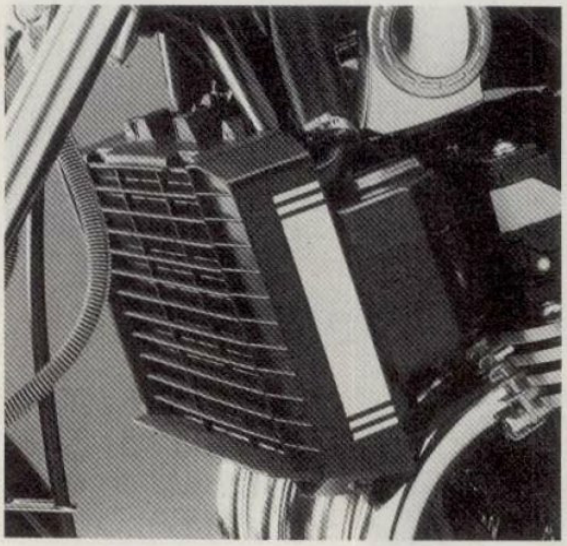
Powerful and linear, the dual front discs do an admirable job of stopping the Maxim, but we'd prefer less lever effort. Coupled with a long-travel throttle mechanism, the high-effort brake lever can swell your forearm quickly during swift backroad work. It is precisely here—on snaky, torturous swervery, that the Maxim divorces itself from the traditional cruiser crowd. While the Maxim may be visually linked to its laid-back contemporaries, its handling abilities enable it to keep more sporting company. Its accommodating ergonomics, suspension balance, grippy tires and ample cornering clearance place it in the same handling league as Honda's snappy Nighthawk S.

Despite gaining some 40 pounds (but still weighing in only 1.5 pounds heavier than the Nighthawk) and 2.5 inches of wheelbase over the first Maxim, the five-valve X-model displays superior equilibrium and broader handling capabilities than the original. Though a good deal of driveline lash is apparent in the lower gears, shaft effect is less pronounced than anything we've sampled from Yamaha. With rear shock preload set on the number four of five positions, shaft induced rise and fall is minimal. Cushier during urban trolling and freeway riding at the lower settings, rear suspension action at the upper settings translates to a firm ride.

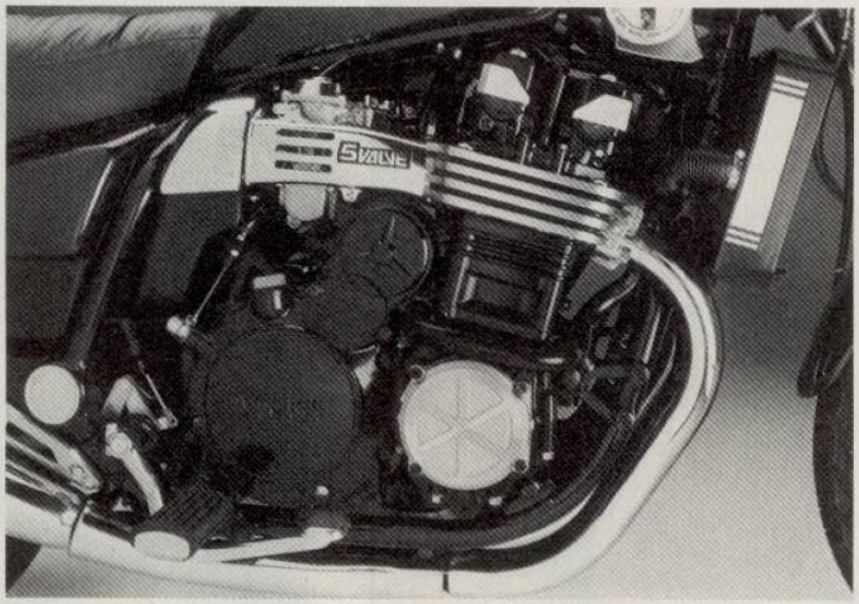
Attribute much of the Maxim's comfort to its excellent seat. Wide, well padded and properly dished, the Maxim's saddle provides room to move about, support for the rider's thighs and a good measure of isolation from jolts that sneak past the rear suspension. Sharp bumps taken at speed would spike the rider's tailbone with a lesser seat or a bolt-upright riding position, but the Maxim's plush perch and subtly aggressive seating arrangement ensure unchecked jolts are dissipated.

The front suspension needs only air-assistance—from 10–17 psi—to perform its many tasks. Set up softly, the fork is plush and responsive but prone to dive excessively during hard braking. Even when the fork was set at higher pressures, some of our testers felt the need for an anti-dive system; keep in mind, however, this need arose only when the Maxim was ridden well beyond the limits of the average cruiser. At these high speeds, the fork provides the Maxim's only serious weakness. Cornering at a truly sporting pace can cause the fork to flex, particularly on a ripply surface. While the fork brace prevents torsional movement, it provides little resistance to the fore and aft flexing that robs responsiveness in so many stretched cruiser front ends.

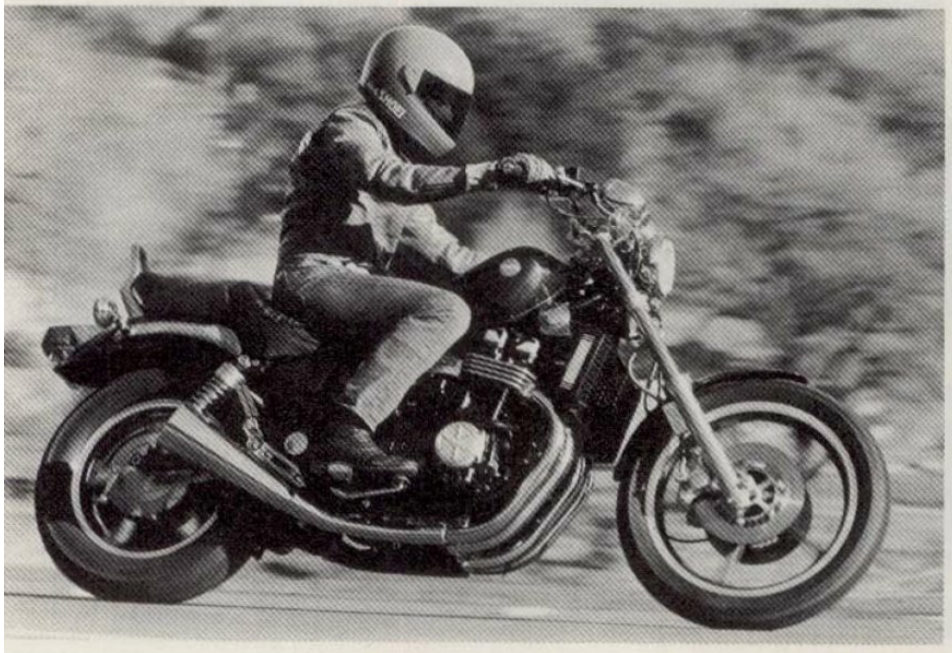
Other manufacturers have solved

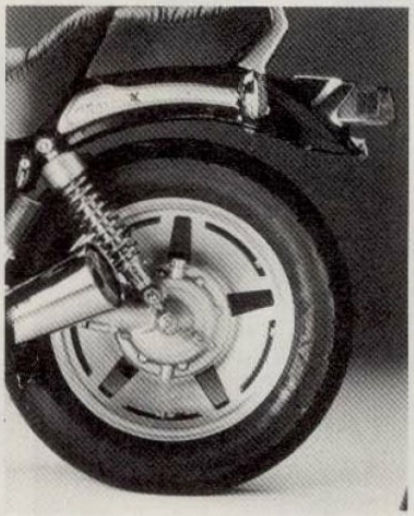


Cool California climes prevented critical examination of 2.4-liter, cross-flow cooling system.



The original Maxim bottom end and shaft-drive assembly appear for the eighth time in the X.





Rear wheel may look stylish, but its extra weight makes the limited travel suspension work harder.

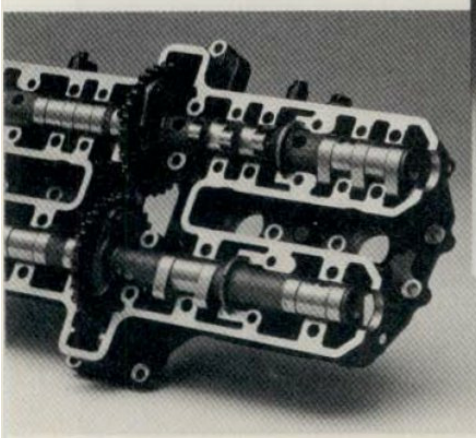
this problem with larger-diameter fork tubes and by increasing the distance between triple clamps to provide more support. Yamaha instead fitted the Maxim with a gull-wing-shaped lower clamp that increases the unsupported length of the stanchions. This arrangement has traded style for function and is not in keeping with the Maxim's new character.

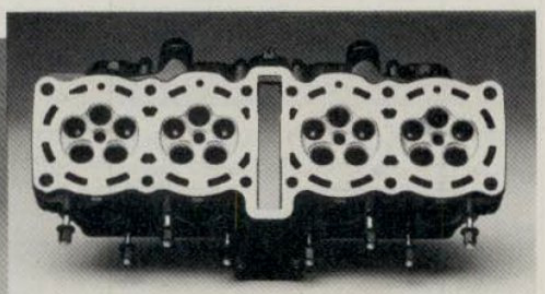
Nevertheless, the Maxim-X has elevated cruiser form to new functional heights. It is, beyond a doubt, the most athletic cruiser we've ridden. This is progress. Yamaha's cruiser chassis engineers, at one time two steps behind the stylists and engine designers, have caught up in a single forward leap and freed the stylists and engine designers to proceed unshackled.

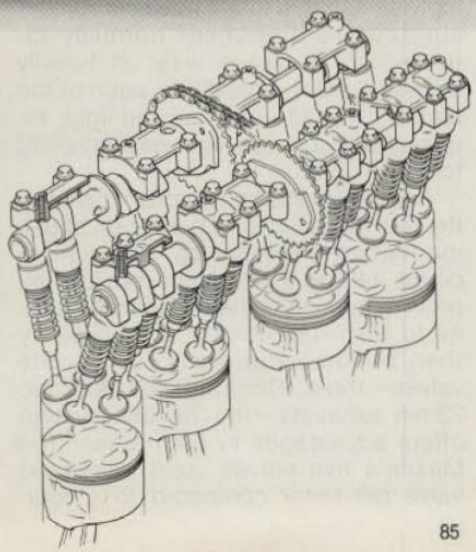
Yamaha's approach to building the XJ700 engine was simple and direct. Four years ago, engineers designed a compact, in-line four to power the original Maxim. By moving the alternator from its standard crank-end placement to a gear-driven jackshaft behind the cylinder block, Yamaha could give this plain-bearing engine wide bore centers within narrow overall dimensions. Through several bore and stroke variations this same bottom end and drive shaft unit have proven a rugged foundation for eight different Yamaha models—ranging in displacement from 650 to 900cc—including the Maxim X.

The X distinguishes itself from this group by being the quickest incarnation yet. Yamaha's XJ900 Seca—a rocket just two years ago—posted an 11.82-second quarter mile; our Maxim ran a scalding 11.79-second quarter at 112.82 mph. Furthermore, its 0–60 acceleration is closer to Kawasaki's potent 900 Ninja than to anything in its own class. Its top-gear roll-on figures from 45–70 mph place it deep into big-bike territory and prove that the Maxim X doesn't sacrifice mid-range for blinding top-end. If this broad-range muscle is five-valve technology speaking, we like what we hear.

Not coincidentally does Yamaha's five-valve FZ750 sport bike share cylinder bore and bore-center dimensions with the Maxim X even though the FZ's lower end is completely new. Yamaha had a fire-breather Maxim in mind when the FZ was on the drawing board, and by sharing dimensions the Maxim could also borrow from the FZ's parts bin. Both bikes use common valve gear, liquid-cooled cylinder block and upper cylinder-head castings. Though the bore centers were wide enough to accommodate liquid-cooling, there was not enough material between bores to provide the needed structural strength with wet liners. Both the Maxim and FZ use semi-wet liners—a sandwich arrangement with dry liners top and bottom and liquid flowing against the iron liners in







Twenty-poppet-valve power arrives in the Maxim courtesy of Yamaha's FZ750 project. Both bikes share three-tier cylinder-head construction, valve gear, and top and central castings. Because the Maxim's cylinder block is angled at only 14 degrees, the bottom tier was recast to accommodate curved ports and standard sidedraft carbs.

YAMAHA MAXIM

the center and up through water jackets to the cylinder head. This central section is positioned within the cylinder block so the piston always strokes within the wet liner where heat dissipation is most crucial.

Sliding the Maxim under the ITC tariff wall was a matter of clipping the FZ's 51.6mm stroke down to 48.0mm, one of the shortest stroke dimensions in all of motorcycling. With the same top-to-bottom cylinder-block height as the FZ and a shorter stroke, new pistons had to be made to bring the Maxim's compression ratio back up to FZ-spec 11.2:1. These pistons are longer from wristpin to crown than the FZ's, and we suspect the weight of their additional material is partially responsible for the Maxim's lower redline—10,000 compared to the FZ's 11,000 rpm.

After much deliberation over valve configuration (see *Cycle*, March 1985, for the FZ750 Tech Analysis), Yamaha engineers arrived at five valves per cylinder because it produced the greatest benefits with the least complication. Which is not to say the system is simple or a snap to adjust. Placing 20 valves and 20 cam lobes in a space previously occupied by only eight is bound to complicate valve adjustment.

As in the FJ1100, Yamaha chose direct valve actuation for the Maxim's five-valve system. Each cam lobe rides against a cylindrical, flat-topped follower. Adjusting shims, located between the valve stems and the followers, can only be changed with the camshafts removed. While this system is no doubt more trouble to adjust than a rocker-arm setup with screw-and-locknut adjusters or a shim-over-bucket system, there are no rocker-arms to flex and no possibility of shim spitting at high rpm. To extend valve adjustment intervals, Yamaha used top-shelf valve components: Valve seats are sintered copper iron, and the hollow chromemoly camshafts' lobes have carburized surfaces—a treatment normally intended to decrease wear in heavily stressed gears. In addition, each of the Maxim's valves are small and light, requiring only a single, light-gauge spring for valve control.

Aside from increasing displacement, the four-stroke engine builder must use innovative methods to gain horsepower: raising the engine's rpm and improving the combustion chambers' ability to burn fuel quickly and efficiently then become the goals. Using five valves—three 21mm intakes and two 23mm exhausts—the Yamaha system offers advantages in both areas. The Maxim's five valves yield increased valve perimeter compared to a four-valve system. This allows shorter cam timing, which means the piston requires almost no valve relief. The large cylinder bore and small valves allow the use of narrow valve angles and a shallow combustion chamber, which makes high-compression possible without domed pistons. In fact, both the Maxim and FZ use dished pistons to form what Yamaha calls a "lens-shaped" combustion chamber. This bi-convex chamber offers unobstructed flame travel and a high concentration of charge near the centrally located plug. By clearing the combustion chamber of obstructions, fuel can burn faster and more efficiently, allowing the Maxim engine to tolerate a high-compression ratio without the threat of destructive detonation.

To make room for all that valve gear, Yamaha designed the Maxim's cylinder head in three tiers: the lower portion contains the combustion chambers, ports and valves; the second story houses tappet guide bores, camshaft webbing and support bearings. A magnesium valve cover serves as a roof for the structure. The Maxim's lower half differs from the FZ750 because the FZ's cylinder block is angled forward at

(Continued on page 111)

TEST SPECIFICATIONS

Make and model	1985 Yamaha XJ700XN Maxim
Price, suggested retail (as of 1/23/85)	$3499
Performance	
Standing start ¼ mile	11.79 sec. @ 112.82 mph
Acceleration, 0–60 mph	3.20 sec.
45–70 mph, top gears	(3) 3.28 sec., 274 ft. (4) 4.32 sec., 367 ft. (5) 5.04 sec., 433 ft.
Braking, 60–0 mph	121 ft.
Engine rpm @ 60 mph, top gear	4663
Average fuel consumption rate	44.6 mpg (18.9 km/l)
Cruising range (main/reserve)	116/36 mi. (187/58 km)
Load capacity (GVWR less curb weight)	519 lbs. (235 kg)
Maximum speed in gears @ engine redline	(1) 48 (2) 69 (3) 91 (4) 112 (5) 129
Engine	
Type	Four-stroke, transverse four; liquid-cooled with two chain-driven overhead camshafts; five valves per cylinder
Bore and stroke	68.0 x 48.0mm (2.68 x 1.89 in.)
Piston displacement	697cc (42.5 cu. in.)
Compression ratio	11.2:1
Carburetion	(4) Mikuni 33mm constant-vacuum
Exhaust system	Four-into-two
Ignition	Battery-powered, inductive, magnetically triggered
Air filtration	Paper element, disposable
Oil filtration	Paper element, disposable
Oil capacity	3.7 qts. (3.5 l)
Transmission	
Type	Five-speed, constant-mesh, wet-clutch
Primary drive	Straight-cut gear; 97/58, 1.67
Final drive	Shaft and bevel gears; 19/18 x 32/11, 3.08
Gear ratios (transmission)	(1) 35/16, 2.19 (2) 30/20, 1.50 (3) 30/26, 1.15 (4) 28/30, 0.93 (5) 26/32, 0.81
Gear ratios (overall)	(1) 15.33 (2) 10.50 (3) 8.05 (4) 6.51 (5) 5.67
Chassis	
Type	Double-downtube, full-cradle frame; tube/box-section steel swing arm
Suspension, front	Leading-axle, air-adjustable fork with 38mm tubes and 5.9 in. (150mm) of travel
rear	(2) shock absorbers, adjustable for spring preload, producing 3.9 in. (99mm) of rear-wheel travel
Wheelbase	59.8 in. (1520mm)
Rake/trail	31.5°/4.7 in. (120mm)
Brake, front	Hydraulic, dual-disc with dual-piston calipers
rear	Rod-actuated, single-leading-shoe drum
Wheel, front	Cast, 2.15 x 19
rear	Cast, 3.00 x 16
Tire, front	100/90-19 57H Bridgestone Exedra G525
rear	130/70-16 67H Bridgestone Exedra G525
Seat height	30.5 in. (775mm)
Ground clearance	6.5 in. (165mm)
Fuel capacity (main/reserve)	2.6/0.8 gals. (10.0/3.0 l)
Curb weight (full tank)	517 lbs. (234.7 kg)
Test weight	672.5 lbs. (305.0 kg)
Electrical	
Power source	AC generator
Charge control	Solid-state voltage regulator
Headlight beams (high/low)	60/55 watts
Tail/stoplights	(2) 8/27 watts
Battery	12V 14AH
Instruments	
Includes	Speedometer, odometer, tripmeter, tachometer with 10,000-rpm redline; coolant temperature gauge; warning lights for low oil and fuel levels; indicators for high beam, turn signals, neutral
Speedometer error, 30 mph indicated, actual	30.29
60 mph indicated, actual	59.79

Customer Service Contact
Yamaha Motor Corporation
6555 Katella Avenue
P.O. Box 6555
Cypress, CA 90630
(714) 761-7300

Maxim *Continued from page 86*

45-degrees to facilitate straight ports and downdraft carbs. By utilizing the existing 650 crankcases, the Maxim's cylinders are locked in at a 14-degree forward cant; straight ports with such a head at this angle would put the carburetors somewhere around your belt buckle. A new lower tier was cast to accommodate the Maxim X's downward port deviations and four standard sidedraft 33mm Mikuni CV carbs.

With the Maxim's five-valve system, Yamaha engineers have managed to thumb their noses in about five different directions. Not only does the Maxim make startling mid-range in a power curve that leads with few bumps to astonishing top-end poke, it does so with flawless carburetion that sips instead of gulps: Extended deep-throttle sessions dropped mileage to only 39 mpg: Leisurely highway riding delivered 51 miles for every gallon that passed over the Maxim's palate.

Frugalities aside, the Maxim's engine is a smooth piece—no-fuss cold-starting manners; slick, crisp, well-matched gearbox; sturdy clutch; no annoying vibration. At 55–65 mph, some vibration passes through the engine's rubber mounts, but it is a muted roughness with no sharp edges.

Down low, the X is aggressive enough to let you zip past freeway traffic without touching the shift lever, but at 7500 rpm an impressive disappearing act occurs. The X kicks so hard above seven-five its mid-range feels wimpy by comparison. From 7500, it will rev quickly past its 10,000-rpm redline—quickly enough to lighten its front end exiting corners and trigger its 12,000-rpm electronic rev limiter if you're not careful. Those who aren't careful may find no reason to be—the Maxim continues to make serious power deep into the red zone and will pull to redline in top gear: 129 mph.

The Maxim X is a motorcycle that doomsayers claimed would never be built. Traditional cruisers have function all right; it's a function of style. In the Maxim X, we see stylized function—a different matter altogether. The suspension still has some weaknesses, and it is here that the cruiser engineers must concentrate future efforts. Still, the Maxim's broad range is impressive. It is capable of outgunning anything in its class, while also being genuinely comfortable, nimble around town, and a willing and able backroad accomplice.

At a time when all motorcycles are more specialized and yesterday's do-all standard is history, Yamaha has created a balanced, versatile machine that imposes few limitations, a machine that could easily become the standard of tomorrow. ■