

Yamaha XV920R

"A skittish motor-bike with a touch of blood in it is better than all the riding animals on earth." —Lt. Col. T.E. Lawrence

BY STEVE THOMPSON

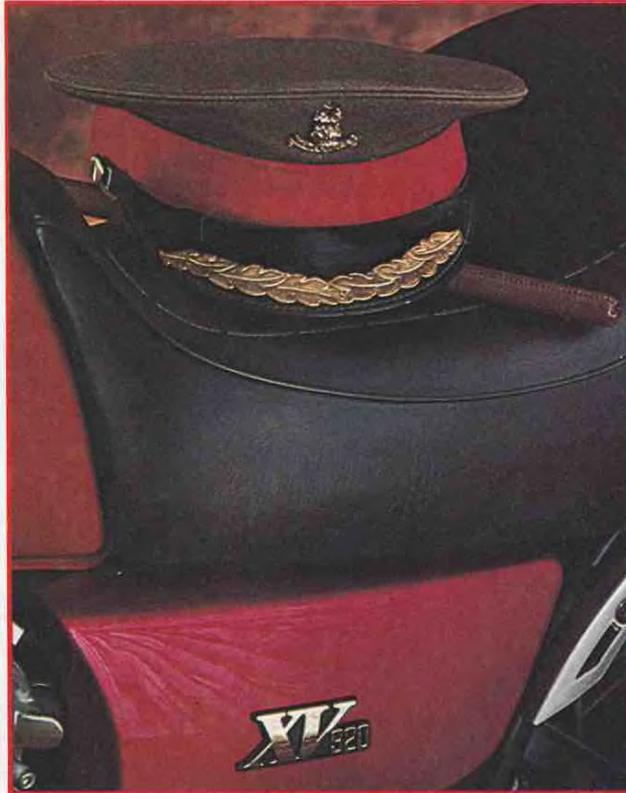
The big news on May 19, 1935 in England was the crash of Lt. Col. T.E. Lawrence, who jammed himself and his motorcycle through a hedge trying to avoid traffic. But as newsworthy as Lawrence of Arabia's death was, no less so was the bike he was riding. In the mid-Thirties, the Brough Superior was very hot stuff indeed, touted by George Brough as "The Rolls-Royce of Motor-Cycles," and evidently thought so by a small but highly visible and socially impressive list of owners. And centerpiece of the Brufsup SS100 was an engine that even in 1935 had become as familiar to motorcyclists as gravel rash: a big-inch vee-twin.

A lot has changed since Lawrence high-sided into history, but motorcycling's love affair with the vee-twin has never really dimmed. The list of famous and enduring vees is recognizable to any motorcyclist from any era since the Thirties, comprising as it does names like Vincent, Harley-Davidson, Indian and Ducati.

To that list, of course, was added the 750cc Yamaha Virago this year. It was a much-heralded, much-applauded attempt by Yamaha to cash in on a rich vein of moto-lore while capitalizing on the company's own Special understanding. But now, to every 10 Viragos that sit on Yamaha showrooms has been added at least one of a different version of the same basic frame and engine. In Europe, its primary market, the bike displaces 980cc and is painted either red or silver. Here, because of a smaller bore-size, it is a 920, is available only in red and with a "more conservative" handlebar. Otherwise, the XV920R is a Yamaha TR1.

Yamaha officials say the TR1/920 is not simply a testing-of-the-Eurobike waters here, because, they say, they know that a market for Euro-concept machinery does exist—as CYCLE GUIDE pointed out in its exclusive test of the Euro-XJ650 (November 1980). The market is, they readily admit, a smallish one, made up of older, experienced riders who have enjoyed the zap of multicylindered life but are searching for a new kind of ride—a search that usually leads them to BMW or Ducati.

The benchmarks for the 920, therefore, are not bikes like the Kawasaki GPz1100 or Suzuki GS1100, but the BMW R100 or Ducati Darmah. This means that, to be successful, the 920 need



not be a drag king, but must have an appetite for low-effort speed over long stretches of two-lane, must produce good fuel economy at those speeds and must possess grace under pressure.

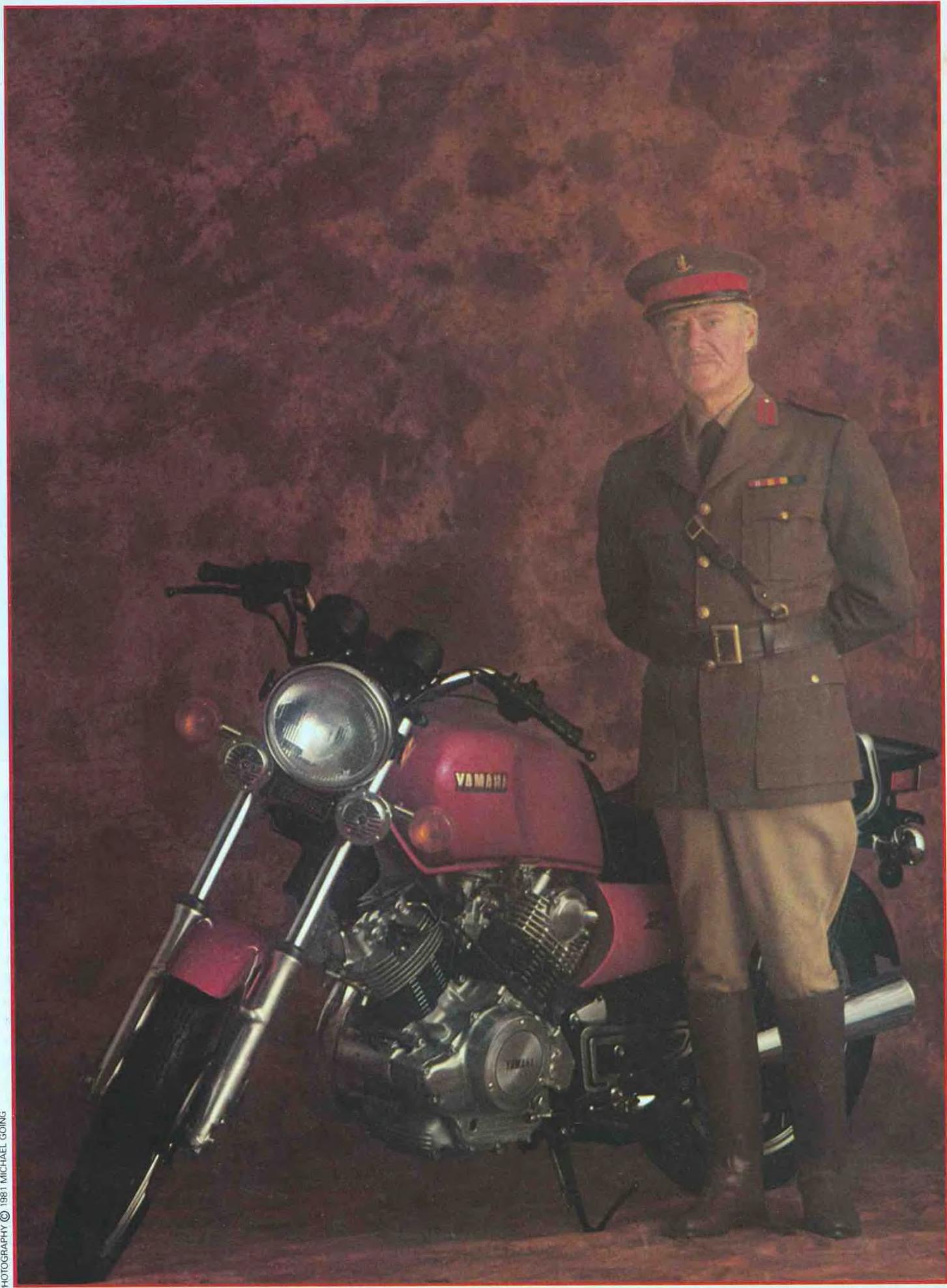
Yamaha has chosen to meet these demands not by the usual European methods of building street bikes descended from racers which are then refined on the *autostrade*, but by the more usual Japanese method of design-for-the-job. Yamaha has already been successful with this approach with its Specials, the Maxim and Euro-XJ650 and, lately, the Virago.

The analysis must have convinced the engineers that a radically new vee-twin wasn't necessary, because the Virago/920/TR1 engine is derived directly from previous Yamaha single experience—which explains the resemblance between XT250 cylinder heads and the vee-twin's heads. However, any resemblance to the push-rod vees of the past is pure illusion, because despite its clean exterior, X-ray vision would show you that the 920's engine really is complicated indeed. Its single-overhead camshafts are driven by two separate sets of cam chains, each with a complex three-gear intermediate set and its own cush mechanism. It runs "backwards," according to Yamaha, to use the jackshaft required to transmit power from the right end of the gearbox to the left-side shaft and chain drives. If the motor ran "forward," the jackshaft would spin the final-drive devices in the wrong direction. And intake plumbing, in order to be kept away from a rider's legs, directs air through a duct below the steering head, through the box-section welded-steel frame to an airbox under the lefthand side cover. The two 40mm Hitachi CV carbs nestle in the 75-degree vee between the cylinders, which are offset 24mm—the width of a connecting rod's big end. And two separate oil pumps keep it all alive.

All the variants of this engine use the same stroke, varying displacement by bore size, and all have the same power characteristics. They pour out torque by the bushel, but peak power is modest—as you'd expect, given the valve areas, compression ratios and design rpm. Like the Virago, the 920 is happiest at low-to-middle rpm; it runs out of steam at about 6500 and the extra 500 rpm to redline aren't worth the effort. The 920 pulls like a tractor

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CYCLE GUIDE



from 2000 and delivers a nice snap around 4000—just the sort of powerband for easy, low-effort riding.

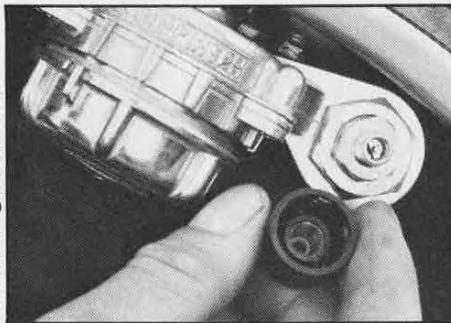
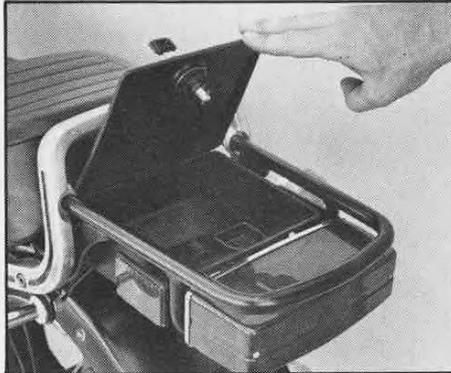
Some of the Virago's complexity has been avoided in the 920 with the elimination of shaft drive. In its place, Yamaha has used an all-too-rare alternative—the fully enclosed chain. Packed in a liter of lithium grease, the 630 chain should be good for 30,000 miles under optimum conditions, according to Yamaha. Its main advantage, however, in the 920 mission-profile, is its unsprung-weight loss.

In the appetite-for-speed department, therefore, the 920's drivetrain shows little unusual. The five-speed gearbox, electric starter and transistorized ignition would have competed for front-page news with Lawrence in 1935, but today it's all SOP. Similarly, despite the hoopla, the Monoshock suspension is, while interesting, hardly revolutionary, since its predecessors have armed many a YZ motocrosser. Its main advantage on the 920 is its full adjustability; like the Virago, it employs a five-notch damping adjuster knob under the right rear seat rail, operating a cable that alters internal damping in the nitrogen-filled De Carbon monoshock. Next to the knob is the air valve for shock preload, and the front fork uses air for preload, too. H-rated tubeless tires, double discs in front and a drum brake in back, and the swoopy curved-spoke "Italic" alloy wheels first seen here on the Maxim 650 complete the chassis.



A convenient rack to mount light luggage

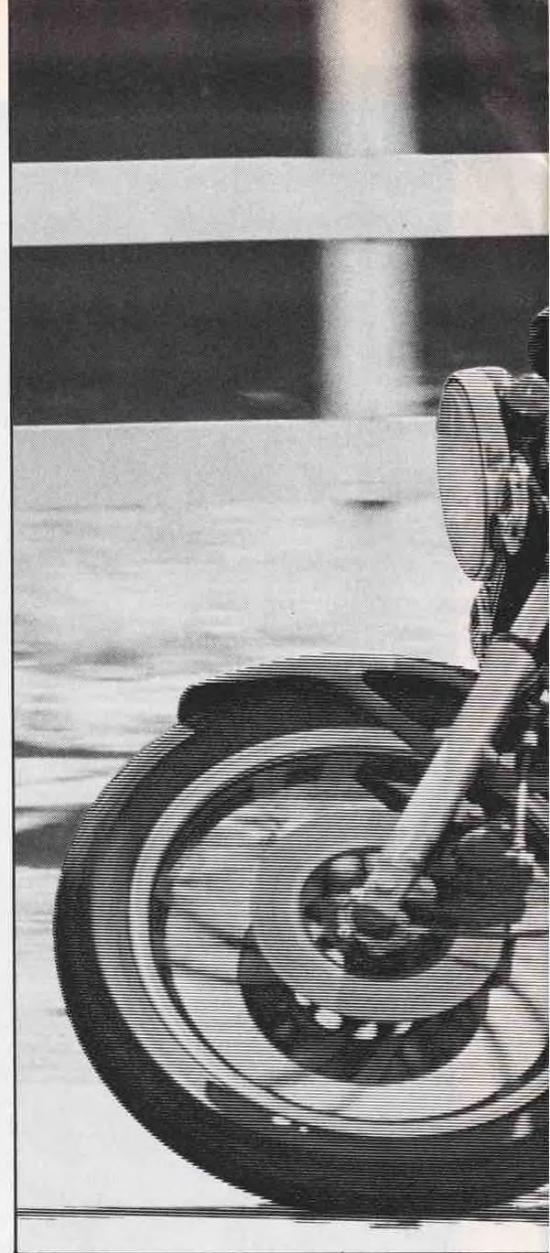
But very little room in the trunk.



Accessible adjustment of the Monoshock

Damping and preload are right at hand.

PHOTOGRAPHY © 1981 VIC HUBER



But as mechanically unremarkable as the drivetrain and chassis are on the 920, the styling is quite another story. The massive quartz-halogen headlight leads the 5.2-gallon gas tank and flared-up seat just as the XJ650's did, to produce much the same visually front-heavy effect. However, Yamaha USA officials say that the Virago-jaded eyes of America seem to think the effect unpleasant—because, they say, of the unbalanced masses of the engine/gas tank and the rear end. Sans external shock absorbers or fat rear tire, the relationship is exactly backwards to most Yankee tastes, at least according to Yamaha. Furthermore, the use of a fender that is attached not to the rear subframe but to the swingarm creates visual disorientation in some folks, as does the small black rack that encircles the taillight and security-chain stowage box. Regardless of the esthetic effect of this combination, the human-factors result is just what the sport-touring doctor ordered. With its slightly rearset pegs, tall tank and long



PHOTOGRAPHY © 1981 HELOTROPE PHOTOS

seat, the bike gives riders up to six feet a comfortable, "in-rather-than-on" feeling. For taller riders, though, the American handlebar produces a too-upright riding position, putting too much weight on the buttocks and inner thighs, and making it seem as though there isn't enough distance between footpegs and seat, a problem made worse by seat padding insufficient for long trips.

Sitting still in a driveway, the 920 seems only mildly promising as a contender in the European sport-touring stakes. It feels heavy as you slide onto the low seat, and quite long. This isn't helped by the side-stand, which keeps the bike a little too upright, and therefore a little teetery. But once you swing the stand up (and to engage first gear with the engine running you *must*, thanks to the starter lock-out-linkage), open the handlebar-mounted starting-circuit lever and punch the starter button, things get livelier.

Vee-twins make wonderful sounds, and the 920 is no exception. It fires up with a

throaty rattle and thunks away with little hesitancy to take throttle after 30 seconds on the cold-start circuit. Because of the long exhaust pipes, its note is more BMW-like than Harley-like. The opposite, though, applies to the way it works as you ease it from driveway into traffic—and that's a compliment. Minus the Beemer's rocking-couple vibes trying to twist the Yamaha onto its side, the 920 can be ridden like a trials bike in traffic, which is to say, almost effortlessly at very low speeds. Its stability is wonderfully calming in go-to-work traffic.

But this bike is supposed to go to work at higher speeds, out where the Interstate offramp opens up the world of the sport-tour. On the way there, with its Mono-shock damping set on the second-softest adjustment, the preload up front at 10 psi, rear at 25, the bike handles the rain grooves, expansion joints and Botts dots with a ride somewhere in the middle of the firm-but-okay zone. A hint of rear-end harshness, however, makes you uncom-

fortable about encountering any washboards on the fast sweepers up the road.

Once there, the 920 provides some surprises, all good. The bike pumps out a smooth flow of power from 2000 to 5000 rpm, making deep downshifting superfluous. It bends into corners under braking with little effort, and, once in deep, provides good cornering clearance. In fast or slow turns, smooth or bumpy, the 920 slowly demonstrates that it is a stable, predictable bike. Its pressed-steel-backbone frame does not provide the taut feel of a CB750F or a Ducati Darmah, but the 920 works well at anything short of its absolute limits. And gradually, you discover that those limits are quite impressive—well before you're chewing up the righthand footpeg or dragging the leftside stand projections, you are into pedigreed sport-touring territory. The Bridgestone tires hold predictably on dry pavement, the recommended suspension settings allow plenty of suspension movement without teeth-jarring jolts on bad surfaces, and gradually

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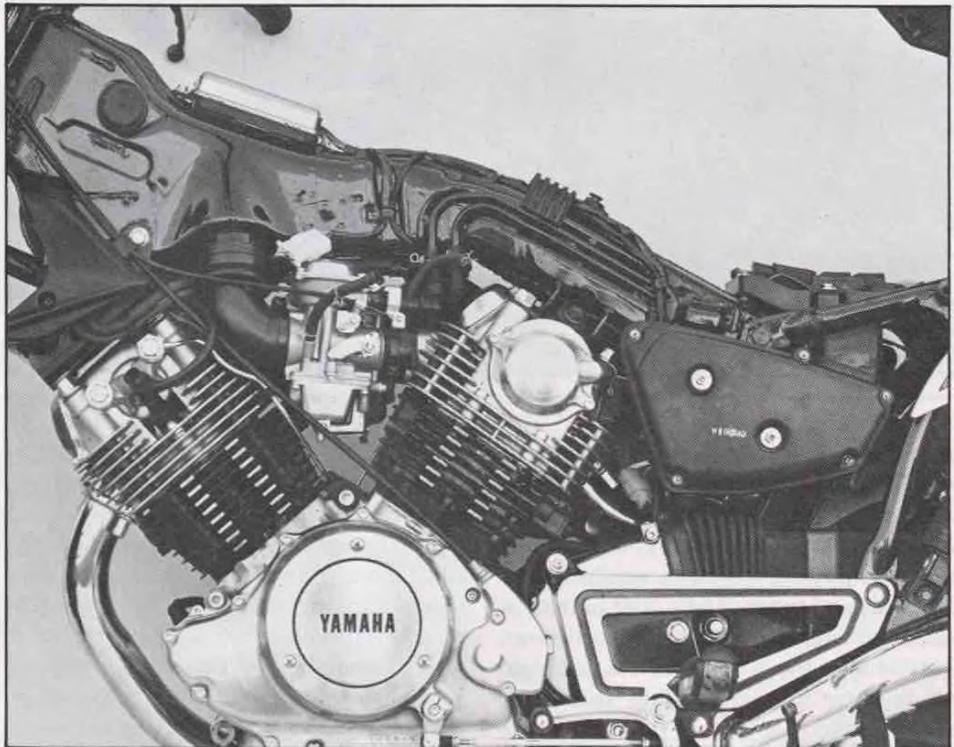
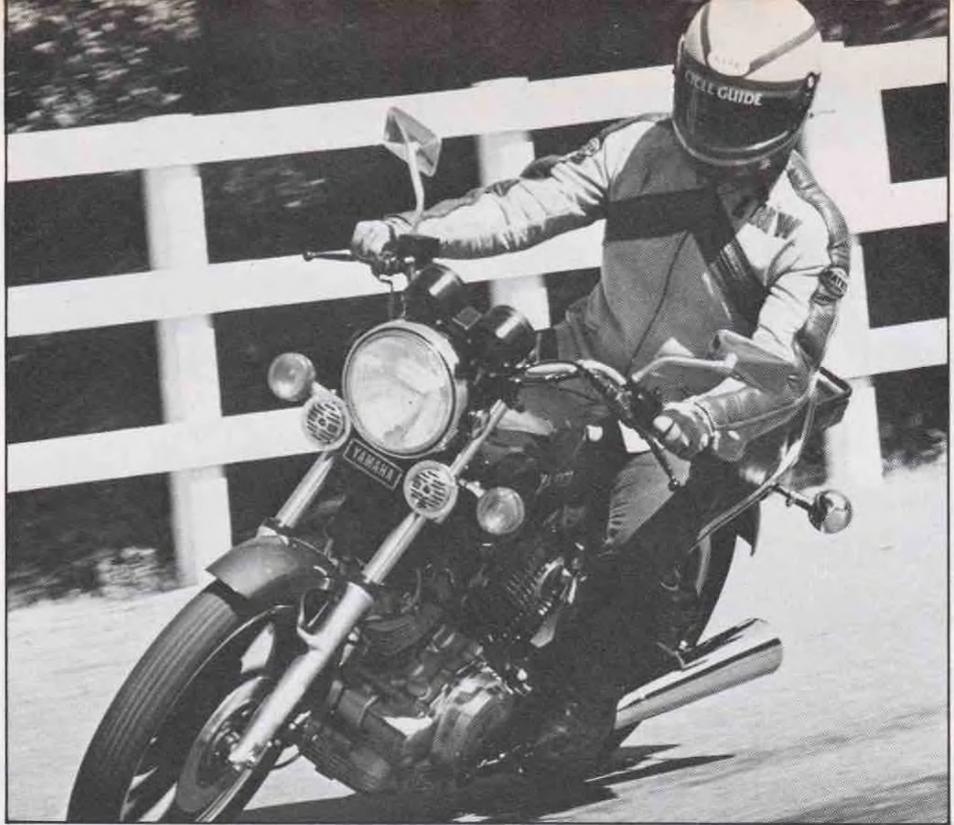
the bike attains a flowing, relaxed feel.

It is not a roadracer. It has much less ground clearance than the XJ650, and the sedate manner of its power delivery and the amount of power to be had encourage quite another style—again, BMW-like is the proper reference, not only for its power, but for its level of vibration (the mirrors go into terminal blur above 5000 rpm) and even for its fuel economy. A day of sport-touring netted 47 mpg.

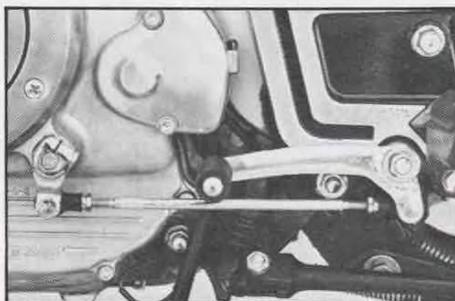
In ruthlessly operational terms, the XV920 is not a superlative machine. Its systems, from engine to suspension, work well but not brilliantly. It is not the fastest, not the best-handling, not the plushest motorcycle you can buy. And yet it is very, very important.

This is because, although it is not a better BMW or Ducati, in one sense it has no rivals. That sense is its lineage; it is the first melding of traditional Japanese excellence in workmanship, fit and finish—with all the resultant benefits they imply—with this particularly European/American configuration. At \$3700, while not cheap, it is far more affordable than its European predecessors. And while it has detail flaws that typify new bikes in general and Japanese bikes in particular (its weight, a toolbox too difficult to remove and replace, an awkward release mechanism for the rear-hinged flip-up seat), as a first attempt, it has come close to being a bullseye.

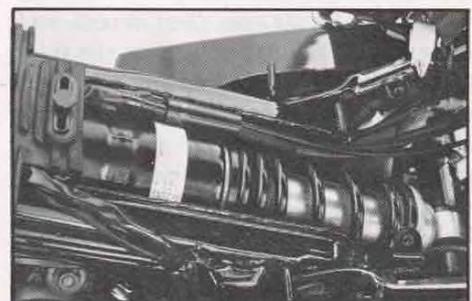
Only refinement from real-world input will polish the 920's sport-touring capacity, but it can't be stated strongly enough that in one area, the bike needs no development at all. That's the area between the driveway and first turn on Fast Road—the area, in other words, where most of our riding is done. There, the superb low-speed steering and low control efforts combine with its instantly available torque to provide the rider with as close to a zero-effort urban/suburban bike as can be bought. The fact that the same machine is capable of high-speed performance so close to the very best from Europe gives it an appeal that Col. Lawrence and his peers would certainly have understood, since the Brough Superior SS100 gained its reputation not because it was the fastest of the day, but because its rider could be assured of a superb degree of workmanship, attention to detail and a splendid ride, slow or fast. For Yamaha to have de-fanged the big-inch vee-twin of the worst of its bad habits and mated it with such a stylish, competent chassis and suspension is no small feat, one that should not only make it front-page news in vee-land, but also exactly the bike the sport-tourers of America have been asking for. ●



Yamaha's vee-twin chugs air through ducts in the pressed-steel backbone
Relocation of some parts helps to keep the XV's overall length down.



Swivels and joints for rearset controls
A long link with a Euro-riding style.



Monolithic shock in pressed-steel frame
Removing road thump from the thumper.

Vee-Twins:

When It Comes To Angles, What's Right Is Right

• When the New Safety bicycle supplanted the Old Ordinary high-wheeler late in the nineteenth century, the vee-twin engine was already in existence. Elegant specimens had been installed in steamboats since 1852, and one of the first of Gottlieb Daimler's experimental high-speed engines was a vee-twin. So by the time the motorcycle had begun to evolve out of the bicycle, the vee-twin concept was already available to those who wanted more than one cylinder for the engine.

At that point, though, the vee was wanted not for its power but for its smoothness; it might be no bigger in displacement than the single-cylinder engine it replaced, but it vibrated less and was easier to turn over to get it started. That mattered more than most things, for there were no clutches then, just a belt running over pulleys fixed to the nose of the crankshaft and to the back wheel. If a rider wished to halt, however briefly, he had to stop the engine; to start, he had to push.

So it was logical, given that simplistic drivetrain, for the crankshaft to lie across the frame, parallel to the rear-axle spindle. By 1901, when the New Werner laid the pattern for the century, it was seen as natural for the crankcase of the engine to be where the pedals of the pushbike had been. And when a twin-cylinder engine was demanded in place of a single, it was equally natural to fit the vee-twin in that same way into the so-called "diamond" frame of the New Safety bicycle.

That pattern has endured to this day: The vestiges of the diamond frame are still to be seen—stiffened here, articulated there, altered in proportions but scarcely in principles—in most of today's motorcycles. We've developed clutches, gearboxes, chains, shafts and all manner of driveline sophistications that didn't exist in that day and age, but we still think of the motorcycle in terms of a layout that is as old as the century, and the vee-twin fits into the pattern as naturally now as then.

So Honda and Guzzi saw fit to set the cylinders *across* their frames rather than in tandem? So did other Japanese, other Italians and, earlier still, sundry Englishmen before them. If it be a little and low-powered engine it will do no harm, and it might even protect the rider's knees; if it be big and powerful, transverse torque reactions will, as in all longitudinal-crank musclebikes, be bothersome—except, of course, when countered such as with Honda's ingenious contrarotating mass (the clutch in the CX500 vee-twin, the al-

ternator rotor in the flat-four Gold Wing).

Gyroscopic precessions can be countered in the same way. But if, as is the general rule, they are not, then they will affect the bike in some way no matter how the crankshaft is installed. In the tandem-vee, as in all transverse-crank engines, the spinning mass of the crankshaft and its weights, together with any flywheel attached, rotates in the same plane and sense as the wheels—meaning that any attempt to bank the bike to the left will encourage it to turn left, which is all to the good. With the crank mass spinning in the longitudinal plane, a change in pitch (nose-dive when braking, for instance) tends to disturb the bike directionally.

So far, then, everything looks favorable for a vee-twin with its crankshaft athwartships. That's despite the fact that the rear cylinder can be masked by the front one to the detriment of its air cooling, which is why Ducati and others have set the front cylinder almost horizontal. Still, the frontal area of a vee-twin can be as slight as that of a single, bar the inch or two of offset necessary to accommodate two connecting rods side-by-side on a common crankpin. Moreover, the weight of the engine can be carried very low without adverse effects on the cornering clearance; so if the opportunity is taken to lower the rider as well, the whole lot can bank from side to side with ease and speed.

Then there's the matter of vibration, the absence of which is a by-product of the included angle between the cylinders. And it is not for nothing that we call an angle of 90 degrees a "right angle." Because for a vee-twin, 90 degrees works far better than any narrower arrangement, though there have been legions of vees with angles ranging from 80 down to 26 degrees. The beauty of the 90-degree vee is that it leaves no primary forces unbalanced: As the No. 1 piston reaches Top Dead Center and stops momentarily, No. 2 is at midstroke and moving at its fastest. No. 1 is completely balanced by the centrifugal force set up by the crank's counterweights, and No. 2 has only the secondary force acting on it. Every 90 degrees of crank rotation sets up a similar situation. And better still, the vertical components of the secondary force always cancel each other, so all that remains is a resultant from the horizontal components, a shake in the plane of the cylinders and perpendicular to the bisector of their included angle. The shake alternates in direction four times per revolution, but its max-

imum value is less than half that of the maximum primary force that has been so neatly eliminated.

The snag is an uneven exhaust beat, audible evidence of unequal firing intervals. On a 90-degree vee-twin there are two power strokes separated by an interval of 270 degrees, followed by a 450-degree wait for the next one.

Obviously, the firing intervals become more evenly spaced as the vee angle is decreased from 90 degrees toward 0 degrees, a layout which would constitute a parallel twin. But the further the angle gets from 90 degrees, the less self-canceling are the effects of engine imbalances, resulting in more vibration to contend with.

The effects also are negative when the vee is opened wider than 90 degrees, except that a vee-twin engine is perhaps its absolute smoothest when the included angle is a full 180 degrees—a flat twin, if you will—because it offers even firing intervals in addition to perfect primary and secondary balance.

Invariably, however, the included angle selected for any tandem vee depends largely upon two factors seemingly unrelated to engine design: the ideal wheelbase of the chassis and the desired appearance of the entire motorcycle. A vee of 90 degrees tends to produce an extremely long and not particularly gracious-looking motorcycle by popular standards, no matter how the cylinders are positioned. That's why so many designers have chosen narrower included angles, knowingly sacrificing some inherent right-angle smoothness to achieve the proper look and length. Yamaha's XV series vee-twins are perfect examples, and it is only through extensive computer studies into vibration control that the designers were able to produce a 75-degree vee-twin that is smoother than most 90-degree engines.

Thus the vee-twin engine cannot be dismissed; as we have seen, there are too many ways in which it so well suits the concept of a motorcycle. It has changed with the passing years, as everything must; engineering has made its own long-legged strides, and today's off-beat ambler sounds less like a galloping horse and more like a pair of Oerlikon cannon running amok. It may not have as many cylinders as other motors, but it may well have more valves; it may yield no more power but may well be more frugal; and although it may have less incorporate behind it, it may yet have a longer future before it.

—L.J.K. Setright

Ride Review

• After 1500 miles in the saddle of the XV920, I guess that its flaws could have soured me. But they haven't. Despite the too-hard seat, despite the too-long stand that eventually put the bike on its side and even despite its unconventional style, I still pick the XV more frequently than any other bike in the garage. For years I've been listening to Paul Dean tell me how the GS1100 feels as if it were built just for him, and now, with the XV920, I finally know what he means. The bike fits; it's really that simple.

So what if it won't stay with a well-tuned 550 in a straight line? The absolute lunge that rewards me when I grab a handful of throttle lets me ride with any bike in the twisties. All without hanging off. I just sit there in control and go like blazes. The XV920 is an adult-rated motorcycle, and I'm happy to say that I've finally grown up. —Larry Works

• One experience, happily, convinced me that the XV920 was more special than Special: splitting freeway lanes. On big, cammy, inline Fours that activity is at best a cautious one during my 60-mile daily commute. Top-heavy bikes with CV carbs don't cotton to trials-ing traffic jams, but my first shot at a constipated four-laner on the XV had it sashaying between vehicles like a filly at a barrel race. With its rheostat throttle and dead-steady slow-speed manners, my only worry was a jerk in a Mustang three cars ahead who wanted to muscle over.

And one experience, sadly, convinced me that the XV920 isn't perfect—yet: At the 30-mile mark I had numbutt. In a word, the seat *isn't*. Calling it too little padding in most of the wrong places is being kind. Rework the saddle and the XV's a thoroughbred. —Jeff Burt

• Take away the thumpety-thump of the exhaust and the mile-wide torque curve and I would hate the XV920. I'd hate the looks—at least the rear end, anyway—and I'd not be crazy about the seat comfort, as well. And for a supposedly narrow vee-twin, the XV's bulging side panels would make me mad. The pressed-steel chassis would not make me happy either, because of its flexy nature in fast turns. It would even drive me crazy to hear the rumbling and clanking starter fire the motor into life every day. It would all be unbearable if it were not for that exhaust note and the flat plateau of torque.

But once the motor is chugging, all the problems seem to melt away. The XV is transformed into a pleasant means of transport, something I would not mind owning—until I switched off the thumping motor. —David Dewhurst

Yamaha XV920RH



SPECIFICATIONS:

IMPORTER: Yamaha Motor Corporation USA
6555 Katella Avenue
Cypress, California 90630

CATEGORY: street

SUGGESTED RETAIL PRICE: \$3499

ENGINE

Type four-stroke tandem vee-twin
Valve arrangement single overhead camshafts
Bore and stroke 92.0mm x 69.0mm
Displacement 917.4cc
Compression ratio 8.3:1
Carburetion two 40mm Hitachi constant-vacuum
Air filter disposable paper element
Lubrication wet sump
Starting system electric only
Ignition battery, transistorized breakerless, twin coils

Charging system 12-volt; alternator, voltage regulator, rectifier

DRIVETRAIN

Primary drive straight-cut gears; 1.660:1 ratio
Clutch wet, multi-plate
Transmission-to jackshaft straight-cut gears; 1.447:1 ratio
Final drive #630 chain (3/4-in. pitch, 3/8-in. width);

Gear	2.188:1 (16/35) ratio		MPH per 1000 RPM
	Internal gear ratio	Overall gear ratio	
I	2.352	12.361	6.1
II	1.666	8.756	8.6
III	1.285	6.753	11.1
IV	1.073	5.639	13.4
V	0.909	4.777	15.8

SUSPENSION/WHEEL TRAVEL

Front air-spring, 35mm stanchion tube diameter (5.8 in. (147mm))
Rear Monoshock air-spring, six-way adjustable rebound damping/4.8 in. (122mm)

BRAKES

Front dual single-action hydraulic calipers, 10.5-in. (268mm) discs
Rear drum, single-leading shoe, rod-operated

TIRES

Front 3.25H19 Bridgestone Mag Mopus L303
Rear 120/90-18 65H Bridgestone Mag Mopus S716

DIMENSIONS AND CAPACITIES

Weight 509 lbs. (231kg)
Weight distribution 53.8% front, 46.2% rear
Gross vehicle weight rating (GVWR) 1005 lbs. (456kg)
Wheelbase 60.5 to 61.3 in. (1537 to 1557mm)
Seat height 30.0 in. (762mm)
Handlebar width 29.3 in. (745mm)
Footpeg height 12.6 in. (320mm)
Ground clearance 5.5 in. (140mm), at centerstand
Steering head angle 28.5 degrees from vertical
Front wheel trail 5.0 in. (126mm)
Frame pressed steel backbone
Oil capacity 3.8 qt. (3.6/ including 0.8 gal. (3.0) reserve)
Fuel tank steel, 5.0 gal. (19.0/ including 0.8 gal. (3.0) reserve)
Instrumentation speedometer, odometer, tripmeter resettable to zero, tachometer

PERFORMANCE

Fuel consumption 39 to 48 mpg (16 to 20 km/l)
Range, maximum 197 to 244 miles (317 to 393km)
Range, reserve only 31 to 39 miles (51 to 63km)
Speedometer error, 30 mph indicated 30 mph actual
Speedometer error, 55 mph indicated 53 mph actual
Best 1/4-mile acceleration 13.338 sec., 99.41 mph (160 kph)
Top speed (calculated) 111 mph (179 kph)
Stopping distance from 30 mph 36 ft. (11m)
Stopping distance from 60 mph 146 ft. (45m)

WARRANTY: 6 months

AVAILABLE COLOR: Brilliant Red

All weights and measurements are taken with machine unladen and fuel tank empty

COMPARATIVE TEST DATA:

Make & Model	Quarter-Mile, sec/mph	Top Speed, mph	Weight, lbs	Stopping Distance From 60 mph, ft.
Yamaha XV920RH	13.34/99.41	111	509	146
Yamaha XV750H Virago	13.28/99.8	105	481	132
Suzuki GS1000G	12.34/110.8	139	564	141
Honda CB900F	12.21/111.1	141	547	130
BMW R100RS	13.48/98.4	127	492	145
Harley-Davidson Tour Glide	15.58/83.9	108	785	223