

Silk purse from a sow's ear?



Launched 25 years ago, Honda's VT500E V-twin was the beginning of one of the longest-running designs from Japan. But why was it produced to replace the popular CX500? John Nutting tested them in the 80s.



When Honda's VT500 V-twin was launched in 1983, it was a triumph for the marketing people over the engineers. Honda already had a V-twin, the innovative CX500, but to appeal more to riders in the lucrative North American market, it needed to have an in-line V-twin engine, like a Harley-Davidson. And so the engineering people swallowed their pride and came up with a V-twin that not only aped the American dream but proved to be one of the most versatile and longest-lasting designs to come out of Japan.

Today's Honda Deauville tourer still uses the same basic engine, although much improved and upgraded to 680cc. At its heart though, the concept still works because of the clever features these engineers hatched up for the marketing people 25 years ago. Honda was a latecomer in offering a V-twin in America. Yamaha had already paved the way with its Virago 750cc and 980cc shaft-drive customs in 1981, and Honda's engineers figured that its V-four range first launched a year later in the form of the VF750S would break into a market that would accept the idea of engineering superiority. Not apparently so. V-twin culture was deeply ingrained into US motorcycling psyche, but not just any old V-twin. The fate of the CX500 proved that even though it performed better than any V-twin, ever, the across-frame layout and, er, unusual appearance (at least to the Stateside eye) would be a non-starter.

And so we find ourselves at the nub of this article. What's better: a motorcycle that is designed from the ground up as a dynamically competent performer regardless of its appearance, or one that primarily conforms to an iconic image, such as that exploited successfully by the Milwaukee mob. By 1977, Honda had positioned itself as the world's leading motorcycle manufacturer, but despite the launch of bikes like the Gold Wing, a machine that single-handedly created the heavyweight touring category, the factory's engineering currency was being devalued. The CB750 four, which likewise was a pacesetter and had started the Superbike era just nine years earlier, was being regarded with disdain for its ungainliness and comparative lack of performance. Honda's engineers were apparently given a free hand to explore their fantasies. At one end of the scale, famed engineer Shoichiro Irimajiri designed the amazing 1047cc six-cylinder CBX, offering a road bike that mimicked the racers that were so successful in the 1960s. At the other end of the scale, Honda's engineers thought they could do better than European factories like Moto Guzzi and BMW which were offering sublime but specialised touring machines that, because of their quirky characteristics, appealed only to really keen enthusiasts.

Their answer was the CX500, which was revealed to the motorcycling press in the autumn of 1977 at the Nogaro racing circuit in France. In principle, the CX500 was in its own way as remarkable a departure from the norm as the CBX, images of which were revealed during the CX500's launch, a move that was calculated to show that Honda was on the move. Although the CX500 was, like the Moto Guzzi, an across-the-frame V-twin with shaft drive, there the similarity ended. Rather than bolt the gearbox to the rear of the engine, taking the drive from a single-plate car-type clutch, the CX500's primary drive was on the front of the monobloc crankcase to a multiplate wet clutch mounted on the front of the five-speed gearbox alongside the crankshaft, very similar to the Gold Wing.

This layout overcame a number of the idiosyncrasies of the Guzzi at a stroke. The contra-rotating clutch counteracted the behaviour of the Guzzi's crankshaft and heavy flywheel which kicked to one side when the twist-grip was opened at a standstill and during quick gear changes at speed. The higher primary drive reduction reduced the speed of the gearbox, improving the slickness of ratio changes. And the engine could be made shorter, enabling a longer swingarm to be used without extending the wheelbase, which reduced the effect on the suspension under hard acceleration or braking.

The CX500 was novel in other ways. To reduce the width, the vee of the cylinders was 80 degrees, less than the 90 degrees that would give perfect primary balance, but the difference was barely noticeable in practice. The cylinder block was one-piece and liquid-cooled, like the four-cylinder Gold Wing. Then there was the valve gear arrangement and operation: the CX500 was the factory's first road bike to have four valves in each combustion chamber, an arrangement it had only previously used in its racing bikes. But the valves weren't operated by overhead camshafts but by short pushrods from a single camshaft in the vee between the cylinders.

It was an elegant solution that allowed the engine to reach high revs while enabling neat packaging of the carburetors. By twisting the cylinder heads through 22 degrees, the inlet ports pointed towards the centre of the bike so that the CV type carbs were side-by-side under the fuel tank with a common operating linkage.

The CX500 engine was a really short-stroke unit: it had 78mm cylinder bores and a stubby crank with a 52mm throw for the adjacent big ends, giving a bore-to-stroke ratio of 1.5 to 1, which was unprecedented. While peak power was a healthy 49bhp at 9000rpm it could be revved

to the 10,000rpm red line with no obvious distress. It was mechanically quiet and uncannily smooth in its own way, its unhurried twin cylinder power delivery belying road speed. The CX500 showed how it was possible to deliver civilised performance in a much more simple and robust design than the 550cc air-cooled overhead-camshaft engines in Honda's range.

That first test of the CX500 at Nogaro revealed Honda's move to mass-centralisation to improve handling agility. It's a feature that's been subsequently exploited by most manufacturers as some time or another, but with the V-twin's engine mounted higher than usual it provided quick response allied to a measure of stability through Nogaro's bends.

Styling was another matter. I was told soon after the launch that Honda's research and development people were ordered to make their prototype look more distinctive, and so it ended up with the Darth Vader headlamp nacelle, bulbous fuel tank, commodious seat and a rear lamp that could have been taken from some Detroit cruiser. It was, if nothing else, unforgettable. I'm sure its designer loved the CX500.

Subsequent road testing over the Easter of 1978 showed that the CX500 was a highly competent long-distance mount, and in many ways far better

than the first impressions suggested. I used it to get to the Match Races across the country, using both motorways and A roads where revs between 4000 and 7000 were enough for ample acceleration to maintain high average speeds. Fuel consumption during commuting was an acceptable 52mpg but cruising at 80mph dropped the figure to 43mpg which if you topped up with 3.2 gallons before the reserve was needed provided a reasonable range of 140 miles.

At MIRA's test strip the CX500 clocked a mean two-way top speed of 110.4mph, the highest figure recorded by a 500cc machine at 'Motor Cycle Weekly', apart from Kawasaki's legendary and fiery Mach III two-stroke triple. And with a standing quarter-mile acceleration time of 14.5 seconds, the CX500 matched, more or less, the performance of the four-cylinder CB550K3. And this was, to my surprise, despite weighing a hefty 467lb with a gallon of fuel.

That weight, and the way it was carried, was the other key criticism of the CX500 in the European markets where it was sold. Although mass centralisation and a high centre of gravity might work for agility at speed, they conspire against easy handling at low speeds - which is when riders form their first impressions of a



VT500E

Euro Sport





(Above) The CX felt top heavy compared (below left) top the VT

machine – and impair confidence in the machine on wet roads.

Typical criticism of the time was that the CX500 felt 'top heavy', a characteristic not helped by the light steering, that was translated into uneasiness on greasy surfaces. There was nothing wrong with the tubeless Bridgestone tyres, or the suspension, just that when grip was limited, loss of control felt closer in the wet.

None of this really impacted Honda's obvious affection for the machine, nor appellations such as 'Plastic Maggot' – a reflection on the CX500's styling – or even the early problems with camchain reliability. Other than the custom variants, it took some four years before the CX500 was changed and towards the end of 1982 I tested the CX500E Eurosport version with sleeker styling, an 18in front wheel (replacing the 19in) monoshock rear suspension and a more flexible engine. It was also heavier and slower, but had lost none of its strange behaviour. A 673cc version of the CX was also launched for 1983 but, by then, the needs of the North American market beckoned ever more strongly.

The key style influences there were custom cruisers and flat-track racing, both of which were dominated by V-twins. And not just any V-twins, but in-line V-twins. A CX-engine machine was briefly and gallantly raced on the dirt

ovals, but with its engine disemboweled and turned sideways, US-style, with a chain drive. The message had been clear from the early 80s and Honda's R&D people provided the answer in its 1983 US model range.

Powering a triplet of new machines – two cruisers and a sport bike – was a completely new in-line V-twin engine. The cruisers – in 500cc and 750cc versions – were first in the Shadow range in a style that would be attempted by all the Japanese factories, but the VT500 Ascot sport bike was novel in that it was a shameless nod to the unchallenged Harley-Davidson dirt-trackers, except that it was powered by the Shadow's 500cc liquid-cooled engine with shaft drive to the rear wheel. But unlike the Harleys the intention was to offer it in a tamed and domesticated package.

The VT500 appeared simultaneously in Europe with the 'E' suffix and with styling from the Japanese school that would also leave its mark on the VT250 V-twin and VF400F V-four which shared the little handlebar fairing, and swoopy lines from the tank to the side panels.

Undemeath, the engine and transmission displayed Honda's inventiveness in attacking one of the inherent drawbacks of the North American narrow-angle V-twin – vibration when revved hard – at its root. Of course, the problem didn't

PERFORMANCE DATA HONDA CX500 – VT500E

All figures compiled at Motor Industry Research Association's proving ground, Nuneaton, Warwickshire.

MODEL:	Honda CX500	Honda CX500E	Honda VT500E
DATE OF TEST:	5 April 1978	October 1982	25 April 1983
TOP SPEED (MEAN):	110.44mph	105.80mph	111.40mph
BEST ONE-WAY SPEED:	117.89mph	110.85mph	113.29mph
TOP SPEED (NORMALLY SEATED):	98.10mph	96.85mph	102.32mph
Standing quarter-mile			
ACCELERATION (MEAN):	14.5 secs/02.50 mph	14.6 secs/03.00 mph	13.9 secs/03.02 mph
SPEEDS ACCURACY, ACTUAL MPH AT INDICATED:			
	30	28.3	28.2
	50	49.5	47.6
	70	69.2	67.8
			66.0
OVERALL TEST MPG:	45.4	48.1	45.6
TEST WEIGHT (4.5 LITRES OF FUEL):	212kg (467lb)	218 kg (480lb)	194kg (427lb)
SPEEDS IN GEAR, MPH	@ 9000rpm	@ 3000rpm	@ 9500rpm
	36	35	40
	53	51	56
	69	67	74
	85	82	85
	106	102	101
		117	



afflict Harleys because they weren't spun much above a chug-a-lug, but Honda wanted the engine – while looking like a narrow-angle vee – to produce power enough satisfy European riders. And that meant revs undreamt of from a Harley, though not as high as the CX500.

The designers couldn't use the CX500's over square dimensions because that would have prevented the use of a narrow vee angle (because the cylinders would clash with normal length connecting rods), so they settled on a more square 71 x 62mm and a vee angle of 52 degrees, slightly wider than the Harley's 45 degrees, but still with the right look.

What was really clever, and which minimised the vibration, was the application of a twin-throw crankshaft with the crank pins offset by 76 degrees so that the firing strokes were closer to that of a 90-degree V-twin. The crank itself was a one-piece forging with three webs that inevitably resulted in the cylinders being offset by about 25mm and leading to some residual buzz at high revs, but this was clearly acceptable to the designers.

To reduce manufacturing cost each liquid-cooled cylinder and head was a mirror image, except that the rear was different to enable the exhaust port to exit on the same side as the front pot. Each cylinder had its own camshaft chain driven from the outer end of the crank with an automatic tension adjuster.

Cylinder head design was completely different from the CX500. A pair of steeply downdraft 34mm CV Keihin carburetors between the heads each fed paired inlet valves to improve volumetric efficiency, but only single exhaust valves were used because of the need to offset the ports to match the exhaust system.

With a high compression ratio of 10.5 to 1 necessitating twin spark plugs for each combustion chamber, peak power was a claimed 50bhp at 8500rpm, slightly up on the CX500, along with stronger torque.

Some testers of the time were bemused by the need to replace the CX500 – especially those who thought the Maggot was the answer to the touring and dispatch rider's prayer – but begrudgingly accepted that the VT500E was a more potent performer, even though it vibrated enough to numb fingers.

Others liked the crispness of the gearbox, which with six speeds offered both closer ratios, and an overdrive top gear so high speed cruising was more relaxed. The shaft drive, achieved through the use of a pair of bevel gears where the drive sprocket would normally be found, was just as unobtrusive as on the CX as well. Comfort was a strong feature too, even though the VT lacked the armchair seat of the CX.

What was especially novel was the chassis, adapted from the US Ascot. Some testers remarked on its almost Italian feel with slow and stable



“ SOME TESTERS OF THE TIME WERE BEMUSED BY THE NEED TO REPLACE THE CX500... ”



steering, which should have come as no surprise because its geometry was very much like a big Ducati of the late 70s.

Frame was a steel duplex loop affair with the 37mm-diameter front fork legs (not the leading axle items from the Ascot) set at a shallow 59.5 degrees giving 4.9 inches of trail and the rear shocks angled at a similarly rakish angle. Wheels were 18in Constars that were much more stylish than earlier efforts.

The original Yokohama tyres came in for criticism in the wet, as did the front disc brake. This, like the double disc on the CBX550 four, was an enclosed unit no doubt offered primarily for style, because it looked like a chunky drum brake, but with the associated benefit of being protected from rain. It also enabled the use of an uncoated steel rotor for better feel, or so it was expected. But with a diameter of 9.5 inches (230mm) its power was less potent than expected. And it was, like the CBX550's, a nightmare to look after. Riders would use the brake until the disc or the pads wore away, because it was out of sight. And getting the thing apart and back together was a day's job in itself.



SPECIFICATIONS

HONDA 500CC V-TWIN

MODEL	HONDA VT500E	HONDA CX500
ENGINE	Liquid-cooled inline six-valve V-twin	Liquid-cooled transverse eight-valve V-twin
CAPACITY	497cc (73 x 62mm)	497cc (78 x 52mm)
VALVE OPERATION	Overhead camshafts, chain drive	Ohv, pushrods, one camshaft
COMPRESSION RATIO	10.5 to 1	10 to 1
LUBRICATION	Wet sump, XX litres	Wet sump, 3 litres
IGNITION	Electronic Inductive	Electronic
CARBURATION	Two 28mm Keihin CV	Two 28mm Keihin CV
PEAK POWER	50 hp at 8500rpm	48hp at 9000rpm
PEAK TORQUE	4.35kgm at 7000rpm	4.1kgm at 7000rpm
PRIMARY DRIVE	Gear	Gear
PRIMARY RATIO	1.763 to 1	2.242 to 1
CLUTCH	Wet multiple	Wet multiple
GEARBOX	6 speed	5 speed
INTERNAL RATIOS	2.73, 1.95, 1.55, 1.28, 1.07 & 0.93 to 1	2.73, 1.85, 1.42, 1.15 & 0.93 to 1
FINAL DRIVE	Shaft and bevel gears	Shaft and bevel gears
FINAL DRIVE RATIO	3.185 to 1	3.091 to 1
OVERALL RATIOS	17.7, 12.6, 10.0, 8.28, 6.95 & 6.02 to 1	18.0, 12.8, 9.84, 7.97 & 6.44 to 1
FRAME	Duplex tubular steel cradle type	Fabricated steel spine type
FRONT SUSPENSION	Telescopic air-spring fork	Telescopic fork
REAR SUSPENSION	Pivoted fork, two spring damper units with 5-positions adjustable	Pivoted fork, two spring-damper units with five-position adjustable preload
FRONT WHEEL	Light-alloy Castor 16in	Light-alloy Castor 19in
REAR WHEEL	Light-alloy Castor 18in	Light-alloy Castor 18in
FRONT TYRE	Yokohama 100/90-51R	Bridgestone 3.25-19
REAR TYRE	Yokohama 120/80-51R	Bridgestone 3.75-18
FRONT BRAKE	Enclosed 230mm (6in) disc	Dual 242mm (9.5in) disc brakes, floating calipers
REAR BRAKE	150mm (5.9in) drum	Drum, 165mm (6.5in) dia
ELECTRICAL SYSTEM	Alternator, 60/35-watt headlamp, starter motor	Alternator, 60/10W headlamp, starter motor
BATTERY	12v/12Ah	12v/14Ah
FUEL TANK	18 litres (4 gallons)	17 litres (3.74 gallons)
WHEELBASE	1480mm (58.3in)	1450mm (57.3in)
SEAT HEIGHT	815mm (32.1in)	775mm (30.5in)
CASTER ANGLE	59.5 deg	63.5 deg
TRAIL	125mm (4.9in)	100 mm (3.94in)
WEIGHT, DRY	177kg (390lb) claimed	200kg (440lb) claimed

At MIRA, the VT500E acquitted itself well. Its mean top speed of 111.4mph with the rider chinning the tank was higher than the CX500 as was the top speed with the rider seated: 102mph. And with a tanked up weight of 427lb, some 50lb less than the CX500E, it was also quicker off the mark, ripping through the standing quarter-mile in 13.9 seconds with a terminal speed of 93.6mph, much better than the CX500E it sat alongside in the Honda range for 1983.

Honda offered the VT500 range for five years on both sides of the Atlantic before it was improved in 1988 with the 647cc shaft drive version called the Revere with a bigger fuel tank and more up to date styling. Sporting versions with chain drive also appeared, as the Hawk GT in the US and the Bros in Japan, both of which became cult machines. Trail bike versions appeared as the 650 Transalp and the even bigger 750 Africa Twin, as good a V-twin as ever existed in my opinion.

Finally in 1996 the Revere was restyled as the 650 Deauville tourer with a fairing and integrated panniers. Two years ago in 2006 this was upgraded again with a 680cc engine

featuring four valves in each cylinder for even more power and to meet increasingly stringent emissions requirements. The Deauville is likely to continue in the Honda range for some time.

With a production run of 25 years, that's not a bad record for any motorcycle design. The designers who originally penned the CX500 might have pursued a lighter and lower version but its styling was against it. The in-line VT500 might have been a complex solution to a marketing need but time has shown that it has been a success.

OTHER READING:

Classic Motorcycle Mechanics, July 2003: Buying Bikes, Honda VT500E
 Classic Motorcycle Mechanics, November 2005-January 2006, VT500E eBay rebuild
 Which Bike? July 1983 No 85, Road test, Honda VT500E

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The VT500E displays cleaner lines and a more swept back shape than the earlier CX