

This 1974-model TX750 has been treated to the 18-point upgrade that Yamaha introduced to stop the engine grenading

# Stirred not shaken

It may have been the first Japanese parallel twin with anti-vibration technology, but the TX750 got a reputation for unreliability. We ride one to see if Yamaha succeeded in properly sorting its issues

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**V**ibration is the enemy of just about everything that makes motorcycling fun. It promotes discomfort, breaks parts, turns lubricating oil into a foam bath and eats up power before it reaches the back wheel. Nowadays there are more bikes built with a balance shaft (aka counterbalancer) than those without – certainly over 250cc, anyway. Yet it was only 50 years ago that the first ever motorcycle fitted with one reached the global marketplace, in the form of the Yamaha TX750 parallel-twin. It was a Japanese take on what a traditional British engine with a 360° crank and both pistons rising and falling in unison ought to have become, but never did. Until then, vibration was something riders just had to put up with, unless you rode a Norton Commando, whose unique Isolastic engine mounts which isolated the vibration from the frame, would insulate you from it, too.

Yamaha has always been the most innovative and daring Japanese motorcycle manufacturer in terms of product design. From left-field models that became legends in their lifetime, like the DT-1 street enduro and its 600cc Ténéré spin-off, or the RD250/350LC ring-ding race reps, or the V-Max, right up to the innovative R1/R6 with which Yamaha reinvented the four-cylinder sports bike class 25 years ago, the firm has a proven track record of ingeniously creating new market trends with cleverly-targeted products – some of them directed at niche sectors, others of wider impact.

Of course, sometimes Yamaha's wilder R&D bets don't pay off at the box office, as the unloved V4 Royal Star cruiser, the quirky, expensive XZ550 liquid-cooled V-twin and the gauche-looking hub-centre GTS1000 all proved. But they failed because they didn't thrill customers enough, whereas the TX750 was that rare thing – an unreliable mechanical catastrophe made in Japan.

The weird thing is, it only came about because Yamaha for once played the conservative card at a time when its three J-rivals were pushing the barriers of road bike technology. Honda in October 1968 had unveiled its four-cylinder four-stroke CB750 at the Tokyo Show and across the hall was Kawasaki's three-cylinder 500cc H1 Mach III two-stroke. Two years later, at the same venue, Suzuki debuted its water-cooled GT750 two-stroke triple – followed a year later at Tokyo '71 by Kawasaki's ultimate drag-strip dominatrix, the 750cc H2 Mach IV two-stroke triple, and then by the 904cc Z1. Against this, at that same October '71 Show Yamaha displayed its prototype water-cooled two-stroke inline four, the GL750, which never made production.

So, commercially speaking, against their rivals' high-performance, high-tech new models, Yamaha's engineers

were up against it – after having already tried to beat the British at their own game with the 1969 debut of their XS650 (aka XS-1) parallel-twin with its sohc unit-construction five-speed motor and horizontally-split crankcases. It sold well enough in the USA for them to consider developing a version of the model which addressed its customers' big complaint – the vibration endemic in such 360° two-up twins.

The result was the TX750, duly launched in 1972 as Yamaha's range-topping model, dead-heading with the Kawasaki Z1, despite which sales initially boomed, with 15,511 examples shipped to dealers in the last five months of the year. While superficially similar to the XS650, the TX750 was an almost entirely new design. Although its all-aluminium, horizontally-split dry-sump engine remained a Brit-style air-cooled parallel twin with two valves per cylinder, a 360° crank and the same 74mm stroke as before, its pistons delivering 8.8:1 compression now ran in 5mm-oversized 80mm cast-iron bores for a capacity of 743cc. This resulted in a claimed output at the four-bearing crank of 63bhp at 7500rpm – up from 53bhp. Much beefier peak torque of 50.7lb ft (against the XS650's 35.8lb ft) was produced at 6000rpm, transmitted via a five-speed gearbox, straight-cut gear primary drive and an oil-bath clutch. Twin 38mm Mikuni Solex carbs fed the reworked cylinder head, with relatively shallow combustion chambers sculptured to produce a better bang. Other new features included a crankcase ventilation system in which gases were fed via a reed valve into the airbox to be recirculated, sintered alloy valve seats suitable for unleaded fuel, and a balance tube in a cast manifold which connected the two exhaust ports together at the front of the engine.

The major new feature on the butch-looking motor was the so-called Omni-Phase Balancer, positioned in a cavity beneath and slightly to the rear of the crankshaft – hence the dry sump engine's oil tank was positioned just under the seat. These vibration-sapping balance shafts consisted of two counter-rotating weights driven by a single chain running directly off the crankshaft. One of these was designed to eliminate the primary imbalances created by the firing strokes of the crankshaft against which it counter-rotated, and the other (smaller) one to counter the rocking couple created by the first balancer. It worked, providing this big-bore twin with a similar feel to a four-cylinder model. 'The result is smoothness beyond belief,' wrote *Cycle World* in its October 1972 issue. 'Shut your eyes, and you are on a four. It couldn't be a twin.'

Unfortunately, all was not rosy, and it took only a few months – especially after sales began in Europe early in 1973 – for word to get out of serious reliability problems with the new motor. Broken cranks aplenty were seemingly caused by the Omni-Phase balancers heating up the engine lubricant at high revs and whipping it into a froth, so the aerated oil starved the crank bearings and conrods of lubrication, while flooding the two ignition points housings. Additionally, the balance chain apparently tended to stretch, knocking the counterweights out of phase and making the engine run much rougher than a standard twin without the balancers – before eventually breaking, with imaginable results.

The company responded quickly – it had to, as sales of 7770 such bikes in January to March 1973 tailed off to 3360 units in all the next nine months of that year – via what's

agreed to be the first technical recall of a current model in modern motorcycle history. This was for no less than 18 different component replacements or adjustments, up to and including new crankcases now incorporating external balancer chain adjusters, a deeper oil sump with anti-froth baffles, a factory-developed oil cooler, and doubled-up gaskets for the points assembly housings. The 1974-model TX750A had no such issues but sales still flopped, with just 900 examples sold that year, and 400 more in 1975 as remaining stocks were sold off at huge discounts. In just two and a half years Yamaha had sold 33,441 examples of what many now regard as the best classic-era parallel-twin ever. It's just that its engineers needed two bites of the cherry to create it.

The TX750's well-earned reputation for unreliability made it a surprise to find an early example from September 1972 (VIN No 341-009409) which today earns its keep in southern Pennsylvania as one of the fleet of street classics available for hire from Retro Tours (retrotours.com) for group or solo rides of up to seven days in length through the north-east USA and the Atlantic seaboard, in company with Retro Tours founder, Joel Samick.

We'll let Joel explain how he came to acquire the 1972 TX750, which I spent an enjoyable 120 miles riding in the Laurel Highlands of western Pennsylvania. "It was the dreariest part of the winter of 2003," recalled Joel, "and I was thinking about how I could add a big four-stroke twin from the tuning fork folks to the Retro Tours fleet. But XS650 Yamahas were too commonplace, almost prosaic, so when I happened across an obscure, probably obsolete listing for a TX750, it sparked some real masochistic interest, because it was renowned as the worst bike that Yamaha ever built – they blew up like hand grenades!"

"So for a motorcycle-related diversion from the cold winter, we took the pick-up truck and headed for New Jersey. I'd called the guy, who said it was a very nice bike, it had been real reliable for him and his wife going touring, he had been riding a newer bike, but he and his wife still preferred to tour on that one, for some reason. My wife happened to have a bunch of money in her purse from our dealership she ran – always risky. Can you see where this is going? We found that it ran and in fact sounded healthy – somehow it had accumulated nearly 30,000 miles, a record for the model, for sure! I test-rode it half a mile in the snow, paid the asking price which was really low, loaded it up and took it home. I'm glad I did. I did some work on it, rode it for a year or two, but the paint was just so ugly I eventually got it repainted in strictly non-standard Kenny Roberts colours."

"During my research, I discovered that before bailing out, Yamaha had methodically updated and improved the TX750 to bring it up to their usual high standard. New crankcases with balancer chain adjusters, a deep oil sump with anti-froth baffles, factory-installed oil cooler, doubled-up oil seals for the points compartment – every flaw had a cure. My new acquisition had all these upgrades, including the new crankcases, plus all the usual work needed to rekindle the flames idled by time. So we've had it for almost 20 years, during which time it's done another 14,000 miles with practically no hiccups. It's just a very good bike that Yamaha should

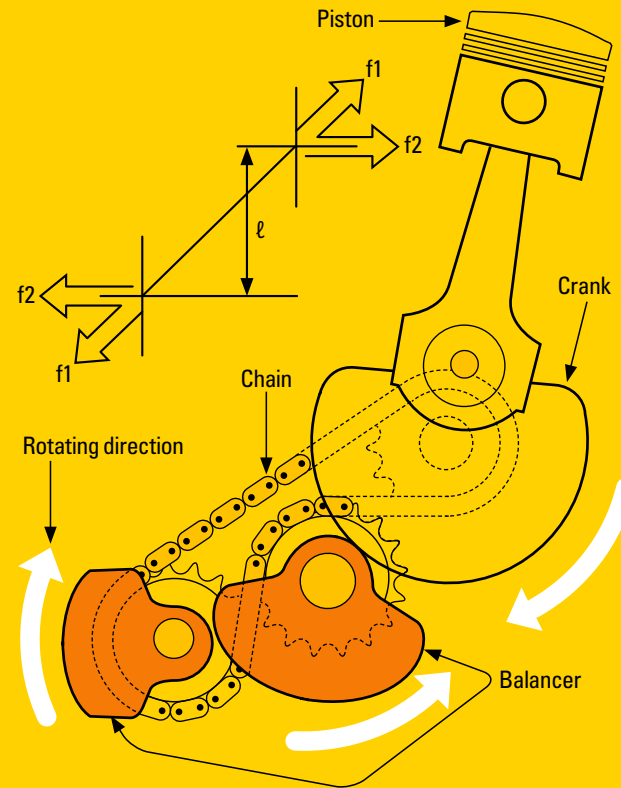


**'THE BALANCERS WHIPPED THE ENGINE LUBRICANT INTO A FROTH AT HIGH REVS'**

Right: Yamaha's 1972 sales brochure showed legendary factory GP rider Jarno Saarinen on the bike. In reality, riding it at high revs killed the motor

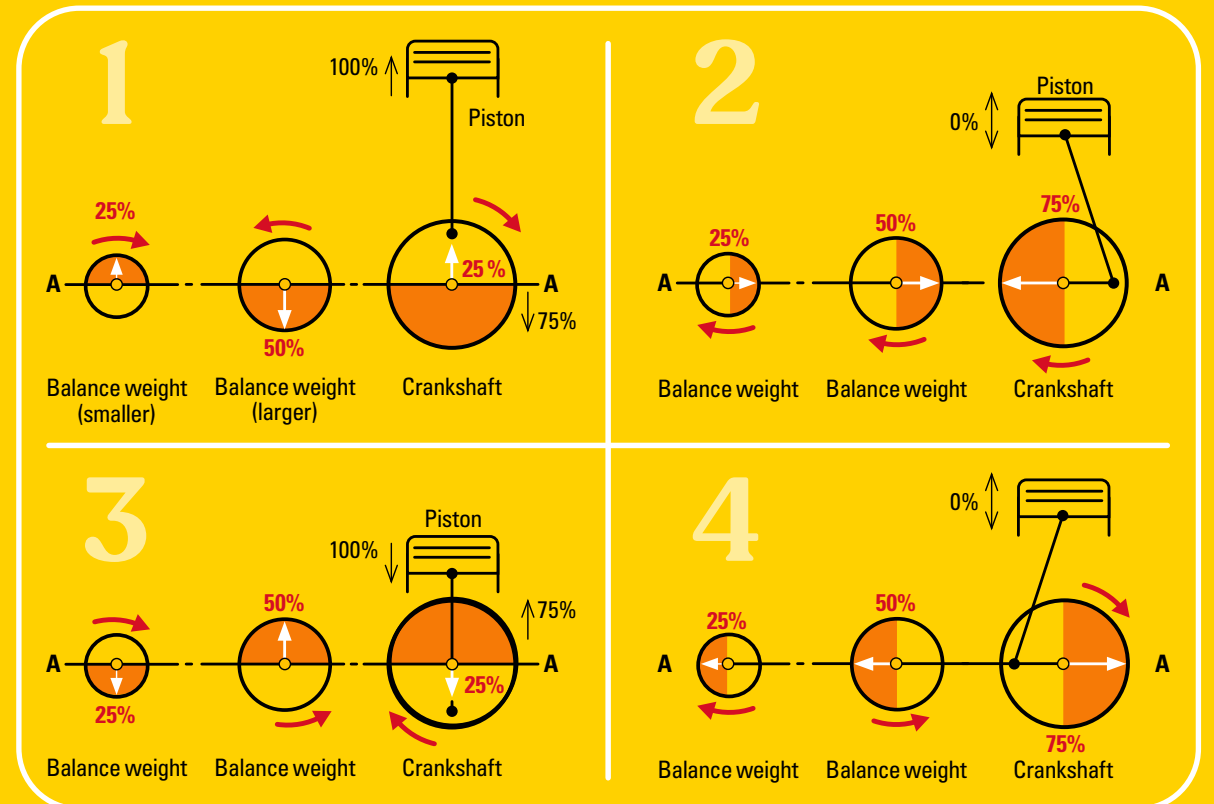
# Yamaha TX750 Omni-Phase Balancer

How Yamaha cancelled out the forces that caused vibration with equal and opposite forces



## Efficient counterbalancing

As shown in the diagram on the left, the balancers are designed to rotate in opposite directions to each other. The f1 moments thrust in a line but in opposing directions, thus counterbalancing each other. On the other hand, however, the f2s are not on the same line, thus failing to achieve complete counterbalance, though resisting each other. A couple of forces between (f2 x l) is generated between the crankshaft and the balancer shaft. In this case, the small balancer works to remove it.



The graphic above shows the dual balancer of the TX750 during the four stages of the combustion cycle. When the TX750 was launched, the 'Omni-Phase Balancer' was an entirely new vibration-reducing device, intended to completely change conventional thinking that vibration produced by a large-capacity four-stroke twin-cylinder engine could not be controllable. In the TX750, balancers (large and small) which are located at the bottom of the engine are driven by chain for rotating motion. Each balancer has the same number of gear teeth as the crankshaft sprocket, thereby to complete each rotation at the same time as the crankshaft, balancers are designed to offset crankshaft vibration by producing equal vibrations opposing to each other.

## YAMAHA TX750



When properly set up, the Omni-Phase Balancer really works. Shame there are so few TX750s left that few people will experience it

have got you guys in Britain to ride hard before they let it loose on the rest of the world. Then they'd have known what they still had to fix before shipping them to dealers."

I'd never knowingly seen a TX750 before throwing a leg over the broad, well-padded 810mm-high seat, so I wasn't quite sure what to expect as I pushed down on the choke lever to the left of the carbs and thumbed the starter. It fired up eagerly before settling to a 1500rpm idle with a great-sounding thrum from the long, tapering megaphone exhausts that sounded 100% like a higher-revving version of a trad British twin. But instead of the shake, rattle and roll, the Yamaha was completely free of vibration.

It was almost uncanny – the best thing I can compare it to is Yamaha's TRX850 with 270° crank 20 years later on, but even that had a slight secondary buzz in sounding and feeling just like a 90° V-twin Ducati/Honda/Suzuki. Thanks to its secondary balance shaft, the TX750 didn't even have that – though this didn't mean it was so smooth that it was soulless. For a start, it sounded really great, and I'll admit to using the gearbox just a little more enthusiastically than absolutely necessary while carving curves through the Delaware River valley, or the Laurel Highlands east of Pittsburgh. Not only was there heaps more grunt on the TX750 compared to the XS650, but the torque curve is much flatter, too, so it's really forgiving in terms of which gear you throw at it. The clutch is pretty heavy – you'll want to use the wide spread of torque for town work and cut down on changing gear, to stop your left hand cramping up unduly. Oh, and neutral is impossible to find at rest – you have to select it while still on the move coming up to a set of lights.

But that smooth engine will pull cleanly away from little more than idle speed – certainly from 2000rpm upwards it pulls hard and strong wide-open to the 7000rpm mark where I shifted gear, 500 revs below the point at which peak power of 63bhp is delivered. Even at higher revs there's no undue vibration, just that low-down thrum from the exhaust that becomes a higher-pitched howl. Like I say, it's a great-sounding bike, and long-legged, too – at 60mph it'd only be running at 3500rpm, rising to just 4200 revs at 70mph, and 5000rpm at 80mph. So it's no surprise that its

previous owner liked to use it for touring so much.

The TX750's duplex cradle frame doesn't exactly rival the Featherbed frame it's copied from in terms of rock-solid stability, but it does feel lighter than a Norton Manx in the way it steers. The Dunlop tyres Joel has fitted really suit the bike, too – especially on the DID-made Borrani-style ridged aluminium rims, which add to the sense of lightness. So you can use lots of lean angle to keep up turn speed. Furthermore, the ease and stability with which the TX750 flicked from side to side through a series of third-gear bends showed that Yamaha got the steering geometry right, with a 27° rake and 99mm of trail for the 36mm forks delivering 150mm of travel for the 19in front wheel (matched to an 18in rear). Joel had obviously been experimenting with fork oil, because he had just enough dive dialled in to make you know you're stopping, without sacrificing the ability to eat up bumps. He'd also fitted a pair of Hagon shocks at the rear, and despite the restricted 80mm of wheel travel, in terms of classic-era rear suspension they don't come better than these.

Inevitably, perhaps the Japanese brakes fitted to the Yamaha aren't in the same league as the forks, because up front there was just a single 300mm stainless steel disc gripped by a single-piston caliper, with a 180mm single-leading-shoe rear drum. With the TX750 clocking in at a porky 235kg wet split 45/55%, a single front disc is quite insufficient for spirited riding, and indeed the left-hand fork leg already has the mounting boss for a brake caliper. That's because for European markets the bike came with doubled-up front discs, with Japan and the USA only getting a single one – making Yamaha's decision not to test engine performance in Europe all the stranger, if they already knew they had to provide extra braking capacity for Euro-riding.

Correctly set up and well maintained, the TX750's Omni-Phase Balancer really works, and it civilised what's potentially the worst of two-wheeled shakers – a rigidly-mounted 750cc four-stroke parallel twin, with a two-up 360° crank. No wonder other manufacturers quickly began to develop balancer systems of their own – but Yamaha was first with this model. What an unexpectedly nice bike – but what a shame it took Yamaha two goes to get it right! 