

Motorcycling

On Test: Yamaha Turbo

Honda CBX550

Yamaha XT550

Honda VF 750



Plus Yamaha DT 125LC

Features: Superservice H-D Cagiva 175/ 250s

Eddie Kidd's Cunning Stunts. Air Suspension

Motorcycling

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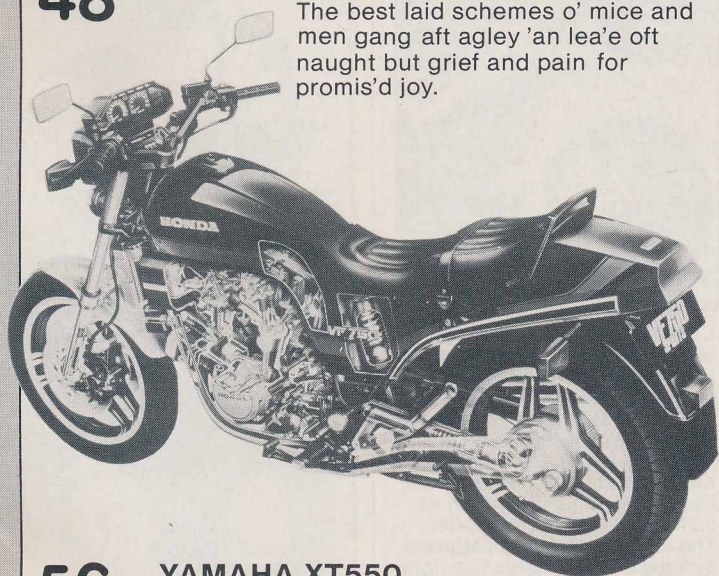
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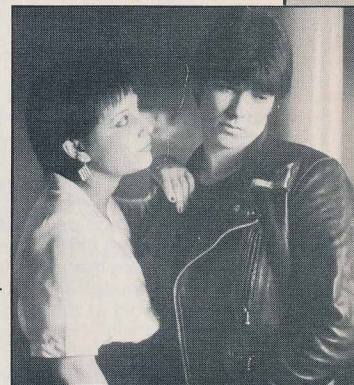
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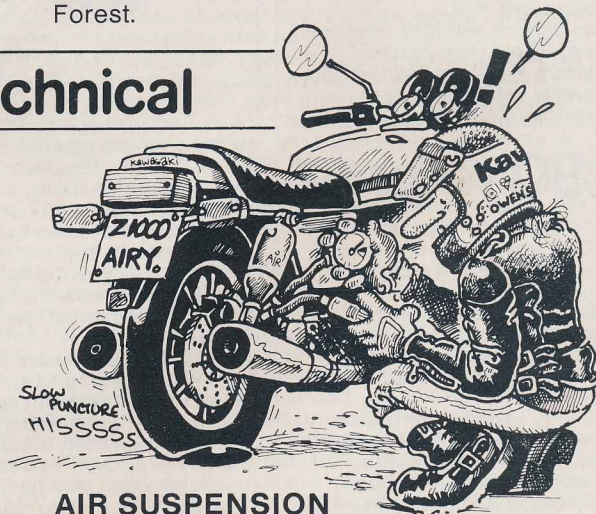
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TURBINE GORILLA

Is this the King-sized boost we've been waiting for, or is the public being Konged?

Bob Goddard reports

It all seems so logical: harness the motor's waste energy, use it to increase cylinder filling and reap the benefits of high performance from a small motor. In today's efficiency-conscious world the turbocharger appears to be the answer to the weight/size/cost versus power struggle of the internal combustion engine of the eighties.

But is it really that simple? Honda didn't think so when they turbo-ed their ubiquitous CX500. In addition to a very neat blower they added fuel injection, an on-board computer to control it, and a multitude of sensors to occupy the computer's spare chips. The result was an amazingly sophisticated piece of mobile technology

which was no faster than the less-heavy CB900, extremely expensive to buy, and prohibitively costly to run. Somehow the efficiency equation went awry and the Turbo drank like a journalist on a press launch. High speed cruising guzzled a gallon every 22 miles.

Enter the Yamaha XJ650T. An across-the-frame four is a much easier configuration to blow than Honda's V-twin and Yamaha have resisted the temptation to bolt on extra techno-goodies just for the sake of it. Consequently production turbo number two is 20lbs and £352 lighter than the CX500T, and it averaged 43mpg over our 1000 mile test. That's better than its unblown stablemate, so boosted motors *can* be more efficient.

So far so good, but here's the bad news: adding that T to the 650's sidepanel puts

over a thousand pounds on the price and, horror of horrors, it doesn't go any quicker. Since performance is *the* point of turbocharging I should explain that I'm referring specifically to measurable performance. On the road, especially in third or fourth gear, the effect of the turbo could be quite mind blowing. With over 5000rpm up and on full throttle, the boost gauge flicked past its mid-range and a second or so later the world you'd been a part of disappeared behind in a raucous howl, and you and the Turbo were zapped into a new time warp. The 650 suddenly became a 1000; the change of tempo was disorientating and the fierce bellow as the spare lefthand pipe chimed in with wastegated exhaust gasses, injected neat adrenalin into the bloodstream.



All very exciting, but the unshakeable fact is that on the day, at the MIRA test track, the Turbo Yam only matched its normally aspirated brother, and with a claimed extra 24bhp and a Star Wars fairing it is not unreasonable to expect something more.

There are several possible explanations, none of them very satisfactory. The bike could have been sick on the day, but I doubt it. It ran a best one-way speed of 126mph, which is not far below the top speed I saw on a motorway. After converting from kilometres (no mph on our test model's speedo) and correcting for speedo error (six percent fast at 100mph) this came to 130mph. And the disappointing acceleration figures may be due to one or more of the bike's in-built safety devices panicking as a loony journo gave the bike full beans in each gear up the test tarmac. Apart from the wastegate which is operated from the inlet side of the turbine, and a secondary pressure relief valve if the first fails, the transistorised ignition system adjusts spark timing electronically to prevent pre-ignition. The extra heat and pressure generated by the boosted intake can cause destructive detonation, so an anti-knock sensor is installed to detect the first hint of pinking. This, according to the P.R. blurb, causes: "the igniter to retard ignition timing gradually until detonation ceases. When detonation has not occurred for a certain period, the igniter gradually advances ignition timing again, up to a point where detonation almost occurs..."

It all sounds a bit too gradual for maximum poke during the intense acceleration of a 12 second quarter mile, but perhaps turbo owners would rather be a half second slower than risk junking their motors every time they get a bit enthusiastic at the traffic lights.

Where the Turbo does score, somewhat surprisingly, is on top gear acceleration. Up to 50mph it is very slightly slower than the standard XJ, but beyond this the turbine starts to take effect and our 50-70, 60-80, 70-90, and 80-100mph flexibility runs showed a marked improvement by between two and three seconds - 25 percent quicker.

On the road a Turbo pilot could overtake two cars every time a stock XJ rider could overtake one. And since sluggish throttle

response delays the XJT's charge, the turbo effect is all the more noticeable.

But enough of this performance fixation. Yamaha's tidy turbo installation deserves a closer look. The Mitsubishi TCO3-06A turbocharger is the world's smallest turbo unit with a maximum speed of 210,000rpm (goodness me!) The motor's four header pipes meet beneath the gearbox in a complex double funnel to smooth out gas pulses for optimum turbine drive and the combined exhaust gases then spin the turbine which is conveniently mounted below the swinging arm pivot, before escaping through the righthand muffler.

Meanwhile, the compressor end of the turbo's rotor is pumping air drawn from the air filter into a surge tank, then into the carburetors and from there into the cylinders. The carburettor float bowls are also pressurised to match the increased air pressure, a pipe from the surge tank operating a pressure regulator controlling the pump-fed fuel line from the gas tank.

When boost pressure gets too high a wastegate valve opens on the exhaust side of the turbine venting gas through the spare muffler. When boost pressure is too low, a reed valve in the surge tank opens, drawing air direct from the air filter so allowing the motor to breathe normally at low revs.

This made the motor very tractable around town. In fact the Turbo had the sort of soft performance you'd expect from a 400cc twin until you wound the motor past 5000rpm and then held the throttle wide for a few seconds. When the motor received full boost the transformation was staggering. The XJ650T is really two motorcycles in one.

Internally the XJ motor is little altered. Piston crowns are 30 percent thicker, main bearings and con rods are modded for improved lubrication and thereby enhanced cooling, and cylinder fins are enlarged to lose some of the extra heat. Around town on a sunny day the hot air wafting over legs and unmentionables became most uncomfortable, but this is one of the penalties you pay for having the luxury of a full fairing on the open road. The fairing was low and small enough to be unobtrusive in traffic and the screen didn't obscure the road like some. Over about 60mph wind deflected by

TECHNICAL SPECIFICATIONS

ENGINE

Type: Turbocharged, DOHC, four cylinder, fourstroke. Bore x stroke: 63.0 x 52.4mm. Displacement: 653cc. Compression ratio: 8.2:1. Carburetors: Four pressurised 30mm CV types. Lubrication: Wet sump. Max bhp: 90 @ 9000rpm. Max torque: 60.25lb.ft @ 7000rpm.

TRANSMISSION

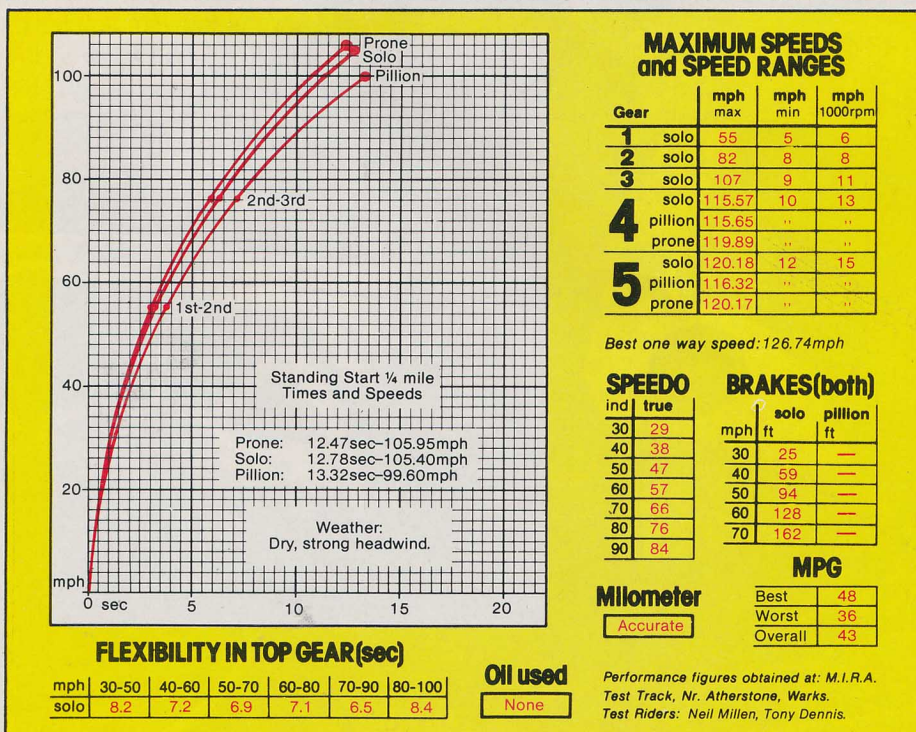
Overall gear ratios: 1st 14.55, 2nd 9.98, 3rd 7.67 4th 6.21, 5th (top) 5.40:1. Clutch: Wet, multilplate. Final drive: Shaft.

FRAME and FORKS

Frame: Full cradle with twin downtube. Front suspension: Telescopic forks with air-assisted



PERFORMANCE CHART



coil springs and oil damping. **Rear suspension:** Swinging fork controlled by two oil damped, coil sprung shocks, with four damping and five pre-load settings. **Front travel:** 5.5in. **Rear travel:** 3.6in. **Trail length:** 4.6in. **Castor angle:** 62 degrees 30 minutes.

WHEELS and BRAKES

Front tyre size: 3.25 V19. **Rear tyre size:** 120/90 V18. **Front brake:** Twin 8.9in dia discs. **Rear brake:** SLS drum, 8in dia.

ELECTRICS

Ignition: Transistorised. **Battery:** 12V 14Ah. **Generator:** 266W three-phase alternator. **Headlight:** 60/55W. **Tail/stop lamp:** Twin 5/21W. **Indicators:** 21W. **Warning lights:** Main beam, neutral, turn, 3.4W. Plus LCD display panel for sidestand, battery, oil pressure, brake fluid, fuel and lights functions.

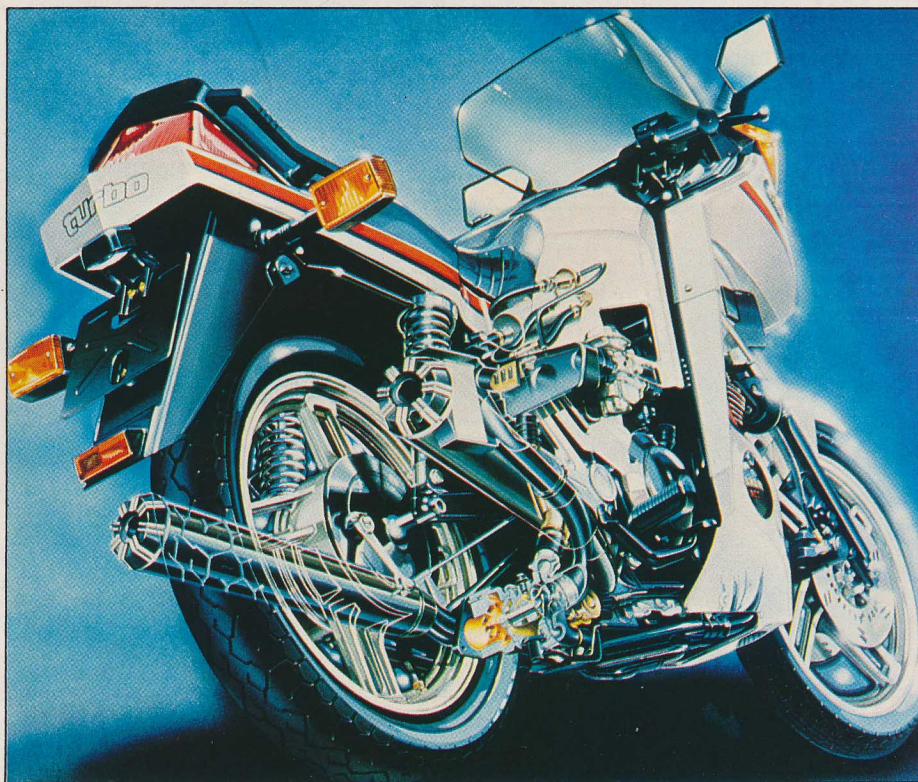
DIMENSIONS

Seat height: 30.5in. **Length:** 86.6in. **Width:** 28.7in. **Height:** 53.4in. **Wheelbase:** 56.7in. **Ground clearance:** 5.3in. **Dry weight:** 507lb. **Fuel tank:** 4.18gal.



COMPARISONS

Make	Speed prone	SS ¼ mile prone	Dry weight	Claimed bhp	mpg	Price on road
Yamaha XJ650 Turbo	120mph	12.47sec/106mph	507lb	90 @ 9000rpm	43	£2998
Honda CX500 Turbo	126mph	13.28sec/103mph	527lb	82 @ 8000rpm	31	£3350
Yamaha XJ650	120mph	12.46sec/101mph	454lb	66 @ 9000rpm	41	£1845
Katana GS650G	117mph	12.70sec/102mph	481lb	73 @ 9000rpm	45	£1775
Kawasaki GT750	127mph	12.29sec/109mph	485lb	78 @ 9500rpm	45	£2100
Guzzi Le Mans III	127mph	12.99sec/104mph	454lb	78 @ 7800rpm	46	£2899



Tucking turbine behind gearbox is neat but makes exhaust headers long and so increases turbo lag. This XS1100 prototype had fuel injection. XJ650 uses carbs.

the fairing hitting the rider's helmet caused whistling and buffeting, but crouching slightly and looking through the screen on the longer fast stretches gave R100RS-type silence and comfort.

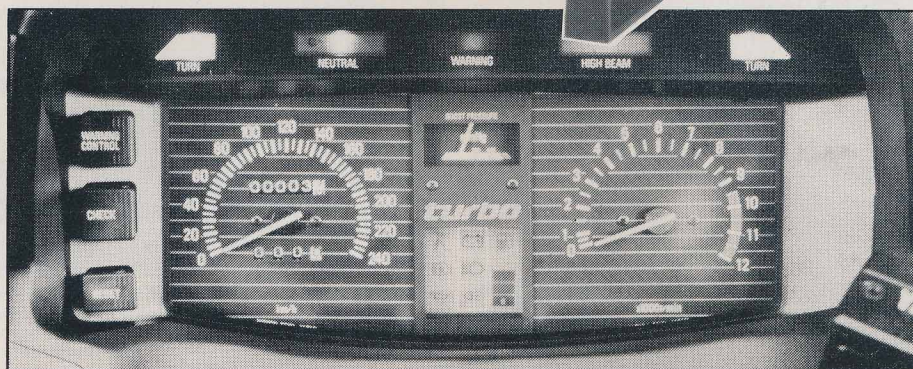
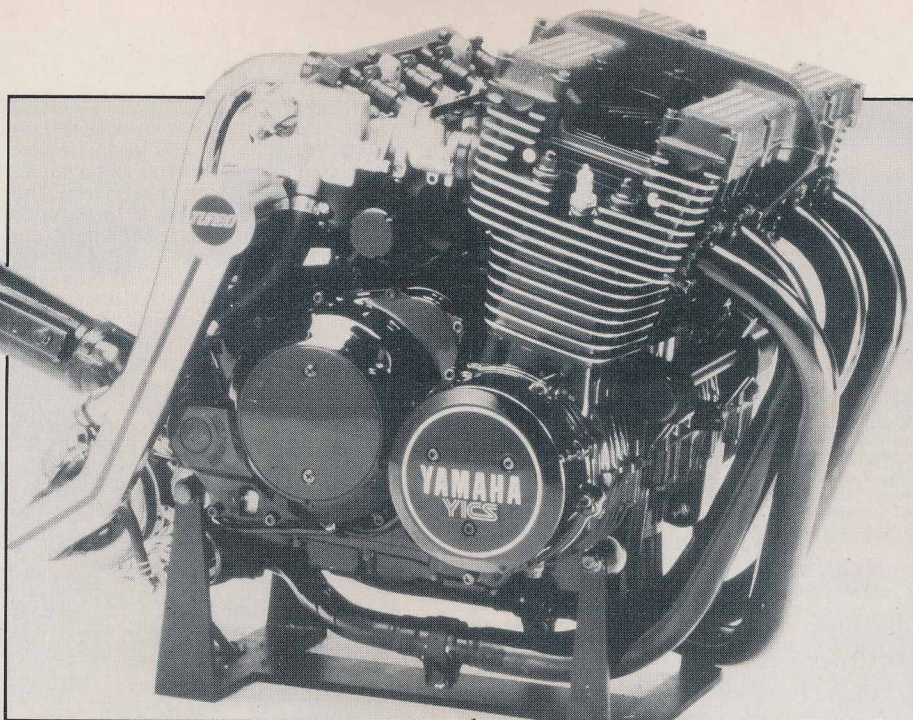
The riding position is good, the unusually shaped seat comfy, especially two-up, and only the whine of the turbine became wearing. The shaft drive is as silent and side-effect-free as the standard XJ's, despite being beefed up along with the clutch and gearbox to cope with the additional torque. If anything the gearshift was lighter and slicker and we had none of the clutch bothers that marred speed testing the XJ650 two years ago.

All the controls were light and the dog-leg levers comfortable and easy to use. The twin 8.9in front discs were more than capable of handling the Turbo's performance - it's not so much that the bike is faster, more that you find yourself going quickly in places where you didn't oughta.

Suspension is basically the same as the unblown XJ with air valves added to the front forks and four-position damping adjustment added to the rear shocks. We found both the damping and springing at the rear end needed to be at or near their highest settings to keep the rear end taut, but no amount of fiddling with air preloads in the forks cured a disturbing head wagging which set in during long fast curves. Keeping the throttle full on reduced it considerably, but with the rate the turbo added speed this was not always convenient. Shutting the taps in mid turn could be scary.

Now, whether this was due to the weight of the fairing, or more likely the downthrust of its wedge shape at speed, I don't know, but I'd be tempted to try beefing up the springs with spacers were the bike mine. Yamaha claim a 25 percent reduction in front wheel lift at 120mph, so fork overloading seems the likely culprit.

Otherwise the Turbo handled and steered very well, feeling safe and happy scratching a peg, changing lanes or lines rapidly and remaining straight-line stable even at 120mph in the wet. The Bridgestone Mag Mopus L303 tyres slipped over while lines with only moderate twitching, gripped well



LCDs are amusing but clear instruments and big warning lights are more useful.

in the dry and gave no cause for concern when it rained. Even the brakes worked as well in the wet as dry.

Starting the Yamaha from cold took a little longer than normal, but it always fired within ten seconds and the 12 volt 14 amp-hour battery never faltered. A handlebar choke lever saves fishing around beneath the fibreglass for enrichening, but the non-vacuum fuel tap required a manual turn.

Smallish, but clearly readable instruments are incorporated in the flight-deck panel which includes boost-pressure gauge and an LCD space-invaders warning light panel. This ran through a check on the status of

sidestand, brake fluid, oil pressure, battery, headlamp, tail lamp and fuel level each time the motor was started, and incorporated a rudimentary fuel gauge too. If any of the monitored components malfunctioned during a ride the appropriate symbol flashed along with a red warning lamp set between the neutral, high beam and indicator repeater lamps above. Quite a neat and efficient system, lacking only the Honda VF750's digital clock and gear indicator.

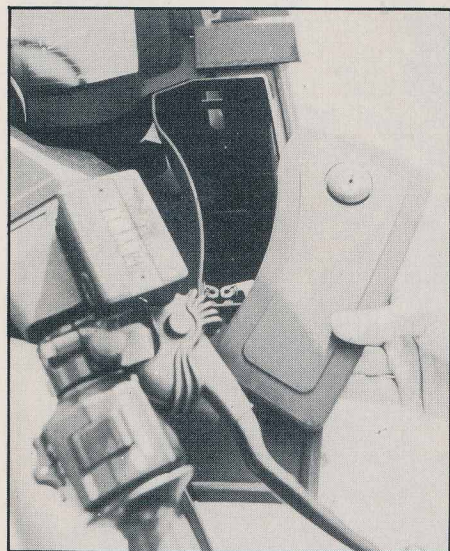
Two fairing-mounted mirrors should have given a good view behind, but were too close together to avoid being half-full of elbows. What little vibration there was did not significantly affect their efficiency.

Once you'd found the hidden lever and undone the seat lock the seat lifted off complete with built-in grab handles. Beneath was an average toolkit but no storage space thanks to the chunky, wrap-around rearlight. Two lockable glove compartments in the fairing were just that. Nothing much bigger than a pair of light gloves would fit.

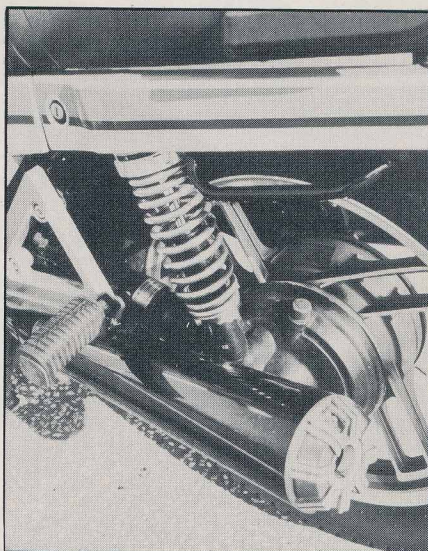
Switchgear was tidy and easy to use, the self-cancelling indicators didn't cancel early like so many others, and the halogen headlamp provided enough light for 70mph travel on unlit night roads. Even dip cutoff was a good compromise.

As you can see from our photographs the styling is, um, ostentatious. It certainly makes people look, and if you've just spent £2998 on a 650cc motorcycle that may be exactly what you want. I felt embarrassed.

So what do you get for an extra grand? A lot more excitement, a little more useable performance, a guaranteed conversation opener and exclusivity. Turbocharging may be the way ahead for the bikes of the future, but with two brave attempts behind us the something-for-nothing theory has yet to become fact. ■



Fairing has two lockable glove boxes.



Shaft drive excellent, suspension average.