CANNONDALE FX400 vs. YAMAHA RAPTOR 660R!

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JULY 2001

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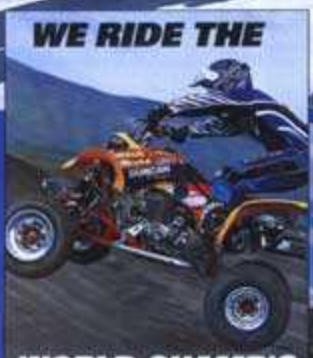

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HIGH-PERFORMANCE SHOOTOUT

Cannondale FX400 vs. Yamaha Raptor 660R

Yes, there's a winner. We never compare two machines, or three, or five, without putting them through enough to find the top quad. Cannondale's FX400 was thrown against Yamaha's awesome Raptor 660R because the Yamaha beat the other hi-per quads we tested in previous comparisons (check our back issues for proof), and the Cannondale blew our most performance-minded test riders out of their boots on a two-day introduction ride.

We were told the press-intro FX400s were standard machines, the kind any buyer could expect to find at Cannondale dealers, but we were suspicious. Large and small manufacturers occasionally trot out hot-rodded, hand-built special machines at press introductions, and then offer regular customers something less.

Riders who are attracted to machines that aren't easily mastered are drawn to these two quads like dust to a well-oiled air filter. If excess performance and the feeling of accomplishment that comes from learning to handle it is your bag, the FX400 and the Raptor are both good picks. The more trick, more radical Cannondale delivers more image value, but not more performance.

SHOOTOUT

For credibility's sake, Cannondale supplied two used "dealer issue" FX400s, and invited us to test them against anything we had. We brought our nearly-stock 2001 Yamaha Raptor 660R. It had seen some hard use in its solo test and in comparisons with the Yamaha Banshee 350, Honda 400EX and the Bombardier DS650. The Raptor proved to be a better machine for all-round use than anything we pitted it against, so it wound up with another combatant, the FX400, the baddest, most expensive, most race-ready rig any manufacturer has ever had the guts to offer for sale.

We anticipated a slaughter, with the muscular-but-heavy, trail-friendly Raptor laid out with the racier Cannondale's Holeshot knobby marks up its chest. The outcome was different, but it took a number of sessions in the dunes and a bar-banging, stopwatch-splitting battle out on cross-country *and* motocross courses to show us which machine out-performed the other.

ENGINE-ERING

Comparing a 400 (actual displacement is 432cc) and a 660 may not seem fair, but these two machines made their own fight by having performance credentials that topped everything that came near them. Yamaha's Raptor 660R pumps power out the old-school way, with truck loads of cubic inches and the high-tech way, with liquid-cooling, two carbs and Yamaha's five-valve head. There's some new thinking in the Yamaha engine but it's not *exactly* new; Yamaha has used versions of the same 660 in other machines years before the Raptor appeared. It's proven, powerful—and willing to punch out more ponies with a few modifications.

Yamaha knew a fast machine could take riders to the ends of their favorite trails quickly, so it gave them a quick way out—reverse, an unexpected but welcome convenience on a high-performance quad. Call us wimps, but we like it—and we'll get out of a dead end faster than riders without the ol' "R" switch! The Yamaha also has electric starting, another convenience feature that comes in handy for racing, too.

Cannondale did something unheard of in the ATV world when it put a full-race motocross motorcycle engine into an ATV. Except for a quieter muffler, a torque-biased ignition curve and a beefed-up clutch, the light, electric-start, liquid-cooled four-valve FX400 powerplant is exactly the same as the one that powers Cannondale's impressive MX400 motocross bike. It was designed from the crank pin out to be an aggressive, quick-revving motor with two-stroke-like response, and it is. The Cannondale's horsepower-per-cc output is what you'd expect from an engine that just *came back* from a high performance shop. It didn't have to; it was designed for full-race performance from the beginning.

With five valves and the biggest engine that has ever powered a production quad, the Raptor has its share of tech appeal.

The dyno tells part of the story. The FX400 is good for 38 horses. The best the Raptor could do was 34.

Peak horsepower is just a piece of the picture in the battle between the Raptor and the FX400, but the Raptor looks bad on the other side of the power-to-weight equation, too. The Raptor weighs in at a rotund 412 pounds, with a gallon of gas in the 3.2 gallon tank. In relative terms, the FX400 is a feather, at 379 pounds with the same amount of gas in its unusual, under-seat, 3.2 gallon tank.

The Cannondale feels serious, sounds radical and accelerates like a 660! It's a hot-rod, and it's even exciting when you're done riding, sitting in the garage eyeballing all the engineering and workmanship that goes into it. The Raptor accelerates like a 660 too. Its Japanese dependability adds some welcome peace of mind on long rides out in the boonies, too.

FRAMED

Since their introduction, frames on four wheelers haven't changed much. Except for specs tailored to specific types of riding, most ATV chassis are cages of steel tubes that surround the engine and provide mounting points for front and rear suspension. The Raptor's chassis is an intelligent design patterned after sound designs from other good-handing ATVs and aftermaket chassis. Thankfully, Yamaha ditched some of its own goof-ups, like the sad chain adjustment system on its big-selling Banshee and Warrior ATVs, when it brought out the Raptor. The result is a light-handling machine that masks its own substantial heft. The stock chassis setup is intended to provide excitement and, at the same time, goof-proof safety for a wide range of riders—and it does just that.

In a nutshell, the Raptor's feel favors fun more than full-tilt racing response and stability. It's eager, sometimes too eager, to wheelie, and it's quick-turning, but a little tippy because of its narrow track. The suspension can be bottomed if the rider goes for big air, but it delivers plush, predictable performance up to its limits.

Yamaha equipped the Raptor with excellent brakes and tires to round out the handling package. The Raptor's original equipment Dunlop radials worked well, but we switched to ITP Holeshots so the Raptor and the FX400 would be on the very same rubber for our comparison. Fine points like a low-effort throttle and clutch add to the Raptor's easy-going nature. The hardest thing about riding the Raptor is hanging on during full-throttle acceleration. It pulls like a big bore should! It's the kind of challenge we like.

Cannondale made its name building high-priced, high-performance aluminum-framed mountain bikes for cyclists who wanted, and were willing to pay for, the extra measure of engineering and performance that could serve above-average riders. Its quad is the same. A rock-solid aluminum perimeter frame makes sure the suspension, not the frame, does the giving when impacts are encountered, and the frame's spacious "interior" let Cannondale gather the heavy parts like the engine, battery and fuel tank near the center to make the machine's handling more effortless. It's kind of like the difference between holding a big fish up by your hand, as opposed to holding the beast at the end of your fishing pole, well away

	2001 CANNONDALE FX400	2001 YAMAHA RAPTOR 660R
ENGINE/TRANSMISSION		
Engine type	Liquid-cooled, DOHC, 4-valve, 4-stroke	Liquid-cooled, SOHC, 5-valve, 4-stroke
Displacement	432cc	660cc
Bore and stroke	95mm x 61mm	100mm x 84mm
Carburetion	EFI	Twin 33mm Mikunis
Compression ratio	12.5:1	9.2:1
Lubrication system	Dry sump	Dry sump
Additional cooling	None	None
Fuel system	Electronic fuel injection	None
Air filter type	Reusable oil foam	Reusable oiled foam
Air filter access	Remove front cowling	Unlatch seat, remove airbox lid (four clips), remove air filter and cage (one screw)
Choke location	None	Knob near ignition switch
Starting/backup	Electric/none	Electric/none
Starting procedure	In neutral or any gear w/clutch engaged or disengaged	In neutral or any gear with clutch disengaged
TRANSMISSION/DRIVE SYSTEM		
Transmission	Manual clutch, 5-speed w/no reverse	Manual clutch, manual shift, five-speed w/reverse
Clutch/shift	Left hand lever/left foot lever	Left hand lever/left foot lever
Shift pattern	1-N-2-3-4-5	1-N-2-3-4-5
Final drive	520 O-ring chain	520 O-ring chain
DIMENSIONS/CAPACITIES/WEIGHTS		
Fuel capacity	3.2 gal	3.2 gal w/reserve
Wheelbase	49.5"	49"
Overall length/width/height	73.5"/46.4"/45.0"	72"/45.2"/43.3"
Seat height	32.5"	33.9"
Ground clearance at footpeg/rear sprocket	10.4"/4.8"	9.8"/3.8"
Wet weight, w/1 gal. fuel	379 lb.	412 lb.
ROLLING CHASSIS		
Frame	Aluminum perimeter frame	Steel round tube
Suspension/wheel travel		
Front	Dual A-arms with compression, rebound and preload adjustable shocks/9.0"	Double A-arms with twin 5-way preload-adjustable shocks/9.1"
Rear	Linkageless swing arm with single compression, rebound and preload adjustable single piggyback reservoir shock/10"	Swingarm with non-linkage single 5-way preload adjustable nitrogen-charged shock/8.8"
Brakes/actuation		
Front	Twin single-piston hydraulic disc/right hand lever	Twin hydraulic disc/right hand lever
Rear	Single-piston hydraulic disc/right foot pedal	Single hydraulic disc/right foot pedal
Parking brake	Foot disc/push button on front brake lever, pull in lever and move clip into place	Rear brake/push button on right hand brake lever, pull in lever and move spacer into place
Tires		
Front	ITP Holeshot 21x7-10	Dunlop KT331 21x7-10 radial
Rear	ITP Holeshot 20x11-9	Dunlop KT335 20x10-9 radial
Wheels	Aluminum	Aluminum
DETAILS		
Battery	8 amp/hour	8 amp/hour
Lighting front	Dual frame-mounted 37.5w headlights	Dual 30W/30W headlights
Lighting rear	Single taillight	Single 5W taillight w/21W brakelight
Instruments	None	Neutral, coolant temp and reverse indicator lights
Colors	Red, Grey	Grey/white, blue/white
Minimum operator age	16	16
Suggested retail price	$7950	$6499
Made in	USA	Japan
Manufacturer	Cannondale Corporation 172 Friendship Village Road Bedford, PA 15522-6800 (203) 749-7000	Yamaha Motor Corp 6555 Katella Ave. Cypress, CA 90630 (714) 761-7300 www.yamahausa.com

from where your mass is concentrated.

Along with centralizing the weight as much as possible, Cannondale shaved weight wherever possible, too. The FX400's electric starter might seem like a luxury to some—until they notice there's no kick starter. There's a vibration-calming counterbalancer in the engine, to help the frame and engine live longer, but don't look for reverse. Cannondale considers that a weight-adding convenience feature for trail riders that racers and hard core riders don't need.

The high-end thinking didn't end with the basic chassis design. Cannondale put top-quality rebuildable, revalveable Ohlins shocks on the FX400 along with Nissin brakes (like Honda uses). Even the chain and sprockets are top-shelf, racing-quality stuff. The FX400 is more like what a racer would turn his showroom-stock quad into than any ATV ever sold to the public. From the firm seat foam to the grippy ITP Holeshot tires, this is a racier quad than most people expect to find on a showroom floor.

ALL-OUT WAR

Enough of the tech briefing mumbo jumbo. It's time we let you know what happened when we turned these two shredders loose on each other. Like any riders with comparable quads, we started by staging repeated drag races between the Raptor and Cannondale. So both machines would be on equal footing, we put the same ITP Holeshot tires the Cannondale comes with on the Raptor's hind feet. Rather than a power-line road or a deserted street, we held our drags on the well-groomed straight of Competition Park's flat track oval. We switched riders, lanes, directions and everything else we could think of and the results were surprisingly similar time and time again. Shocking, considering the Cannondale's considerable power-to-weight advantage.

If the Cannondale rider's reaction to the start signal and shifts were good, the FX400 would cross the finish line right beside the Yamaha. If not, the Raptor would pull the Cannondale, but not put it to shame. The biggest difference was about a quad-length. Since both of these ATVs are for expert-level riders, we'll call this section of the shootout a tie.

We have to point out that although the Cannondale can match the Raptor's drag race times, it takes a very good rider to consistently get fast drag race runs with it. Do us a favor and don't try any drag-race style riding with either of these machines, unless you've got a lot of ATV riding miles behind you. Pin the throttle and bang the gears, and both wheelers are capable of fierce acceleration and high-speed wheelies that beginners can't handle!

Our Raptor suffered a brake caliper seal leak, but the brake continued working. The mess was a lot bigger than the loss of fluid. Raptor front suspension: plush and predictable.

CANNONDALE FX400 vs. YAMAHA RAPTOR 660R: DRAG RACE RESULTS

RACE 1
Rider: Adam Campbell. **Machine:** FX400. **Time:** 15.26
Rider: Alan Knowles. **Machine:** Raptor. **Time:** 15.20

RACE 2
Rider: Adam Campbell **Machine:** FX400. **Time:** 15.24
Rider: Alan Knowles **Machine:** Raptor. **Time:** 15.22

RACE 3
Rider: Adam Campbell **Machine:** Raptor. **Time:** 15.30
Rider: Alan Knowles **Machine:** FX400. **Time:** 15.28

RACE 4
Rider: Adam Campbell **Machine:** Raptor. **Time:** 15.38
Rider: Alan Knowles **Machine:** FX400. **Time:** 15.38

MISSILE TRACKING

Our testing moved to two of Competition Park's *four* motocross tracks to see how the machines stacked up there. Remember, both machines had completely *stock* frames and suspension. No special A-arms, swingarms or underarm deodorants were used.

To eliminate the time-bungling effect of two nut cases battling with each other for good lines, we did individual timed runs with our own lovely and talented associate editor, Adam Campbell, and the less lovely but surprisingly talented Alan Knowles—of CT Racing. To get more test input and some spectacular photos, we had H-Bomb Films' Wes Miller pound a few hundred laps on each machine—until he pounded himself into the ground while strafing a whoop section on the Cannondale. Fortunately, only Wes was damaged, and testing preceded without interruption.

How close were those two on a long, loose, sandy hillclimb? This close, and almost every time, too.

Despite the FX400's trick frame and high-buck Ohlins suspension, the results were as close as the side-by side drag runs, which surprised us and the riders. Of course, we never anticipate the outcome of a comparison, preferring to stand back with clipboards and pens poised to record the results as they emerge—yeah, right. When the times were recorded, the motocross results were as close as the drag race results. Going by the times, we can't declare a clear winner here, either. Dang! Closely matched quads make this magazine shootout writing business tough!

While you study the times, also consider the surprisingly similar comments of the test riders and the words of ATV Action's less fast but more talkative managing editor, D.J. Williams

Allen Knowles, owner, test rider, R&D guy for CT Racing and part-time pit-area car and truck customizer/vandalizer: "I've spent so much time on Raptors I feel really comfortable on them. Even though the stock suspension is soft for the track, the machine gives you a good feel for its limits. You know just how far you can push it. When you go too fast or over-jump something, the Yamaha doesn't bottom too harshly or do any-

thing scary. It's really predictable, and the power, even stock, is pretty healthy and easy to use.

"The Cannondale feels more like a race bike. The engine revs fast and high and it makes a lot of power at high revs. It's like a highly modified engine. The suspension feels pretty firm but it would bottom, sometimes without much warning. The steering is light, but it seems to turn toward full-lock too easily once you initiate a turn. It's definitely more sensitive and less forgiving than the Yamaha. It sticks well and holds its line when you're cornering hard, though. I like the Cannondale's light feel, the brakes and the ergonomics. It's a pretty good package for such a new design, but I'd go with the Yamaha because I know they can be made to handle and run a lot better than stock with a few mods (He should know. CT Racing has *tons* of hop-up parts for Raptors—Editor). The FX400's suspension and steering only needs a little fine tuning to be excellent, but it may not be possible to make the engine a whole lot faster than it is.

Adam Campbell, ATV Action associate editor, pro-level motocross racer, girl chaser and man about town: "As a good-looking hunk of man, I like being on a sharp-looking quad, and the Cannondale is definitely more of an eye-catcher than the Raptor, which people are used to seeing. The Cannondale feels more like my favorite kind of machine, a hard-hitting two-stroke race quad, but it's got that good, controllable four-stroke-style power, too. The engine is pretty smooth even when you scream it, and it loves to rev. The cornering is a little over-sensitive and I'd firm up the suspension, but the quad is good in general. The Raptor is fun and really plush but the weight is really noticeable when you ride it hard. I just like the lighter, more racy feel of the Cannondale better."

Wes Miller, H-Bomb Films Movie Mogul (as in "Huevos" 1 through 33), Baja racer, ATV Action test/photo rider and crash test dummy: "Is the Cannondale's seat aluminum, too? Ow! The Raptor's seat is brutal, too. The foam's okay, but if you hang off the side the seat base gouges you like the sharp side of a hubcap.

"The Yamaha's a nice, refined machine, but I'm more of a 250R guy, so I'm more at home on the Cannondale than something that feels heavy like the Raptor. The Cannondale feels light enough to get aggressive with, but the stock suspension needs revalving. It blows through the travel and bottoms pretty easily on the MX track. Of course, I'm 210 pounds, which is heavier than a lot of riders (try turning down a Huevos Rancheros breakfast every now and then, Wes—Editor again).

D.J. "The Yeti" Williams: I really like both of these machines, but for different reasons. The Raptor is far more reliable, so far, and it's easy to ride. Cannondale made a lightweight quad that's fast, but its quick steering makes it scary in the turns. There's more ultimate performance potential in the FX400, but I prefer the Raptor when both machines are in stock trim.

Joe "The Editor" Kosch: Are you punks going to give me a chance to ride or do I get stuck shooting all the photos and doing all the writing again?

CANNONDALE FX400 vs. YAMAHA RAPTOR 660R: MOTOCROSS TRACK LAP TIMES

MOTO 1
Rider: Adam Campbell. **Machine:** FX400. **Time:** 2:32.20
Rider: Alan Knowles. **Machine:** Raptor. **Time:** 2:31.55

MOTO 2
Rider: Adam Campbell. **Machine:** FX400. **Time:** 2:31.35
Rider: Alan Knowles. **Machine:** Raptor. **Time:** 2:31.10

MOTO 3
Rider: Adam Campbell. **Machine:** Raptor. **Time:** 2:31.11
Rider: Alan Knowles. **Machine:** FX400. **Time:** 2:31.00

MOTO 4
Rider: Adam Campbell. **Machine:** Raptor. **Time:** 2:32.25
Rider: Alan Knowles. **Machine:** FX400. **Time:** 2:31.71

LOOKING FOR FUN TIMES INSTEAD OF FAST TIMES

Both of these ATVs have plenty of racing performance, but high performance four-wheelers are too much fun to save just for race day. We hit the dunes, trails and hills every chance we get!

Long, hard rides in the dunes and trails show a lot about how a machine holds up, and how versatile it is in varied terrain, so we loaded up the Raptor, the FX400 and some gas cans and headed to one of our favorite testing spots that has dunes, hills and trails all within a day's ride.

We wanted to begin the trail riding outing with a photo session before any crashes took out a rider or machine, but our highly disciplined test riders left us in the dust and headed straight for the biggest hillclimb in the area. Fortunately, both machines and riders are capable climbers, and we got to see how the 400 and 660 compare on Earth's own dyno, a long, loose, steep climb that shows what kind of beans the engines put out. Again, the results were as close as two machines could be. When the two riders would hit the hill side by side, one would have to back out of the throttle just to give the other some space to turn around at the top of the climb! Neither machine had any trouble blasting up the biggest hill around.

In the dunes, the high revving Cannondale proved to be more fun. The power is more like a Banshee with good bottom end than a typical four-stroke. The Raptor is a great duner, too, but the torquey, woods-style power isn't as exciting in the sand. Our riders' only gripe about the Cannondale in the dunes was the automatic "auger-in" steering response. Yamaha's Raptor is as well mannered in the sand as it is on the track.

On our trail loop, we liked the FX400's light, tossable feel, but we found ourselves riding "tight" to keep the steering from getting the best of us. The power's a blast and the suspension is firm so it doesn't dive or wallow. It always feels ready to charge.

Riding the Raptor was a riot, too. The wheelie-happy 660R feels like a

FX400 front end: firm, but far from bottom-proof.

The FX400 squirted a little coolant after about 30 drag races and some wide open TT-style taps. It never felt like it was running hot and coolant loss was minimal. Charging system problems sidelined the FX400 on one of our test days, but Cannondale claims they've found and cured the cause on the latest batch of machines.

Cadillac—one with a breathed-on 32 valve Northstar V-8. It hauls! The narrow stock track made for some nervous moments when we overcooked a few corners, though.

WORKING ON TWO FUN MACHINES

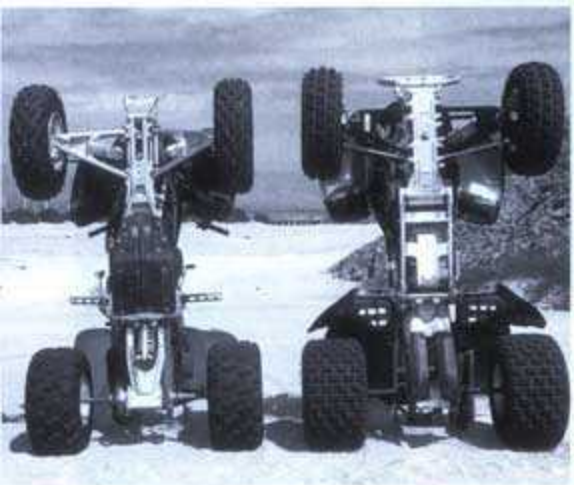
We gave the Raptor and the Cannondale quite a beating during the days of testing that produced our shootout results, and both came through pretty well. We have to mention that our trusty Raptor had seen lots of hard riding before it ever went wheel-to-wheel with the FX400. Our Raptor had endured comparisons with a number of other machines and some grueling dune and trail riding before this shootout began. The FX400s (that's right, two) Cannondale supplied had been ridden hard, too, but hadn't seen the hours our Raptor had.

Failures were limited to reluctant starting on one FX400 after a long, hot dune riding session. It fired right up after a ten-minute cool-down period. The same machine suffered a charging system problem at the motocross track which left us with just one FX400 to ride for the rest of the test.

Our Raptor came through without any engine trouble, but we blew a brake caliper seal, which caused a minor brake fluid leak. The brakes got a little soft, but continued working.

Servicing the Yamaha is pretty simple, except for adjusting those five valves. The valves rarely need attention after the first service, though. Oil changes, air filter maintenance and chain adjustment are all simple.

The Cannondale's air filter is easy to get to and it has one less valve than the Yamaha, but the all-important oil change procedure is a bit more of a hassle because of the dual frame-mounted oil drains. Our FX400 made enough engine noise to worry some riders, but the busy mechanical sounds are music to race engine lovers. If you love your FX400, change its oil often. The highly stressed, high-revving mill deserves it. The Cannondale does have some smart service touches, like the racing-type two-piece clutch cover for quick plate changes. We didn't cook a clutch on either quad, but don't expect either clutch to tolerate paddles and hard dune riding without attention.



Here's the view racks and riders see jump over get. Both quads have decent belly protection.

Raptor rear end: smoothe large and small bumps equally well. FX400 rear end: suited to serious riders but not punishing.

ATV ACTION 4-WHEEL RATINGS

	Cannondale FX400	Yamaha Raptor 660
MOTOR		
Overall power	★★★★	★★★★★
Low	★★★★	★★★★★
Mid	★★★★	★★★★★
Top	★★★★	★★★★
Idling smoothness	★★★★★	★★★★
Throttle response	★★★★★	★★★★
Shifting/tranny	★★★★	★★★
HANDLING & CHASSIS		
Overall handling	★★★★	★★★★
Turning precision	★★★★★	★★★★★
Turning stability	★★★★	★★★★
Sliding predictability	★★★★★	★★★★
Steering ease	★★★★★	★★★★★
Brakes: f	★★★★★	★★★★
Brakes: r	★★★★★	★★★★
Suspension: f	★★★★	★★★★
Suspension: r	★★★★	★★★★
Low-speed ride plushness	★★★★	★★★★★
Ground clearance	★★★★	★★★★
Undercarriage protection	★★★★	★★★★
Traction	★★★★	★★★★
Hillclimbing	★★★★★	★★★★★
Downhilling	★★★★★	★★★★★
Stability on off-cambers	★★★★	★★★★
High-speed straight-line stability	★★★★	★★★★★
Jumping	★★★★★	★★★★★
Tracking in whoops	★★★★	★★★★
RIDER COMFORT/CONVENIENCE		
Overall ease of use	★★★★	★★★★★
Startup ease	★★★★★	★★★★★
Warm-up time	★★★★★	★★★★★
Seat comfort	★★★★	★★★★
Vibration	★★★★	★★★★
Bars/seat/foot location	★★★★★	★★★★★
Air filter access	★★★★★	★★★★★
Airbox design	★★★★★	★★★★★
Choke access	None	★★★★★
Handlebar control esse	★★★★★	★★★★★
OVERALL		
Fit and finish	★★★★★	★★★★★
Overall rating	★★★★	★★★★

★★★★★ = EXCELLENT, ★★★★ = ABOVE AVERAGE, ★★★ = AVERAGE, ★★ = BELOW AVERAGE, ★ = POOR