

**CHRISTINI ALL-WHEEL-DRIVE DIRT BIKE**



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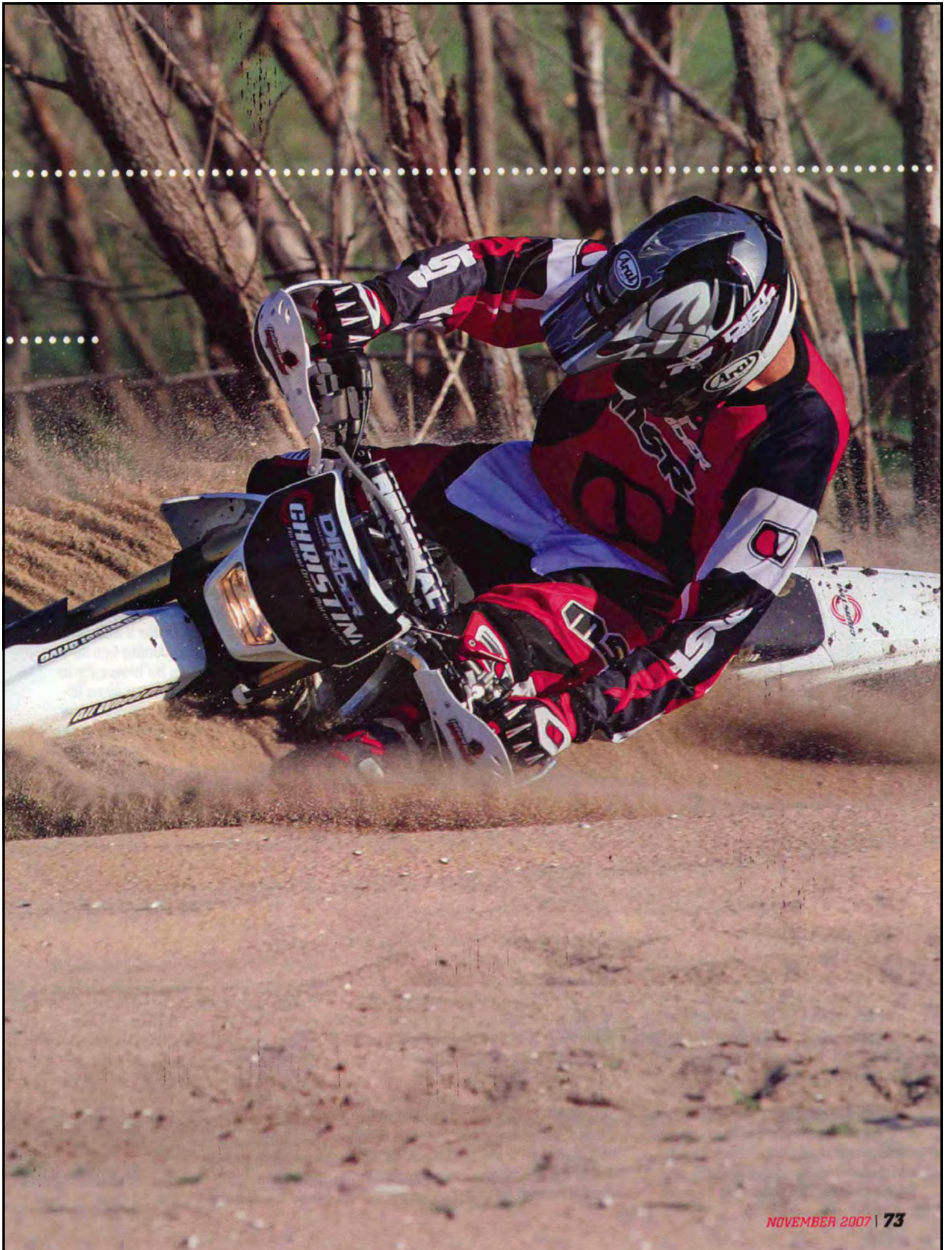
Story by Pete Peterson • Photos by Karel Kramer and Jimmy Lewis

# CHRISTINI

## ALL-WHEEL-DRIVE CRF250X

*The Next Unfair Advantage?*

**M**otorcycle technology usually advances slowly with refinements, not revolutions. Every once in a while the sport takes a huge leap, as it did with the modern four-stroke race bike. Whether it's the displacement advantage or the more tractable power, it doesn't matter, the sport looks, sounds and feels different today than it did 10 years ago. Steve Christini may be leading the sport on another leap forward with his drive system that takes a bike's power somewhere it rarely gets to go—to the front wheel.





**“Jumping from the stock bike to the Christini is like taking a step up in rider talent.”**

Make no mistake about it, the Christini is an all-wheel-drive bike, not a two-wheel-drive bike. The difference between the two is the amount of power directed to the front wheel. The Christini drive runs full-time, but at a mechanical reduction. The power is always going to the front wheel, but the rear wheel is going faster, keeping the front tire free-wheeling ahead of the power coming to it. When the rear wheel slips, the power catches up to the free-wheeling front tire and starts driving it. It's a “dumb” system, in that it uses no electronics or sensors, but effectively turns the front-wheel-drive into an only-as-needed function. At the same time, this design limits the power

being directed to a spinning rear tire—acting like a traction control device. The design is solid on paper, but in off-road you don't ride theories and principles. *Dirt Rider* has ridden all the prototypes, but this time we took the Christini 250X (a 2007 Honda CRF250X with the Christini frame kit) and a stock 250X out to the trails to find out how the production AWD bike truly works.

In deep sand the bike is . . . not in deep sand. The Christini is amazing here. From the moment you let out the clutch, you feel like you're riding on solid ground. The bike gets unbelievable traction. Turning with the power on in deep sand is probably the single greatest difference the

Christini has compared to a standard bike. When you would normally expect to initiate a turn with the handlebar and arc around in a slide, the Christini magically goes where it's pointed. It's less a bike feel than an optical illusion. You see the sand, but you're somehow not riding in it. The front end actually feels lighter than on a standard bike because the tire is powering up and staying on top of the sand rather than being pushed into it by the rear tire. Jimmy Lewis has ridden several AWD systems and noted on day one, “On sand and in low-traction situations the AWD makes the bike ‘float’ easier and earlier at a lower speed. The tone of the motor is totally different, and you can lug it in really soft stuff because you are spinning way less.”

Riding the Christini in mud gives a similar feeling. The slick mud still allows the bike to slip and not be as sure as it is in the sand, but it is still much more planted than the stock 250X. Riding in mud at lower speeds allows the drive's weight to come into play and makes the bike feel a bit heavier and more cumbersome than its stock counterpart, but the front wheel pulls around corners rather than pushing out through them. The Christini bike feels less active here—it takes some of the finesse and balance required out of the experience and replaces it with surefootedness.

Out of the sand and mud flats and up into the trails, the AWD bike feels better planted than the stock bike. The extra weight can be felt in power-off downhills, but anytime the bike is accelerating, the AWD system is helping. Jumping from the stock bike to the Christini is like taking a step up in rider talent—as long as the bike is driving forward. You can go from zero to hero when you're on the gas, but just remember when it comes time to slow down the machine functions like a standard bike with some extra weight on the front end.

In the corners the AWD takes some getting used to. The front end holds its line better than a non-driven wheel and eliminates much of the push a standard bike would have. The front wheel pulls the bike around in the line you choose. The Christini likes to be steered with the bar more and slid with the rear less. Jimmy quickly found new ways to ride the bike, “The steering is affected when the tire is pulling. At first it's strange, then I was using it to my advantage. If I was going into turns too fast, locked up and sliding, and was going to miss my line, I would gas it early and the bike would, almost magically, grab the line I was going to miss and pull through the turn instead of missing it completely.”

When trail obstacles turn a little more technical, the Christini continues to impress. Slippery, steep rocks are ridden over with less drama. Karel Kramer noted, “The bike shines brightest when you end up with the front wheel butted up against rocks or logs. Normally that means getting off and lifting the bike over one or both of



Like to play in the mud? The Christini will keep you smiling.



The drive system seems built for the long haul, so we're going to Long Haul it.



the impediments. With the Christini you ease out the clutch and it crawls right over." The front wheel pulls and the rear wheel spins less, and the rear has much less tendency to try to come around on off-camber rocks. One quirk of the bike found here is its tendency to bog when the front wheel hits an obstacle (whether rock, log, ledge, etc.). This is a trait the Christini rider must adapt to by using a little more throttle. For the less-advanced rider, the technical obstacles are the place where the AWD can make all the difference. It's the point-and-shoot of motorcycles. Advanced riders benefited from the AWD in dead stops on steep hills, or on hills that included kickers that throw the bike into the air. Jimmy was impressed. "The little lunge the bike gives you if you get stopped on a hill can be priceless for getting going again. It is like someone, or a group of guys, is giving you a push, without tugging you out of balance. And if you bounce or jump on a steep climb, the bike goes when it lands, it doesn't try to dig in like normal, especially on soft hills," he said.

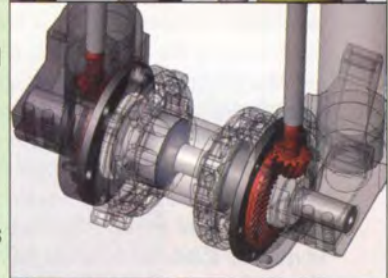
While 250Fs aren't the best weapon for bombing high-speed fire roads, we tested the AWD system here, too. You might be surprised to realize how much you're actually sliding when you think you're steering through sweeping turns. The Christini front end pulls the bike along and goes exactly where it's pointed. No drama and no strange feelings. And the bike always has a

## THE MECHANICS

### POWER TRIP

The Christini drive is engineered to limit one inherent disadvantage in front-wheel-drive: torque steer. If you've ever accelerated with a front-wheel-drive car and felt the steering wheel pull to one side, you're familiar with torque steer. On a car, it's annoying, on a motorcycle, it could be hazardous. The Christini 250X setup keeps the gyroscopic and torque forces distributed on both sides of the bike and working in opposite directions to cancel out one another. Here's the path the horsepower would take to get to the front wheel.

The bike's power runs to two sprockets on the countershaft. The outer sprocket drives a chain that runs up the side of the bike to a top sprocket. (On the 250X, this chain drive runs at an 80 percent mechanical reduction compared to the chain drive to the rear wheel and is adjustable with sprocket changes.) Here, the power goes into a gearbox under the bike's tank (a special tank makes room). From there it transfers through a torque-limiter clutch to a set of spiral miter gears that drive a coaxial shaft (a smaller shaft counter-rotating inside a larger shaft) that runs down through the steering head. A set of counter-rotating sprockets each drive a small timing chain inside the lower triple clamp, each one reaching out to a sprocket on the top of a shaft that connects to a linear spline bearing assembly. These spline bearing assemblies rotate in opposite directions down each fork leg to a spiral bevel gearset on each side of the front hub, turning at a 4:1 ratio (one revolution of the wheel equals four revolutions of the spline bearing assembly). These gearsets each run a one-way clutch inside the front hub, and both clutches drive the front wheel.





more stable nature. The system seems to act like a good steering damper. And any time you don't want all-wheel-drive, you can shut it off with a handlebar-mounted lever in one easy pull.

The Christini does have some general disadvantages. The bike weighs 13 pounds more, dry (257 pounds compared to 244 pounds). The system also changes the weight distribution. Full of gas, where the stock X has a 47- to 53-percent front/rear weight ratio, the Christini has a 49- to 51-percent ratio. The added weight and weight bias can be felt, especially when trying to loft the front end over something. Also, the driving front wheel can get you into trouble if you get it turned off-line in the air then set it down. On steep hills, where the bike is in a small wheelie, riders use the front wheel for balance, often pulling it to one side as they guide the bike on the rear tire. If that front tire comes down sideways or off-line, it will pull the bike in that direction and can upset the rider's balance. Whenever the rear is spinning and the rider is turning the handlebar, there is some added resistance, like a steering damper set pretty stiff. Riding at speed in the soft stuff brings another difference—the Christini's front feels rock solid but the rear takes on a loose or less planted feel that takes a little getting used to. And lastly, the bulge and hard edge of the upper drive sprocket cover can be felt at your left knee. It doesn't stick out far, but it can be bothersome.

And then there are the disadvantages that have nothing to do with the ride. The first obstacle any Christini rider must get over is the bike's price. The kit retails for \$5995, which includes the modified frame and drive system. Add that to the \$6595 price of the stock X and you've got a \$12,000 dirt bike. The bike is sold as a complete unit: already converted to a new bike. The bikes are available now, but only through authorized Christini dealers (Honda dealers that offer the bike and carry replacement parts), and are currently only available for the Honda CRF250X and R, and the CRF450X. The next bike to be adapted will be a KTM—both the 450F and the 300 two-stroke, and will be available through authorized Christini/KTM dealers. The list of



## CHRISTINI TIMELINE

A New Idea on an Old Spin

### ■ Summer 1994

Steve Christini comes up with the concept for an all-wheel-drive mountain bike (bicycle).

### ■ June 1998

Steve quits his mechanical engineering job to design and build his AWD bicycle.

### ■ June 1999

Christini Technologies, Inc. is born.

### ■ 2000

Idea for AWD off-road motorcycle starts to brew.

### ■ August 2002

First AWD bicycle sold to the public.

### ■ August 2002

In just four weeks' time, Steve Christini assembles the first Christini AWD motorcycle based on a CRF450R. The bike goes on display at the Interbike bicycle show in Las Vegas. Within 30 minutes the bike has Honda mechanics surrounding it.

### ■ September 2003

Second prototype, also based on a CRF450R, is shown at the next Interbike trade show.

### ■ Spring 2004

R&D of the second prototype. The normal spline drive is found to cause stiction and is changed to a linear bearing assembly. The rake is pulled back to mimic stock geometry, and the optimum ratio of power to the front end is closed in on.

### ■ July 2004

The improved second prototype is tested with magazines and manufacturers. Drive system weighs approximately 35 pounds. Drive system still uses heavy right-angle gearbox, heavy industrial parts, heavy torque-limiter and over-built gearbox teeth.

### ■ Fall/Winter 2004

Developed third prototype based on CRF250X. Major changes included bringing the fork legs further back in relation to the steering head. Drive system loses significant weight, down to approximately 22 pounds, partially by going from steel to aircraft aluminum drive shafts, and the gearbox is angled rather than run straight down the frame backbone.

### ■ September 2005

Jeff Botsford races the bike in the muddy Unadilla GNCC. The bike and drive finish the muddy race fully functional, but wear and maintenance issues arise, including the need to move the torque-limiter inboard between the frame spars, and to increase the teeth size in the AWD gearbox.

### ■ Spring/Summer 2006

More R&D gets the drive finalized. Spline shafts now pass beyond the lower triple clamp to allow for a larger boot that does not limit travel, the system goes from external venting to internal venting to limit contamination, overall sealing is improved, custom seals and bearings are created, and weight is further reduced, mostly with design changes to the dropouts and triple clamps.

### ■ Fall 2006

Production begins on the gears, a six-month process.

### ■ January 2007

Production of the drive systems begins.

### ■ March 2007

First production Christini AWD motorcycle sold.

### ■ Fall 2007

You read about it in *Dirt Rider!*

## OPINIONS



I was apprehensive about all the moving parts involved in the two-wheel-drive system, but the reality is that none of the chains, shafts and gears intrudes negatively on the riding experience. I expected the bike to shine in tight, rough, technical trail sections, and it pulled out of situations that would have stymied a lesser machine. On my first ride I took off in deep, soft sand and the benefit of the front wheel pulling through the sand rather than having to be shoved through by the rear wheel is pretty amazing. In those first feet the bike felt like it had a very effective steering damper installed. The drive of the front wheel does make it want to go straight, but once you initiate a turn, you aren't fighting the bike at all. That feel of the front wheel floating and wiggling is gone. The steering is rock steady. With the Christini, when the rear end gets away from you, the front wheel pulls the bike back in line. From a performance standpoint I cannot fault this bike. Just the improvement in rear tire wear is worth pursuing two-wheel-drive technology. If money wasn't an object, I'd have one. Christini is asking a fair price for the product, but that price isn't in my range.

—Karel Kramer/6'1"/210 lb/B rider



Christini has put together a great product this year; the bike is by far the best bike you could possibly have if you ride enduros or rough, rocky, steep terrain. What I like most about the AWD bike is, if you mess up going up a rocky face, you can actually restart from where you left off because the front end pulls you up, which is unlike any other regular motorcycle. Also, at high speeds going into a corner, instead of the bike pushing, you just point the wheel where you want to go and it will pull you to that point! One thing I didn't like was the feeling when you're going fast over chop—it's just a weird feeling with the front wheel pulling. I also noticed the front end seemed a little heavy. The last problem that could go wrong but didn't for me is there is a second chain, which means just another thing to work on if it slips or stretches. Overall, I would rank this bike for trails and rocky terrain a nine, and can't wait to see how it performs on a motocross track!

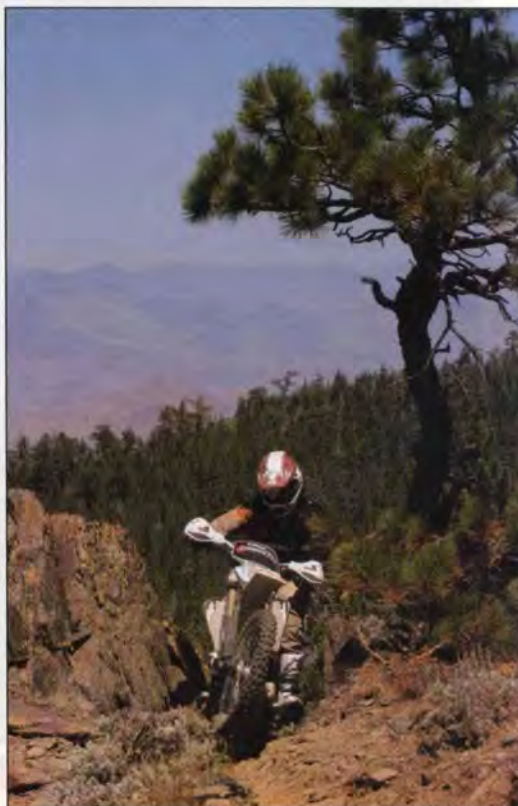
—Chris Dvoracek/5'11"/160 lb/B rider



This is the most unique dirt bike I've ever ridden. It has gobs of traction without sacrificing the overall rideability. I immediately began riding more aggressively and started braking later in turns due to the planted feel that this bike delivers. The Christini also blasts up hills like a frightened squirrel scampers up a tree trunk. Although I didn't get to ride this bike on wet, leaf-covered single-track or slick rocks, I have no doubt that the Christini would have a huge advantage over other bikes in a long, grueling enduro.

The only things I didn't like about this bike were the heavier steering feel and the chain cover that protruded a few millimeters too far, which whacked my left knee several times. Other than that, I believe two-wheel-drive dirt bikes are not a novelty, and as the price comes down over time, you'll see more and more people riding them.

—Brian Purtymun/6'3"/175 lb/C rider



### WHAT'S HOT

- Traction improved every time the rear wheel spins—and that's happening more than you might think
- Front end pulls the bike around the line in turns
- Drive system seems well-built with good fit and finish
- The AWD bike doesn't pick up too many awkward traits

### WHAT'S NOT

- Price. The kit doubles the buy-in
- Weight penalty on the front end
- Upper chain drive bulge bothers some riders
- Reliability simply unknown

### SPECIFICATIONS

Price: \$12,594 (kit and Honda CRF250X)  
Actual weight (ready to ride, no gas): 257 lb  
Seat height: 37.5 in.  
Ground clearance: 13.5 in.  
Seat-to-footpeg distance: 21.0 in.

authorized dealers is growing but they're not everywhere yet. Frame kits can be purchased without the bike but again only through a Christini dealer.

At nearly double the price of a stock bike, the buy-in is intimidating. To make the decision easier (or more anguishing), many Christini dealers are hosting demo ride days so riders can feel for themselves if the AWD system is worth the cost. Check out [www.christini.com](http://www.christini.com) to find a local dealer and to see if a ride is in your future.

The AWD will also require more routine maintenance. The drive seems well-built, with great fit and

finish, but moving parts are moving parts, and they need inspection and care. The main maintenance requirements for the Christini are to keep the chain drive lubricated, replace that chain's tensioner when it wears and keep the linear spline bearings lubricated (made easier with zerk fittings and a grease gun included with the bike). The drive can also make maintenance of the rest of the bike more time consuming—most obviously the way it limits access to the carb. We can't speak for the long-term reliability of the drive yet, but Steve Christini is so confident in his design he's letting *DR* induct the

bike into our Long Haul fleet, so keep an eye on the magazine for updates as we rack up the hours.

We're impressed. The AWD works. Most of the disadvantages are felt in the wallet and in the garage. On the trail it offers some very real advantages and doesn't do anything too goofy. Which brings up the best advice we can give anyone regarding the Christini: If you're not going to buy one, you better make sure your riding buddies don't. And don't take a test ride, either!

