special TEST

by JONTY EDMUNDS

HONDA CHRISTINI AWD

DRIVING AMBITION

PUTTING A NEW TAKE ON AN OLD IDEA US COMPANY CHRISTINI TECHNOLOGIES ARE CONVINCED THAT ALL WHEEL DRIVE IS THE WAY FORWARD. WE HEADED TO THE STATES TO FIND OUT IF TWICE THE DRIVE IS TWICE AS GOOD

When it comes to choosing a dirt bike most of us want pretty much exactly the same as what our mates have - a brightly coloured, lightweight, high performance machine fitted with all the latest bits and pieces. Without exception it'll also be one-wheel drive.

Chances are, give or take a few technological advances, that's more or less exactly the same general specification your last bike featured, and the one before that, and the one before that. Off-road bikes don't differ all that much from one another and despite four being the new two modern day off roaders aren't all that different to the way they've always been.

New technology does come along every now and again with some manufacturers willing to push the boundaries more than others. BMW's soon to be released enduro offering and Husaberg's '09 enduro models two obvious examples. But even they have one underlying similarity - power from the engine drives the rear wheel and the rear wheel only. That's the way all modern day dirt bikes are.

Step forward Christini Technologies Inc - the American company headed by mechanical engineer Steve Christini. Having spent the passed five and a bit years developing an all mechanical All Wheel Drive 'kit' for off-road motorcycles, the company is now building bikes that are unlike anything else available today due to having two driving wheels, instead of the usual one.

When I say building AWD motorcycles what I really mean is that Christini, which is based in Philadelphia, PA, produce an AWD system, which can either be brought over the counter and fitted DIY style, or that has been ready fitted to a new bike. These bikes are then sold as either Christini Hondas or Christini KTMs. Christini themselves don't make a complete bike. And at present only have AWD systems for red and orange bikes.

The Christini AWD frame kit features eight main components. The frame, which is a standard Honda or KTM chassis that has been modified to accept the drive system, custom fork modifications, a new fuel tank, an alloy front hub, the complete All Wheel drive system, an engagement system, billet aluminium triple clamps and the Christini plastics/graphics set. ▬


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The technology

Christini's patented mechanical All Wheel Drive system delivers power from the motorcycle transmission to the front wheel through a series of chains and shafts, which is where it differs from the last manufactured two-wheel drive bike - Yamaha's 2-Trac, which used a hydraulic system to power the front wheel. As Christini themselves like to point out, there is no energy-robbing hydraulics involved in their system.

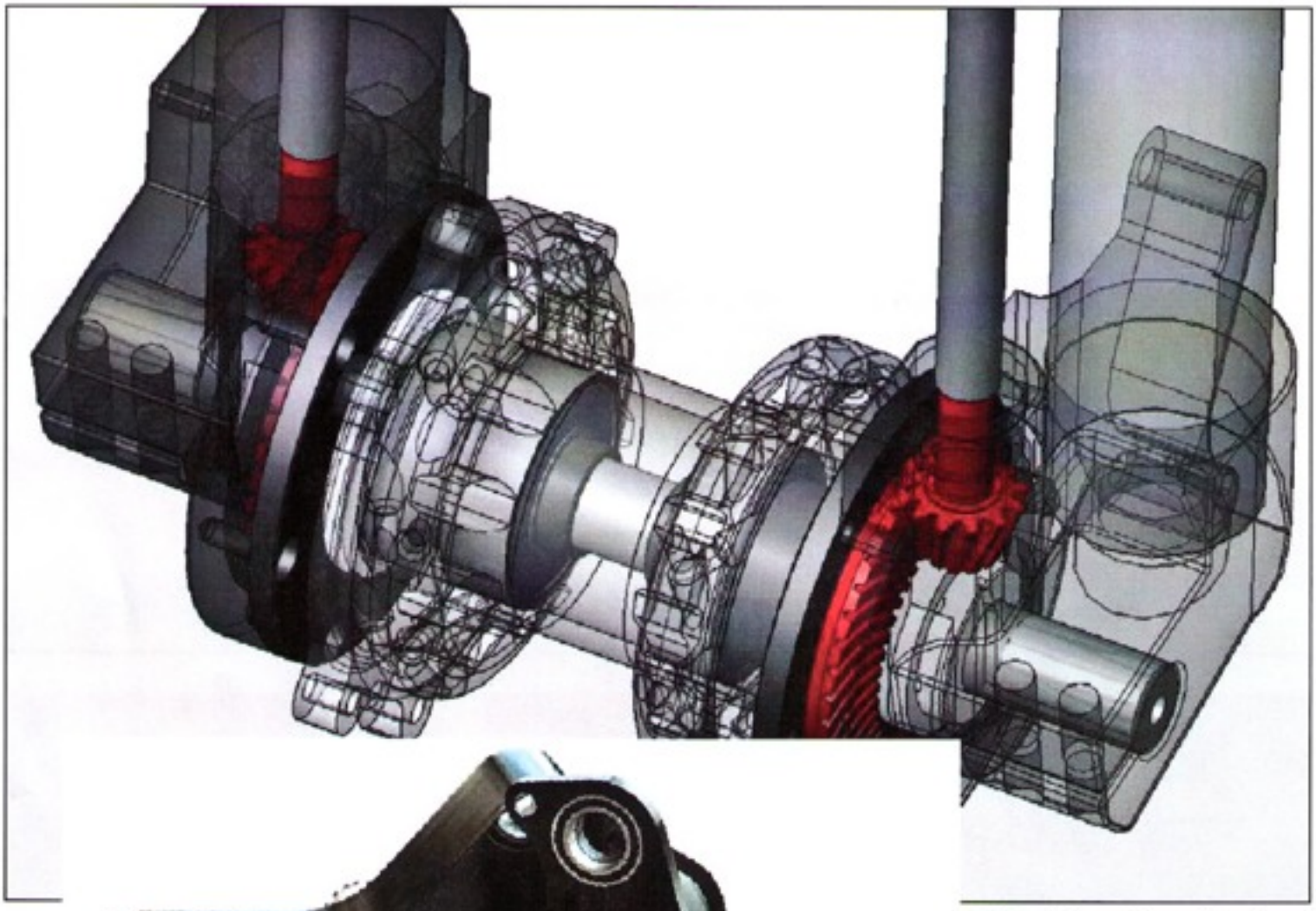
The transfer of power from the bike's engine to the front wheel starts with a second sprocket that's piggybacked onto the gearbox sprocket. With the inner sprocket driving the rear wheel, the outer sprocket is wrapped with a chain that runs up into the Christini modified frame (that's what's behind the

From the secondary shaft sprocket to the front wheel hub, the rotatory drive is transferred through a complex mechanism of chains and cams that obliged the American manufacturer to revise the left stanchion and the internal part of the steering stem on the Honda CRF250X frame.
This photo shows the extreme attention paid to detail, such as the superior Tig welding.

bright red cover on the left side of the bike) where it meets another sprocket. This sprocket is attached to a clutch damped shaft, which runs under the modified fuel tank, to the head tube. From there counter rotating bevel gears move the power to the lower triple clamp where two chain and sprocket pairings then send power to the telescopic driveshafts, which run alongside each fork leg.

From here power is directed through gearboxes, which run into Talon made hubs that feature one-way clutches. The front wheel is then driven at 75 per cent of the speed of the rear wheel. While not the first all mechanical system commercially available, it is the first system that works in conjunction with modern day off-road motorcycles with long travel suspension.

The all-mechanical system works in a similar way to that of AWD systems found on four wheeled vehicles. The AWD system powering the front wheel is driven at a slightly lower rate than the rear wheel (approximately 80%). Under optimum traction conditions, the rear wheel is actually driving faster than the front AWD system. One-way clutches within the front hub allow the front wheel to freewheel under these conditions. At this point, the AWD system is effectively passive. Though the front AWD system is turning, it is not actually transferring power to the front wheel. When the rear wheel loses traction, the drive ratio, relative to your forward speed, changes. The AWD system engages, transferring power to the front wheel until traction is re-established at the rear wheel. Simple.



LD drawing illustrates the complexity of one of ments of the AWD system: the hub, whose two ctions on the fork foot are fitted with helicoidal r-nuts which are driven by the same number of spic cams which run along the fork rods. In the hotos: the highly elaborate lower triple clamp tral sprockets and distribution chains, and the l button on the handlebar to switch off integral traction when the bike is at a standstill.

The reality

Christini claim that their system works like traction control - when the rear wheel spins the front wheel drives. The advantages of such a system are many in theory but, as we all know, theory alone never got any bike manufacturer very far. The proof, as always, is in the riding.

I'll be honest, I was extremely sceptical about riding the Christini kitted Honda CRF 250X. Having ridden Yamaha's 2-Trac several years ago and found it to be great in extremely slippery conditions and when climbing hills I also found it offered no advantages what so ever anywhere else. The fact that I was riding a bog stock 250X fitted with an AWD system, well, I just wasn't expecting much at all.

The quality of the Christini workmanship is hard to fault. Make no mistakes about it these aren't kits cobbled together in some nutty professors garden shed. The engineering and attention to detail is extremely high with a high quality finish to match.

Unlike Yamaha's 2-Trac, which saw it's hydraulic pump protrude from the left side of the bike, the Christini chassis is only ever so slightly intrusive. To be honest I'm sure that if I'd have been sat on the bike having not looked to see what it was I'm sure I wouldn't have even noticed the long red cover that leads from the gearbox sprocket up to the rear of the fuel tank.

Also, different to Yamaha's 2-Trac is the fact that the AWD system can be engaged and disengaged simply and easily by moving the large red handle mounted on the handlebar. But only when stationary. While you'd undoubtedly leave the system on when riding normally, for the purpose of testing the bike the fact that it could be disabled proved extremely useful.

The Christini requires a slightly different riding style to most 'normal' bikes. With the front wheel not driving unless the rear wheel is spinning in order to get the bike to pull you, rather than push you, up a climb you need to encourage the rear wheel to break traction. While that often happens anyway when climbing, trying to feel for grip gets you nowhere. Basically a lower gear, higher revs and a weight over the front technique is what works best. The higher revs encourage the rear wheel to spin, which tells the front wheels to drive, while having your weight forward encourages the now driving front wheel to do its thing and assist in the climbing.

When pointed straight at a loose climb there is no doubt that the AWD system works. It works well and it works without you really noticing it works. Not until the system is switched off do you realise just how much easier it is to climb when a bike's front wheel is doing much more than just waiting to be pushed up the hill. Hills, like mud, come in many different types. And what was soon noticeable was that while the Christini bike was extremely adept at climbing straight, lose inclines, despite the stock 250 X not having the

Whether the Christini's front wheel is on the ground or off it, as long as the rear wheel is spinning the front wheel is driving. And that is where the problem lay when trying to negotiate uphill, heavily rutted 180-degree turns. Normally lofting the front wheel into the air while at the same time accelerating moderately in order to pivot the bike around, with the Christini each and every time the front wheel was removed from terra firma it would, because it was driving, want to pull the bike upright. Not a massive amount, but just enough to unbalance me and make the very technical climb I thought the bike would help me scale harder than it actually was. I learnt there and then that I didn't like the Christini bike when the front wheel parted company with whatever was beneath me. Keeping the wheel on the ground with weight forward and the bike climbed switchbacks fine.

A driving front wheel comes into its own on good and the rear wheel isn't spinning you don't really need it. I say you don't really need it because what you don't realise when you're bombing along faster forest road style tracks where traction feels good is just how little time your front and rear wheel actually spend in line with one another. Stood up, with the AWD system engaged, my head over the front mudguard riding the bike as hard as I dared like a wannabe Dakar stage winner the AWD system was almost more impressive than when I was climbing loose hills. The bike felt like it was on rails.

Giving me the confidence to brake later into flowing turns, I wasn't worried that I might out brake myself or that the front end might tuck under me as I turned, like it can on a 'normal' bike. Instead of a gently, gently approach to drifting in and out of turns while steering with the rear of the bike, I simply buried the throttle - something that would normally result in the bike stepping sideways, only to be driven around feet-up corner after feet-up corner like the bike was remotely following a high-speed rut. Without wanting to do the bike a huge injustice the traction control effect acted like a phenomenally accurate steering damper, which somehow stuck the bike to the ground and stopped either wheel stepping out of line. With the AWD system engaged along high-speed tracks and trails the bike losses all want to 'twitch'.

Without question the place where the AWD system works best is in deep sand. With most of us having at some point 'lost' the front end having turned way too sharply in the soft yellow stuff, aboard the Christini it is all but impossible to have the front wheel washout beneath you as the driving front wheel comes into its own and pulls you in the intended direction. At any speed you can throw the bike into a 180-degree turn, in sand, and it will pull you around, out of and away from the berm you've just made.

The disadvantages

Although initially disappointed that the AWD system actually made the way I prefer to negotiate tight, uphill 180-degree turns harder rather than easier, the more I rode the bike the more I started to both get used to it and to like it. Truth is whenever I wasn't sure whether the bike was actually doing anything beneficial I'd turn the system off and more often than not I preferred it on.

The bike does have a few disadvantages. The weight of the system is just under six kg, which admittedly isn't a lot but it is added to the front of the bike and not spread evenly throughout. What that means is that it's a little harder to loft the front wheel over obstacles. Due not only to the fact that the bike is slightly heavier on the front end, the fact that if you slip the clutch to lift the wheel, as you would normally do, you will likely result in generating a little wheel spin, which starts the front wheel driving making it want to pull forward

and the ground.

One other thing Christini riders need to be ready for is a skyward and driving front wheel returning to the ground. While a spinning front wheel in the air occasionally had the effect of stiffening the steering slightly, when that same spinning front wheel touched back down to earth it would drive in whatever direction the handlebars were pointed, rather than being pushed straight like on a rear wheel drive bike. Not much of a problem provided there's space enough to correct things, where accuracy is important the bike's bars need always be pointed straight ahead. If not, make sure you're not crossing a narrow mountainside track with a steep drop to one side.

The cost of the Christini kit is another hurdle that has to be overcome. With the Honda kit costing $3'995 and the KTM kit a little more, at $4'595, enjoying AWD isn't cheap.

Finally, the fact that the system is mechanical means that parts, over time, will wear. With chains and sprockets at the heart of the system they will need checking periodically although Christini claim that the bike is 'easy to maintain with tools that you probably already have in your toolbox'. Additional maintenance on top of that needed to keep the bike running won't be everyone's idea of fun.

The verdict

With American made off-road motorcycles about as desirable as American made fast food the Christini, in some people's eyes, will be seen to be from the same mould as Cannondale and ATK. It's not. It does cost as much as a one-year old second hand 250cc two-stroke, but it is built well. How well it will last no one knows yet but having not rushed the product I'd say those that do buy one won't be disappointed by its durability.

Spending the fist full of cash needed to secure a Christini kit means that only a select few will even consider venturing into the realms of AWD. But those that do will find that while the mechanical wizardry within the Christini system won't make them a better rider it will give them more confidence on slippery surfaces and make many of their riding days more enjoyable. The Christini AWD system doesn't deliver the perfect off-road riding experience but it does offer some very real advantages.

Yamaha 2-Trac
I REMEMBER THAT...

This might sound a bit over the top but if I'd have had the money I'd have bought myself half a dozen WR450F 2-Trac Yamaha's when they were available and started a new sport named Motorcycling Swamp Racing, or something like that. It would be a simple sport allowing myself and five mates to spend warm summer evenings racing around a 30-second long, heavily watered, special test showering each other in mud while enjoying the benefits of all-wheel drive motorcycles.

The idea for Motorcycle Swamp Racing came to me while putting Yamaha's two-wheel drive 450F through its paces back in '04. Having tried the bike 'on the trail', up the side of a small mountain and around a special test it wasn't until I rode the bike in mud - slippery, smelly, greasy mud, that it really impressed me.

When I first jumped on the 2-Trac, blasting off along third and fourth gear trails, I'll be perfectly honest and say that the bike felt anything but impressive. In fact the effect of the two-wheel drive was hardly noticeable and the bike felt very much like a standard WR450F, only with mildly heavier steering. However, when we decided to 'hit the hill' and later play in the mud, the two-wheel drive really started to show its true colours.

If you ever get the chance to ride either a Christini or one of Yamaha's rare all-wheel drive bikes don't think twice about it - take it. Until you do you'll never be able to appreciate just how much a 'normal' bike is pushed from the rear. Now I know that might sound a little obvious, after all everyone knows that accelerating pushes a regular bike forward because the driving wheel is at the rear. But until you jump on a bike that is both pulled forward by a driving front wheel, while at the same time being pushed forward by the rear wheel, it is hard to appreciate just how much work the rear wheel does on a regular one-wheel drive bike. When climbing 'the hill', or on the occasions where I rode on loose surfaces where traction was easily broken, the driving/pulling effect of the front wheel on the 2-Trac was impressive, very impressive. What it equated to though was increased confidence. Instead of feeling the need to hurriedly gain speed at the base of the climb, like I did on the WR450, the 2-Trac simply got on with the job of driving me forward. Giving me more time to focus on the line that I wanted, when on the slope the front wheel not only noticeably pulled me up the hill but also made sure the front wheel was firmly planted on the ground. Attacking the climb over and over again the increased grip coupled with my boosted confidence meant that I was able to crawl up it in first gear - something I never would have attempted on the WR450.

Around a special test three things quickly be- the ground like shit to a blanket when accelerating out of corners. And thirdly, the bike was noticeably less manoeuvrable that its one-wheel drive cousin - something I only really noticed when jumping straight off the 2-Trac onto the WR450.

The fact that the bike doesn't build revs quite as quickly as the WR450 wasn't a problem during most of the day. Not until I tried to lift the front wheel into the air and over a ledge while climbing a hill that is. With the front wheel seemingly grabbing hold of every available blade of grass as it pulled me up the hill, the fact that a quick dip of the clutch didn't result in a serge of power enough to lift the front wheel meant that, on that occasion at least, the bike was telling me how we were gonna get to the top of the climb and not the other way around.

The way the bike drove out of flat corners was a major plus point for 2WD. Instead of the front wheel lifting into the air as I rewed out it simply remained planted on the ground and pulled me forward. The gluing of the front wheel to the ground wasn't something that was noticeable all of the time but when riding the two bikes back-to back it became clear just how effective the system is.

But it wasn't until I got the bike dirty that I really started having fun. Deciding to see how well the bike would deal with a standing start in about eight centimetres of mud it was then that I realised I wanted a 2-Trac. I now have an idea of what it must be like to drop the clutch and accelerate away in a fully prepped WRC car. The bike, in second gear, drove forward seemingly gaining speed better than a WR450 does on dry land. It was simply amazing how much speed it gained without once weaving sideways. Deciding after about two dozen starts that as the bike was already dirty I might as well put it through its paces and see how it dealt with being thrown into flat, slippery, muddy corners, the smile on my face increased tenfold. Enabling me to drift out of turns with new le-vels of confidence, to have attempted the same thing on a one-wheel drive bike would have seen me end up on my back a lot earlier than I eventually did! The only thing that took some getting used to was the fact that instead of under-steer I found myself riding a bike, for the first time ever, that was seriously over steering. As I broke traction with the rear wheel the front, no matter what direction I was pointing it in, was also driving me forward. Taking a little while to adjust to the new sensation I realised that while on dry, grippy terrain the bike was at times nothing special, on loose surfaces it was a completely different animal. It was about then that I got the idea for Motorcycle Swamp Racing.


All Wheel Drive
CHRISTINI

Not a new idea
Proof 2WD isn't a new concept

Enter 'two wheel drive motorcycles' into an internet search engine and you soon realise that Christini aren't alone in reckoning that a bike with a driving front wheel, as well as driving rear wheel, has definite advantages.

Yamaha's 2-Trac, which was released in '04, is the most recent example of a two-wheel drive dirt bike. Based on Yamaha's WR450F, Frenchman David Fretigne used the hydraulic system in Dakar competition but due largely to the bike's high price tag only small numbers of machines were sold and the bike hasn't been seen since.

KTM fitted and tested a mechanical hydraulic system to a 525EXC in '04. Featuring a pre-set torque distribution between the front and rear wheels the Ohlins system was never seen again and the bike never put into production.

Truth is mechanical two-wheel drive motorcycles have been around almost as long as motorcycles themselves. The earliest on record was a 1924 Raleigh, which was converted to 2WD for trials events.