CycleNews

FIRST RIDE: MOTOCZYSZ 012 E1PC RACER

EXOTIC ELECTRIC

MOTOCZYSZ 012 E1PC

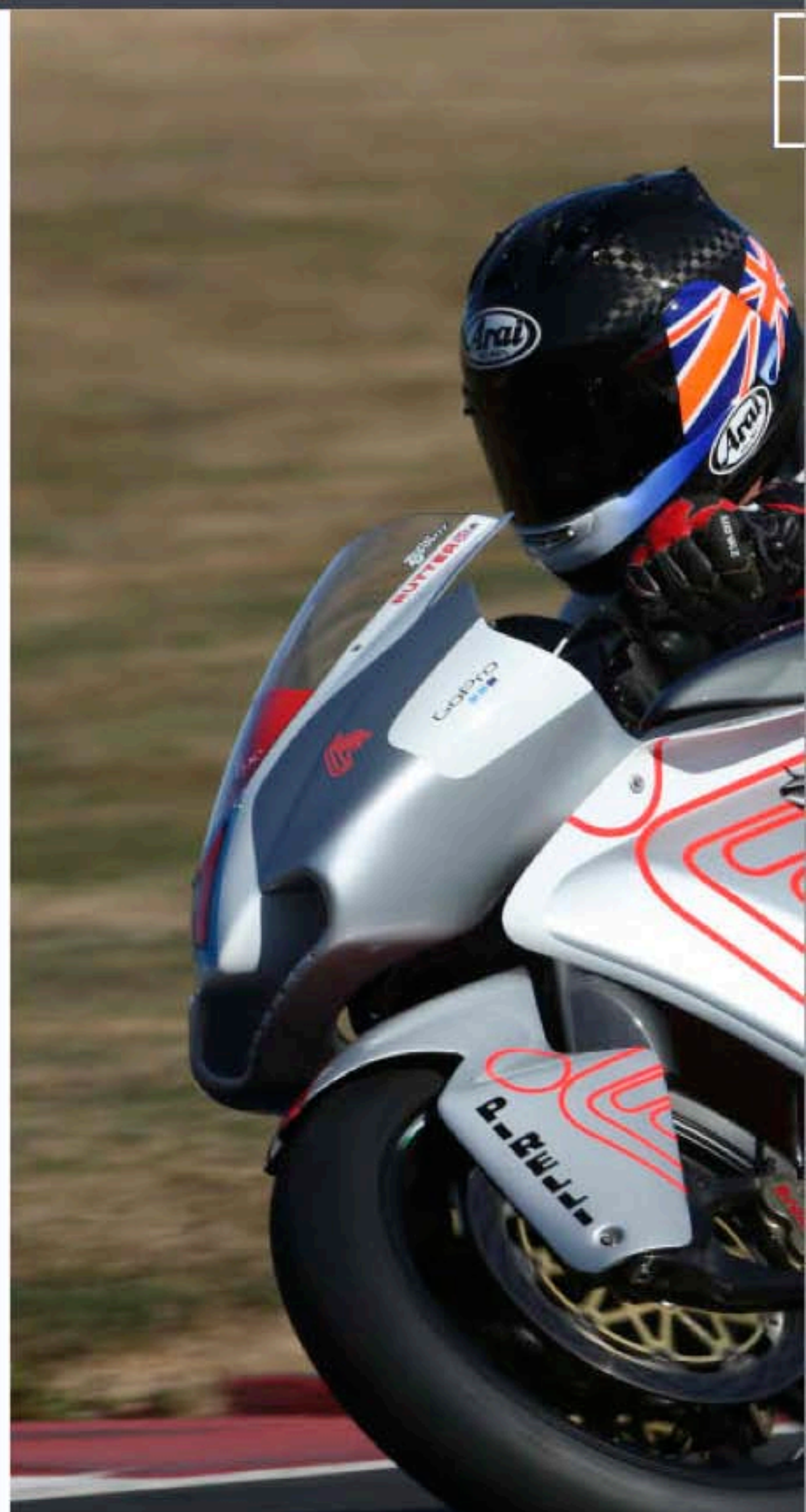
BY ALAN CATHCART
PHOTOGRAPHY BY KEVIN WING

It's by no means hyperbole to stamp Michael Czysz as a Renaissance man, one who combines aesthetic artistry with a talent for engineering, in a variety of disparate fields. If Massimo Tamburini is the Michelangelo of motorcycling, as he's been widely – and justly - acclaimed to be, then there's a case for stamping the 48-year old resident of Portland, Oregon, as a latter day Leonardo (as in, da Vinci!) whose capacity for innovation and eye for beauty is matched by his determination to break down the barriers of two-wheeled convention.

Czysz is a radical revisionist, a self-taught engineer with the capacity to smash the mold of two-wheeled design convention, in favor of creating something completely unique and technically innovative – that delivers success on the racetrack as measured by the stopwatch, the ultimate arbiter of what works - or doesn't.

The swoopy, silent-running succession of MotoCzysz E1pc e-racers have proven to be the ultimate arbiters of electric excellence among the new wave of zero emission road racers developed in the wake of the first TTXGP race for such devices held in the Isle of Man in 2009. The first hurriedly produced MotoCzysz E1pc (as in, politically correct?) had a troubled debut in that event, but one year later it returned to triumph in the race held over a single lap of the 37.73-mile Mountain Course, with experienced American TT racer Mark Miller riding it to victory at an average speed of 96.82 mph from a standing start. It was the first TT win by an American motorcycle since 1911, and the first ever by a bike and rider both from the USA.

One month later, it was Michael Czysz'



We rode the MotoCzysz 012 E1pc at Portland International Raceway – the same electric Superbike on which Michael Rutter won the 2012 Isle of Man TT Zero race at an average speed of over 100 mph.

ELECTRIC EXCELLENCE

We take the Isle of Man TTXGP race winner to the track and come back surprised

MOTOCZYSZ 012 E1PC

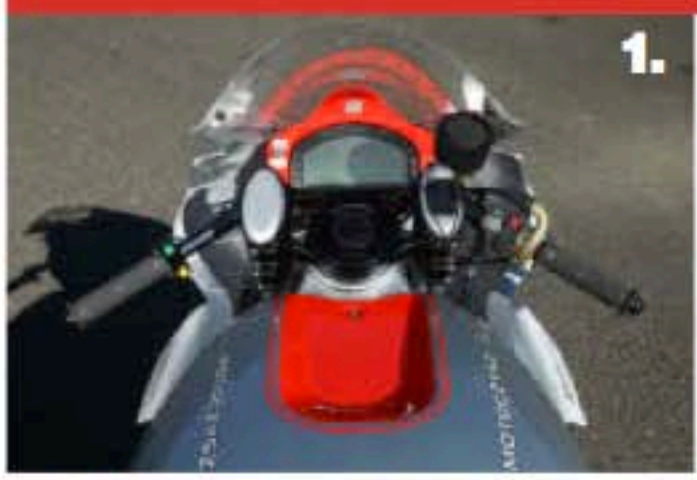
The bike was created by Michael Czysz, a former top architect who designed Las Vegas hotels and nightclubs before turning his attention to motorcycles.

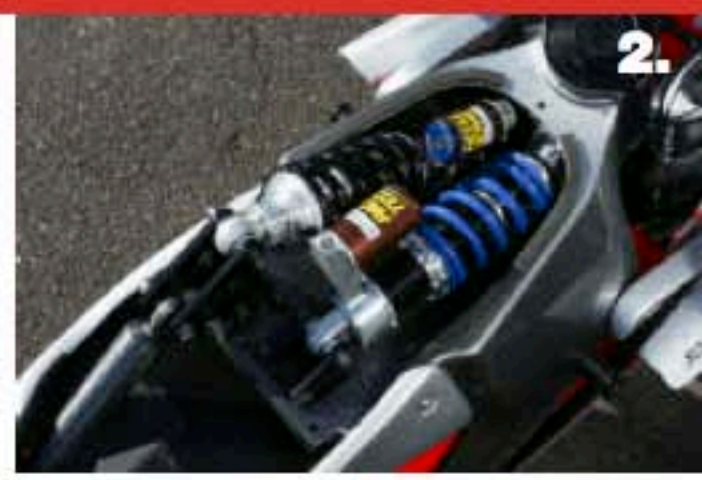
turn to take his creation to victory at Laguna Seca in the inaugural FIM e-Power race staged alongside the U.S. MotoGP, before gathering sponsorship from electric two-wheeled transportation manufacturers Segway to return to the Isle of Man in 2011.

After a further year's development, the aim was not only to win but to gain added prestige by setting the first-ever electric-powered 100 mph lap, with the attendant 10,000 Pound bounty awarded by the Isle of Man Government for such an achievement. To better his chances, Czysz brought a second 011 E1pc bike for British TT veteran Michael Rutter. Ruttter won the race with Miller second, but missed out on the cash bonus by lapping at 99.60 mph.

For 2012, Czysz returned to the TT for a fourth time, again with Segway's support, for Rutter and Miller to race a pair of brand-new 012 E1pc bikes that manifested the considerable attention he'd paid to aerodynamics – and whose front fenders sported the slogan <22:38.28, denoting the lap time needed to break the magic 'ton.' The growing global interest in zero emission racing was underlined by the presence of entries from two Japanese teams, one ridden by TT ace and current outright lap record holder John McGuinness. McGuinness was racing a bike named the Shinden – after the Japanese god of electricity – that had been created and entered by Honda's blue-sky R&D affiliate Team Mugen. That made this a thinly disguised entry by the giant Japanese manufacturer itself, tended by a bevy of up to 14 engineers in matching overalls around it at any given time.

But it was the American e-bike that again came out on top, with Rutter crossing the line 23.52 seconds ahead of McGuinness to win again at an average speed of 104.06 mph, fast enough to





1. The dash is relatively simple for something so complicated. That changes when it all lights up.
2. The Czysz' front and rear suspension is unique and sits where the fuel tank would normally be.
3. The front of the bike features the oval-section fork tubes, and a large-diameter steering head.
4. It's all in the wings.
5. The bike's electric motor produces 201 horsepower at 8000 rpm with 220Nm of constant torque.

write his name and that of MotoCzysz in the TT record books – as well as to collect the bonus money, which he shared with teammate Miller, who finished third. All three riders broke the 100 mph barrier, and Rutter had in fact averaged over 107 mph as far as Cronk-ny-Mona, less than two miles from the finish, before slowing to make sure he had sufficient charge left to cross the line. (You can watch the race at http://motoczysz.com/news/article/motoczysz_iom_history).

In a previous life before motorcycles, Michael Czysz (pronounced 'sis,' as in sister), acquired fame and fortune in designing Las Vegas hotels and nightclubs over a 20-year career as one of America's top architects, and as the creator of homes for A-list celebrities like Cindy Crawford and Lenny Kravitz. But he also has a family heritage on two wheels: Grandad Clarence Czysz was a top Norton tuner in post-WW2 AMA competition, and father Terry followed in his tire tracks by preparing racebikes for his son.

Along the way his passion for creativity inspired Michael Czysz to dream of building an American motorcycle worthy of the MotoGP grid, then bringing it to the public as a high-tech Superbike - just as Aprilia did with its RSV4. Except the MotoCzysz C1 turned out to be way more radical than the Italian World Superbike Champion, via the clean-sheet construction of its unique 988cc Twin-Crank Quad-Cam V-15 engine that sat lengthways in a carbon-fiber chassis equipped with radical front and rear suspension solutions.

"Back in 2002, I'd achieved some credibility in the field of designing buildings," says Czysz. "But - what next? Well, one day I was in Las Vegas, and I visited the Guggenheim Art of the Motorcycle exhibit in the Venetian Hotel. Right at the end I found the Britten V1000 on display there, which I'd seen before in photos, but never up close. It was clear this was something completely non-derivative, an autonomous solution by one guy to the question of what a motorcycle should be. So, at the back on my mind, the question started forming - is there any chance this is ever going to happen again, that someone takes a clean sheet of paper to answer the question of - what is a motorcycle? Well, obviously, the answer to that is yes, it can

Czysz concentrated a lot of his efforts on the bike's aerodynamics.

happen anytime - in which case, I can be that guy. It was a total epiphany."

Like Britten, Czysz experienced frustration and, ultimately, disappointment in bringing his mold-breaking design to the world stage, and in spite of sacrificing his career in architecture, shutting down his lucrative practice in favor of working full-time on developing avant-garde motorcycles, he ultimately shut down the C1 project in favor of starting all over again with the E1pc.

"We made the decision in December 2008 to go electric, and the TTXGP race in June '09 was our target for completion," says Czysz. "We were starting from ground zero – we had a spare carbon frame from the C1 and a couple of wheels, but that was it – I had to Google and call people to find out what motors and batteries to use. We designed our own batteries, but couldn't find anyone to build them, so we had to do it ourselves using bought-in Dow Kokam cylindrical lithium-ion cells, like they use in laptops. That was the best thing that ever happened, because now our battery knowledge is higher than practically anyone else in the field."

Czysz sourced three brush motors from Agni in India of the type almost everyone else used that first year, but ran out of time and showed up with a bike for Miller to race that had scarcely been tested. Though by some way the fastest and most powerful bike in the race, the MotoCzysz entry's array of 10 detachable batteries sent too much current to the trio of motors, and burnt them out.

"We'd designed a suitcase chassis with hot-swappable batteries built for the two-lap race we were told was coming next year," says Czysz. "But then the TT organizers made a land grab for TTXGP, and Azhar Hussain whose idea it was in the first place, got kicked out. So his two-lap race never happened, and we came back from the Isle of Man that year, decided there was nothing on that bike worth preserving – and started all over again from another clean sheet. Ground zero again!"

The MotoCzysz 010 E1pc that was the result of that retained the same essential carbon fiber chassis as before, but everything else was new.

For 2011 Czysz created a new

battery design storing yet more energy on board, as well as a new carbon frame with a different weight bias and altered center of gravity, and took the first steps in enhancing rider information by installing an on-board computer doubling as the dash, which constantly analyzes what's going on – especially range - and communicates that to the rider. The 100-mph-plus bike of 2012 was an evolution of that, but with much greater attention paid to aerodynamics.

Thus Rutter's 2012 TT-winning MotoCzysz utilizes a very slim aero-friendly carbon fiber twin-spar chassis cured in an autoclave oven (so, not wet-lay like the Britten V1000's similar component) with the MotoCzysz-built battery pack slotted inside the frame, but not functioning as a load-carrying component. This high-energy package contains an integrated thermal management system, with real time data collection for managing the state of charge and health of each individual Dow Kokam lithium polymer cell via the liquid-cooled on-board controller/ECU specially developed by MotoCzysz.

These power the liquid-cooled D1g1tal Dr1ve IPM/interior permanent magnet BLDC/brushless DC motor built by MotoCzysz with a bought-in rotor and stator, and coyly rated by Michael Czysz as 'over 360 volts.' This high-voltage motor is controlled via a total-loss 12 volt battery-powered inverter developed by MotoCzysz using components sourced from outside, with a positive-action twin-cable throttle running to a remote ride-by-wire control box, just as on the Ducati Desmosedici's similar system. It spins to 10,500 rpm, with a soft limiter imposed via the digital throttle at 10,000 rpm, and over 150kW/201 hp is claimed for delivery at the output shaft at 8000 rpm, with a constant 220Nm of torque available from 1rpm upwards.

A train of three primary gears brings the motor drive to an output shaft for the chain final drive that's nearly concentric with the swingarm pivot, which in turn allows the motor and inverter to be positioned low down in the optimum location for ideal handling, says Czysz.

Czysz has taken advantage of the free space normally occupied by a fuel tank to mount the now ultra-accessible twin RaceTech shocks for both front and rear suspension - which are fully adjustable for high and low speed compression damping and rebound, and give five inches of wheel travel at either end - beneath the rider's chest in a full tuck, where the gas/petrol would normally be. This means the aluminum swingarm operates the left-hand rear shock (with black coil-over spring) via an 18-inch long titanium rod via a 2:1 progressive ratio link, while a short aluminum pushrod works its companion front shock with blue spring, with both links offering ride height adjustment.

The front suspension is an adaptation of Czysz' self-designed 6X-Flex front end found on the C1, which sees the wheel located in sliders bolted to male stanchions running on recirculating linear bearings mounted within long female sleeves measuring 75mm x 32mm in ovality. This elliptical-shaped fork was chosen partly to increase resistance to deflection under hard braking to counter the substantial weight transfer stopping a very heavy bike weighing 525 pounds.

A second reason for choosing the oval fork is for packaging reasons, claims Czysz, in order to narrow the front end for aerodynamic purposes, while still delivering good steering leverage. The rake angle of the fork can be varied over a 22.5-24.5-degree range via inserts in the steering head, with trail variable from 87.5mm to 100mm via MotoCzysz patented detachable front axle insert mounts. To alter ride height, damping rates and spring preload, you simply adjust the shock, and in order to change trail, you need only swap the detachable spacers in the sliders holding the front axle for others of a different value – a five-minute job.

A major improvement for 2012 was the latest E1pc's extremely good-looking and evidently functional aerodynamic package, developed by Czysz in-house, but without benefit of a wind tunnel.

Instead of the BST carbon fiber wheels employed on previ-

ous E1pc models, the TT-winning 2012 bike has forged magnesium Marchesini wheels fitted with Pirelli's 17-inch slicks. That means a slightly surprising 200/60 rear with a fatter footprint, and thus increased rolling resistance, compared to a 190-section tire.

So in 2012 the MotoCzysz e-racer completed a hat trick of TT Zero victories, as well as breaking the magic 'ton.' Will the American bikes return to the TT in 2013 – and is there any more performance left in the tank?

"For sure we'll be back with two bikes for Rutter and Miller," says Czysz. "We'll continue to push the aero, bring in a new onboard computer, and continue to improve battery energy without adding any more weight, but to get more charge per kilo."

And what about the challenge from Mugen/Honda?

"It's scary, and very intimidating. They can crush us at any level – except one. When we each sit down to decide what next to focus on, they have no more inherent right to be correct in what they choose to do than we have. We're all making this up as we go along – and that's what's so exiting about it."

Michael Czysz

RIDING IT

The chance to ride Rutter's TT Zero-winning MotoCzysz E1pc came on the e-bike's home ground at Portland International Raceway. I did have some points of reference, having previously ridden the only two e-motorcycles ever to have beaten the MotoCzysz in a race: the Agni-Suzuki that Rob Barber took to victory in the debut TTXGP in 2009 and more recently the San Francisco-built Mission R on which AMA Superbike rider Steve Rapp beat Czysz in the 2010 Laguna Seca MotoGP support race. It'd make for a unique comparison.

The MotoCzysz is deceptively voluptuous, its swoopy bodywork leading you to expect that it's a bigger bike to snuggle aboard than it really is. In fact, it's surprisingly slim and comparatively small, but quite long and the 56.4-inch wheelbase allows you to push yourself well back in the seat in a straight line to minimize drag. The view from the bridge is subtly distinctive, with a hefty upper triple clamp housing the oval-section fork tubes, and a large-diameter steering head.

In front of you is the AIM digital dash, whose bright red surround incorporates a square LED 'fuel gauge' readout at the top that goes from 99 to zero, telling you the state of charge at a quick glance. There's a row of LED's under that, starting with green ones on the left that flash to show you're okay to complete your programmed route on the available charge, then blue in the center which is neutral, then yellow on the right standing for caution. The more yellow lights that are displayed, the more caution you must use. There's a more detailed series of switchable computer pages on the AIM dash, which even Rutter admits to being confused by.

To boot up the MotoCzysz, simply pull the toggle switch on the left of the dash out and up, and then press the red button on the right clip-on – noting that the left one naturally has no clutch lever, but also none for the rear brake, either. Working this is done con-

ventionally via a right-foot pedal, just as on a combustion-engined motorcycle.

Now you're live, so just twist and go – but do get ready for some arm-straightening acceleration comparable to a factory Superbike's.

The MotoCzysz doesn't have the same hyper-aggressive pickup from a closed throttle that afflicted the prototype Mission One streetbike I rode three years ago, thanks to the fact that its substantial maximum torque was immediately available from 1rpm upwards, as with all electric bikes. But the MotoCzysz motor's pickup from rest was still pretty brusque, more so than on the cleverly sanitized Mission R racer in spite of a comparable attempt to do so via the ride-by-wire throttle mapping.

However, thanks to the grippy Pirelli tires (even without any form of traction control available), I didn't suffer any problems with hook-up out of turns even on my out lap. Plus, the fact that the build of power all the way to the soft-action 10,000-rpm limiter is so smooth and linear, with no spikes in the delivery ready to set the rear tire spinning via a sudden spurt of speed, made it feasible to exploit the deep reserves of performance of the MotoCzysz motor.

But its massive 220Nm dose of torque all the way through the rev range (compared to the Mission R's 156Nm) meant I destroyed a perfectly good brand-new Pirelli rear slick in just 16 laps. Unlike the Mission R's totally addictive and utterly thrilling scream of speed uttered via its straight-cut primary reduction gears as revs mount, the MotoCzysz wafts along completely silently at over 160 mph. There are zero emissions as you do so, but also zero dBA – all you can hear is the swish of the Pirellis running over the tarmac, plus a little chain noise. That's it.

There isn't even much wind roar from your helmet, thanks to the e-bike's effective streamlining – it's quite uncanny, and frankly a little underwhelming. The visceral thrill of mechanical sound is a key contributor to the thrill of going fast, whether emanating from the exhaust, the primary drive, or the engine itself, and riding the MotoCzysz E1pc at high speed underlines that.

For winding the throttle wide open exiting the final right-hand turn onto PIR's pit straight saw the MotoCzysz hunker down at the rear as the substantial rearwards weight transfer helped dial up grip from that rear tire, yet without any massive wheelies - just a lazy wave of the handlebars denoting mind-boggling drive out of the turn. I was easily able to out-accelerate a 1098R Ducati I came up on one lap, pulling alongside him as we headed off down the long straight. We were dead even on top speed, though I fluttered the revlimiter just before the end as I hit a top speed of 162 mph, according to the onboard telemetry (the team had been a little conservative with their gearing for me).

But then - much to my surprise - the much heavier MotoCzysz outbraked the Italian V-twin into the double right-hander at the end of the straight, the great bite from its radial Brembos aided by the regenerative braking delivered by the ECU. This gave all the hallmarks of variable engine braking – at last the feature I've been seeking for years on electric two-wheelers: rider-adjustable regen.

In response to Rutter's request, for 2012 Michael Czysz installed a four-way switch that allows you to vary the amount of regen available, or indeed to switch it off altogether. Doing that dials up a good impression of a two-stroke GP bike, as you freewheel into a bend with a pretty good chance of missing the apex altogether unless you work the Brembo brakes just right. Going to the other extreme and dialing in the most intrusive setting will practically have the MotoCzysz stopping dead in its tracks as you back off the throttle, but any of the other three are good to work with in helping you stop from high speed - and all without any trace of the rear wheel chatter. But it's very important to adjust the regen on the go with your left hand, while keeping the power dialed in with your right one. Otherwise, if adding more regen you may find the bike will suddenly slow abruptly unless you have at least part-throttle dialed in, leading to

potential excitement if riding one-handed.

Since you don't have to worry about slamming it down through the gears, it means you can focus 100 percent on track position, on hitting your braking marks, and on how early to get back on the throttle again. And all this is made even better by the single best ingredient in the MotoCzysz handling package, the Czysz-designed (and patented) oval-section carbon fiber fork with adjustable-rate link operating the monoshock housed where the fuel tank would normally be.

The Czysz fork immediately delivers significant confidence, where even the best set of conventional forks will ask you to take time exploring their limits. That's because the damping provided by the fully adjustable RaceTech monoshock delivers fantastic feedback from the front tire, with minimal stiction at any time.

It's as if you're holding the front axle in your hands, with only the tire between you and the track, so you can feel every ripple, every imperfection in the road surface, telling you exactly how far you can push the tire while cranking the MotoCzysz hard over, and keeping up cornering speed. It feels stable, yet sensitive – those linear bearings work. And the fact that suspension response is separated from the steering means you can trail-brake deep into the apex of a turn without any fear of the fork freezing or failing to absorb bumps.

Rutter is also a fan, and the confidence inspiring handling of the MotoCzysz apparently allowed me to lap within the e-bike lap record set in the round of the U.S.TTXGP series there in June by the works Brammo e-racer that won this National-level Championship in the absence of the MotoCzysz. That's a mark of how capable a motorcycle this is, and how accomplished both its engine performance and handling are.

> **"I had to Google and call people to find out what motors and batteries to use."**
>
> **- Michael Czysz**

Indeed, the best compliment I can pay the MotoCzysz is that it's a sportbike with impressive performance by any standards that just happens to be powered by an electric motor rather than a combustion engine. Even compared to the highly effective but slightly less powerful Mission R (which produces 120kW/141bhp at 11,000 rpm, compared to Czysz's claimed 'over 150kW/201bhp' at 8000 rpm, both at the output shaft), its handling is on another level. I think this comes down to the TT-winning bike's lower center of gravity and generally more user-friendly architecture compared to the Laguna Seca race-winner.

This makes the turn-in under braking of the MotoCzysz more intuitive and practically indistinguishable from a 'normal' bike, whereas I must admit that even on the Sears Point race track I never had the confidence to throw the Mission R on its side in pursuit of higher cornering speeds that I immediately had from the MotoCzysz. And the Portland-built e-bike was more poised on turn-in, whether on the brakes or off, and required much less thought to flick it from side to side than the Mission R.

Hopefully the MotoCzysz will one day be headed to a country road near you – or closer to me. With a maximum quoted range from a single charge of 150 miles at road-legal speeds (compared to 38 miles at TT Zero race-winning speed, albeit including climbing a 1385-foot so-called Mountain), the MotoCzysz already has enough practicality to be the ultimate Sunday morning ride. One hundred miles at track-day speeds is within range on a flat track like PIR – and is sufficient for owners to have fun with. So here's hoping that the MotoCzysz business plan that is being massaged includes a Michael Rutter Replica E1pc. **CN**