



**THE  
CRASH  
PAGE**

**HOW MOTOCZYSZ IS BUILDING A RADICAL  
200-HORSEPOWER AMERICAN RACEBIKE**

# ROADRACING WORLD®

**& MOTORCYCLE TECHNOLOGY**

Volume 16, Number 9

September 2006

\$3.99 \$5.99 Can.

[www.roadracingworld.com](http://www.roadracingworld.com)

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# Building The Dream

By Sam Fleming

"I was reading an article on the MotoCzysz in MCN. I never read MCN (a British tabloid) but I was reading this article and they were slagging off this American builder's bike. The more I read the article the more I started taking issue with them because they were slagging it off because they didn't understand the intent of the design. I started defending the design to the article. A few weeks later I looked on the MotoCzysz website and they didn't have any job descriptions that matched mine so Adrian and I wrote up our own job descriptions, sent them in and applied for the jobs. A few months later we had left Cosworth and we were working here." This is how engine designer Simon Jackson described his recent emigration from England to America, from Cosworth to MotoCzysz.

I remember having a similar reaction to the first article I read on the MotoCzysz (pronounced Motosizz) project in the January 2005 issue of *Roadracing World*. At first I think I was personally offended that someone had the audacity to challenge the conventional wisdom that only Italians and Japanese can build racebikes. My irrational emotional reaction was that it was heresy for someone to pro-

pose building a MotoGP bike outside of one of the five established manufacturers, much less one designed by an American club racer of whom I had never heard. Reading one long uninterrupted quotation after

*The MotoCzysz frame is carbon fiber designed completely (including geometry and even fabrication specifications) by MotoCzysz but fabricated in South Africa, where apparently there is a government-subsidized composites industry. This results in a light and incredibly stiff frame. Rigid frames tend to overwhelm suspension systems at full lean angles as the tire is forced to absorb all surface irregularities. In a conventional motorcycle the frame flexes slightly laterally to absorb bumps. The C1 frame does not.*



As I read through it again I was still struck that many of the design ideas sounded brilliant. Counter-rotating longitudinal crankshafts to improve handling, tuned-flex forks to reduce chatter and provide consistent fork action, a quick-access transmission, a long swingarm with constant chain tension. It is all the type of advanced thinking that we revealed in when John Britten was making his own carbon wheels in his backyard shed. And I loved reading about Ian Cramp's ultimately abandoned attempt to build a 500cc GP bike in the mid-1990s. So why did I have a twinge of resentment about an American attempting the same? I finally came to the con-

clusion that Britten always came off as the very picture of modesty and humility and, in photographs, websites and interviews, Michael Czysz comes off as being a little cocky. His declarative statements sounded like confidence tipping over the edge to hubris. And lastly, every genetic motorcycle aficionado has dallied with the idea of designing a bike. Some have even built a couple. But ultimately we tell ourselves that it is impossible to build a revolutionary racebike because if it could be done then Honda or Yamaha or Ducati would have already done it. And if Czysz pulls it off, he demonstrates not only that it can be done, but also that the reason the rest of us didn't do it was because we were not talented enough, diligent enough, hard-working enough or smart enough. Czysz's success, therefore, would highlight the failings of every dreamer. And so I, and thousands of others, read with respect but were touched by envy. And, of course, there is the



The Czysz headquarters building houses both MotoCzysz and Architropolis in east Portland, Oregon.

another I struck an uneasy balance between grudging respect for the design philosophy but could not quite let go of the resentment about some of the declarative statements.

racer in all of us that thinks, "You talk a mean game in the pits, but show me the lap times." Statements of superior design seem awfully hollow when they are not backed up by lap times. The initial round of publicity seemed premature.

But that was because I missed one of the points of that round of publicity. It served the interest of the project in two ways: It helped raise the profile of the company and the product to current and prospective investors, and it raised a light around the world to like-minded engineers, designers and fabricators. They started sending in resumes from around the country as well as from England, Austria and Italy. MotoCzysz grew from a crew of four to a crew of 22 with top people in specialties ranging from engine design to composites to patent law. The company tripled its dedicated square footage and ordered up (by my estimate) at least \$1 million worth of machine tools. Czysz formed a formal corporation, established a board of directors and began building relationships in the racing community as well as in the manufacturing community.

None of this would have been possible without some additional cash and expertise and that would not have materialized without the notoriety and publicity that resulted from a round of interviews and those confident, declarative state-

ments. The publicity a year ago wasn't about lap times, it was more a call for help from friends to come pull an all-nighter to get the racebike together. Only in this case it was a call to the global economy and the all-nighter lasts for two years. Lap times are still a little ways off.

## The Man

Michael Czysz, born in May of 1964, grew up in southern Oregon with some time in San Bernardino, California, and

studied at Parson's in New York and Portland State University. He married Lisa in 1988 and has two sons Max (7) and Enzo (9). He started his architecture firm Architropolis (architropolis.com) in 1990. Through his work with Architropolis he earned a reputation for designing successful high-end residential and commercial properties including projects for such notables as Lenny Kravitz and Cindy Crawford. His commercial work spans resorts, hotels and casinos including, most recently, the Red Rocks resort in Las Vegas, Nevada.

racing and he took this sensitive piece of equipment straight to the AMA series. The AMA was a tough proving ground and between the new demands of fatherhood and the temperamental 250 he decided to take his track riding a step back, returning to track days.

His racing interest is not that of a dilettante but of a fourth-generation motorhead/designer/engineer.

Michael's earliest memories are all of being surrounded by motorcycle engines and

The 2005 C1 prototype languishes in a corner of Michael Czysz's expansive private office.



The architecture side of the Czysz operations.

His first motorcycle was a 65cc Yamaha dirtbike that he got when he was 11. He began road racing an Aprilia 250cc streetbike in 1994 with OMRRA when he was 30 years old. He switched up to an AF1 (a real 250cc GP bike) in 1997 and won the OMRRA regional Championship in his class. In 1999 he was able to get his hands on a full-on factory RSV250 just one step down from the World Championship-winning spec. At that point it was only his third year

frames. Friday nights were spent sleeping on the workbench in the back of his grandfather's van at Ascot. His family's surname has been twisting tongues at racetracks for 60 years—their history includes some accomplishments at prestigious levels of racing. For instance, Michael's grandfather Clarence Czysz built a Norton engine to power a Cooper T17 car to a world land speed record of

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## MotoCzysz Factory Tour

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118.271 mph in 1955. In 1965, Terry Czysz (Michael's dad) tuned a Norton which competed at the Daytona U.S. GP and took second place to Mike "The Bike" Hailwood and his factory MV Agusta.

This is not a man or a family that is unfamiliar with the Sisyphean task of racing. They know all about shattered connecting rods, broken valve springs, late nights, long drives, sacrifice and hard work. They are very familiar with competing with limited resources against teams with far greater depth of talent. This family has been there and done that.

Most of the rogue racebike builders we've seen in the past were engineers. Michael Czysz is a designer. And a designer who spent some of his formative years in and around celebrity California. Designers, by nature, must be concerned with appearance, as a designer not attuned to the emotional impact of image would have a very short career. As such, Czysz brings a lot of style to everything he does. His office is a mix of minimalist clarity and 1960s love nest. He is attuned to the way the workshops look, personally involved in the design of the apparel, opinionated on the wattage of the lights for displays and dresses more the part of LA celebrity than grease-under-the-nails bike racer.

The impression of him that I had from the MotoCzysz website and other interviews was of a bit of an egotistical design guru who would be more typically found in the fashion or art world rather than in the motorcycle industry.

With an expectation of meeting someone who is a little too sure of themselves, a little too smug in their own talents, a little too slick, I was pleasantly surprised to find that he is casual and engaging. He makes up words, uses the term "damper" for "damper" and, when

sitting on a lowered bike lift staring at the mock-up of a racebike peppers his language with expletives just like the rest of us. His very talented staff is respectful and clearly fond of him but not obsequious.

He is handsome, charismatic, friendly and undeniably talented. He is patient and polite with his team, cool in the face of chaos, reasonable with the multitude of frustrations and late deliveries involved in a project but clearly passionate about motorcycles. The commercial building and the bike collection

imply a great deal of debt or, more likely, decent (but not exorbitant) financial success earned through gift and hard work. Contrary to the stylized mogul photos and in contrast to the declarative quotations, he is pretty down-to-earth and surprisingly sensitive to some of the criticism of his intentions.

He was somewhat taken by surprise at some of the negative reactions that his motorcycle project (see: "Show me the lap times or shut up") has garnered in magazines and, particularly, postings on the

Internet. He isn't even too fond of the name MotoCzysz; it was originally a working title and ended up being adopted permanently. Many brands, of course, were proper names (Harley-Davidson, Honda, Michelin, Dunlop, etc.) but Czysz has got an awful lot of consonants in it for the North American eye.

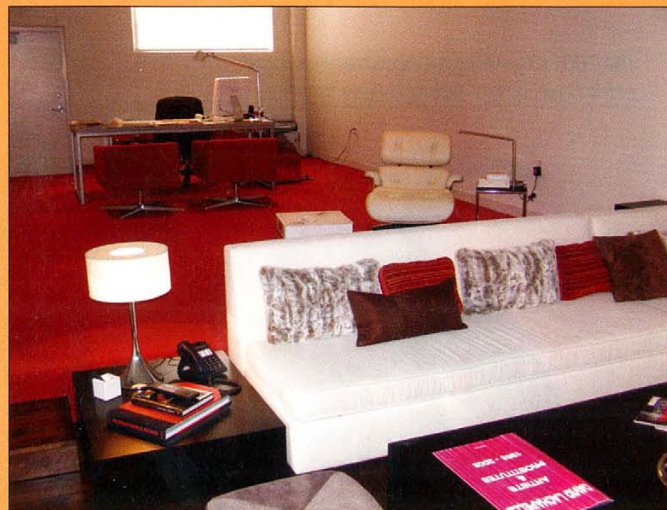
Lastly, in my estimation Michael Czysz would achieve far greater financial success in his lifetime if he dedicated the energy expended on this company and bike towards client development for the architectural firm. This is clearly not about making money—this is about building the best bike possible. The company will ultimately have to turn a profit to survive but for Czysz it is all about the bike.

### The Firm

Architropolis is primarily known for its luxury no-compromise design and buildings, and its work has been widely reviewed by a myriad of national and international architectural periodicals. Architropolis is housed in a non-descript but retro-stylish 1950s industrial building in Portland, Oregon, a low-slung two-story building with high ceilings and big, square warehouse windows with neighbors that include a bakery and a plumbing supply house. The west side of the building is dedicated to architecture; the east side of the building is dedicated to MotoCzysz. Michael Czysz's office sits in the rear of the building with a separate door into each half.

The two businesses are incorporated separately. In the last two years MotoCzysz has been formally incorporated, raised additional capital by selling shares of the company to various private equity interests, hired an additional 18 people, tripled its occupied square footage, invested in production and testing machinery and almost formalized the goals and timeline for the company.

MotoCzysz is currently



Michael Czysz's expansive private office has doors into both MotoCzysz and Architropolis, his architectural design firm.



MotoGP 2005 / 2006 posters and apparel are laid out in the conference room pending the final design decisions before production and loading the truck. All of which had to happen in the next week.

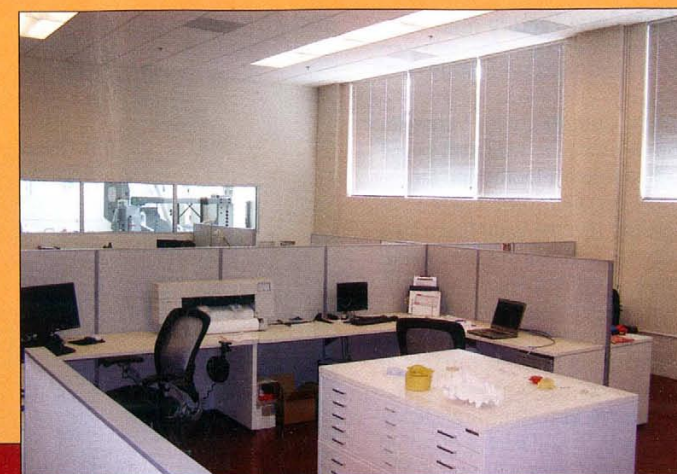
financed using the sale of equity (or shares in the Limited Liability Corporation, or LLC) to investors. Czysz himself retains over 50% of the shares of the company and thus, typically, control.

The following are my baseless estimates. The published amount of money spent was \$1.5 million on the design and prototyping as of June 2005. Since that time the staff and machinery has expanded tremendously. My estimate is that the burn rate at MotoCzysz is some-

a pretty large financial hole.

When I bounced my calculations off of one of the visiting investors he smiled like he knew something I didn't and spoke confidently of his faith that this investment will yield a good return over time. More telling, he didn't offer to sell me his stake at the conclusion of expressing his confident sentiments.

MotoCzysz has recruited top talent from around the world. Cosworth alumni head up the engine department. The com-



The bike design desks with seating for about 15. The room also contains a lunch table but the architecture side has the better espresso maker—no doubt an additional incentive for the motorcycle company to turn a profit.

### The Plan

On the idea that history repeats itself, first as tragedy and second as farce, Czysz is, to some extent following in Buell's footsteps. Erik Buell's first bike was a Square Four two-stroke designed to be raced in the AMA Formula 1 class. As his design came to fruition, the AMA adopted Superbike rules that made the Buell ineligible and obsolete in one line of the rulebook.

In this case the Czysz is facing a similar circumstance. The C1 is 990cc, the displacement limit for MotoGP, until next year when the limit gets dropped (almost exactly as has happened in the past) to 800cc. The MotoCzysz-targeted C1 will, therefore, be ineligible for competition in pretty much any class in the world except for WERA endurance, WERA Formula 1 and WSMC Formula 1.

Aware of this rule-based obsolescence, MotoCzysz would really like to get the bike on the track in a MotoGP race this year and is aiming for a wild-card

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Part workshop, part showcase, part investor relations: The assembly room for the new C1. In the foreground is a frame made of rapid prototype epoxy, in the background is an actual chassis with a rapid prototype engine, behind the glass in the far background is a meeting room with an actual angel investor inside.

where in the neighborhood of \$250,000 a month depending on the amount of outside parts sourced in any given month. Staff costs alone must be in the \$120,000 to \$150,000 a month range before getting into payments on machine tools, rent, and purchasing of externally sourced parts like engine parts or frames. At this rate MotoCzysz is going to be running through around \$3 million to \$4 million a year with not much expectation of positive revenue for at least five years. That is

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and instrumentation.

Despite small-to-medium-sized businesses being the largest growth engine in the American economy, many of the federal regulations governing business are weighted heavily in the favor of big business. MotoCzysz is running square into these dynamics which range from DOT and EPA regulations of motor vehicles to immigration restrictions which create costly and maddening delays in assembling staff, and thus, motorcycles.

## MotoCzysz Factory Tour

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entry, potentially for Valencia. Since the bike was still being bolted together for the first time—nary 100 feet from where I sat on July 10—the team had a long way to go in terms of testing, tuning, refinement, and, probably worst of all, lobbying Dorna for a wildcard exception before showing up in the southeast of Spain. Witnessing the dedication, multi-tasking and steady progress, it still seems possible that MotoCzysz will pull it off.

Participation and, more importantly, qualifying for a MotoGP race is incredibly difficult and would be a tremendous accomplishment for MotoCzysz as well as a very important step in laying the groundwork for building a mystique and soul for the company.

Regardless of racetrack outings MotoCzysz is planning to begin production of the first 50 motorcycles this fall. These 50 bikes will be sold for \$100,000



*These are a portion of the machine tools at MotoCzysz. These are very expensive and allow skilled operators to turn computer drawings into finished parts relatively quickly. All of that said, building even just a single part for a motorcycle is a time-consuming chore.*

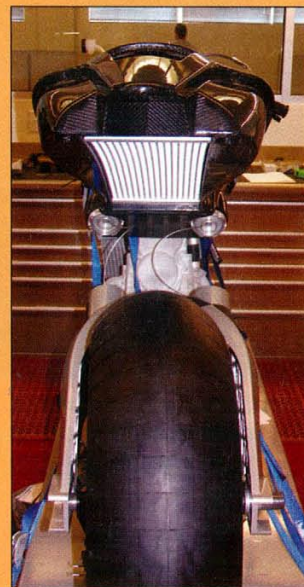
each with plans calling for \$10,000 deposits to be accepted at the U.S.GP. These bikes will not be street-legal. At that price, and restricted to track days or WERA racing, these bikes seem mainly destined for collectors or wealthy enthusiasts rather than general consump-

tion. However, assuming all the parts go together as planned and work as designed these bikes will deliver an astounding level of performance. Think low 300s for weight and low-to-mid 200s for horsepower.

Even at \$100,000 each this first production run could eas-

ily result in a net loss of cash to MotoCzysz. Readers familiar with the production costs associated with limited-run, no-compromise fabrication will not be surprised by that revelation.

As the C1 will not be eligible for MotoGP in 2007 MotoCzysz has switched the target to racing in AMA Superbike. This will result in a massive increase in the cost of production to MotoCzysz. Not only will the company have to build 150 to 300 units but those bikes will have to be street legal. Street legal means expensive DOT and EPA approval as well as engineering all that street equipment like lights, sidestands, mufflers, air filters and the like, unless the AMA just lets it in the way it did with the Harley VR1000. On the plus side, building a streetbike will also broaden the appeal of the brand to a much larger audience.



*The pipes are not bolted on and there is no fairing but notice that the rear wheel is wider than the engine. This bike is incredibly narrow. It is crazy narrow. It is so narrow that it feels like a dirt bike between the legs, not like a 1000cc racebike. Keep in mind that horsepower requirements rise exponentially with speed so this slender profile may make up for any deficit of horsepower.*



*One of the more unusual machines at the MotoCzysz plant is a computer-controlled mold-making machine. It carves hard, dense foam into computer-generated shapes to allow for rapid prototyping, and finished production of composite pieces. Composite construction has its own dedicated room of about 1000 square feet.*

Depending on how the discussions go with the dynamic (meaning, perpetually in turmoil) AMA racing decision-makers, MotoCzysz could be racing in the AMA as soon as 2007 but, more likely, in 2008. That is assuming the technology pans out, the investors keep writing checks and the rules are accommodating for the inclusion of a new brand.

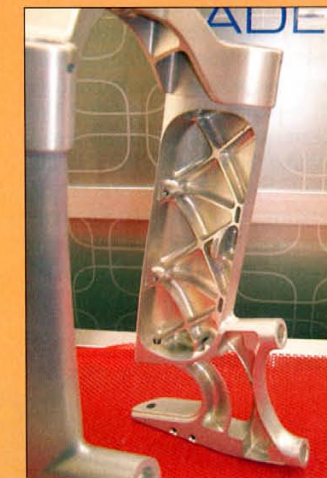
Internally, the company's attitude towards racing is that, although expensive, it is imperative to both the development of a world-class performance motorcycle and of building the image around the brand; branding being paramount in the emotion driven motorcycle market. In other words, qualifying for a MotoGP in 2006 would be well worth the expense for the worldwide name recognition value alone. That is, as long as the bike does reasonably well and doesn't fail catastrophically.

At this point there are no formal plans to build an 800cc engine to return the focus to MotoGP competition.

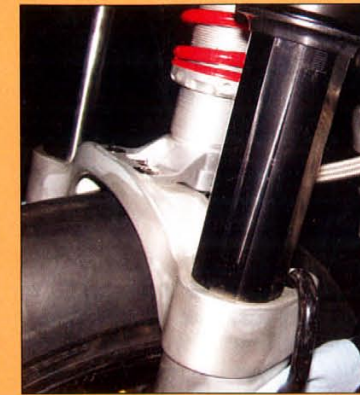
In addition to producing and selling complete motorcy-



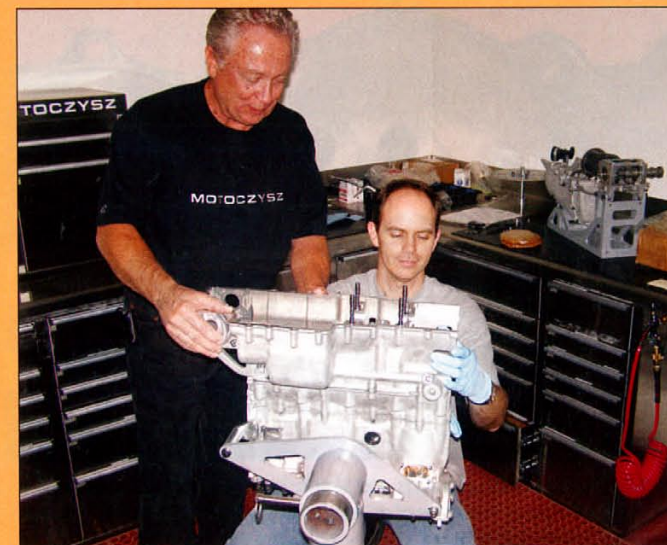
*Small companies require that individuals wear a lot of hats with only loose connections to their formal job descriptions. In a graphic representation of this work ethic, the President of MotoCzysz, Federico Cioni, turns parts at a lathe.*



*Instead of flex in the frame the C1 has suspension components (forks and swingarm) that are designed to be rigid in the suspension travel directions (up-and-down and back-and-forth), but flex laterally to absorb bumps from the side. This is done in the rear with a swingarm that is extensively braced top to bottom but with a little give side-to-side. The flex in the forks is provided in the lowest portion of the fork leg. The large section front-to-back resists deflection during braking but the thin section side-to-side allows the fork to soak up bumps at full lean. At least that is the theory. The big oval in front of the brake mount is for the axle insert.*



*The fork tube is firmly attached to the lower oval sections of the fork like in a conventional inverted fork. Telescopic forks slide up and down on oiled bushings that, by necessity, have a bit of play in them. This play introduces a bit of slop into the fork action. Also, when braking, the forks can bind on those bushings. Really good forks, of course, have less slop and less tendency to bind. The Czys sports diamond-like-coated titanium fork tubes with flat sections on them. The flat sections match linear roller bearings (imagine a ladder where the ladder rungs are roller bearings) in the upper part of the fork. These bearings positively orient the fork making it so it cannot bind no matter what forces are applied to it. The damping and springing action of the fork is contained by a single Öhlins unit mounted to a bridge between the sliders. The arrangement eliminates variations between the tune on each fork leg and also allows for the complete replacement of the valve stack and spring in a few minutes through a simple external swap of damper units. Lastly, this damper is already gas-charged, preventing cavitation of the damping oil. No leaking fork seals, either.*



*Terry Czysz and Simon Jackson work to build the very first new MotoCzysz engine. This is not like assembling a GSX-R engine because none of these parts have ever been installed together. That means that every single clearance and tolerance and gasket and seal and bearing and torque spec and thread pitch and assembly order and roll pin and alignment have to be checked, and rechecked and disassembled and rechecked.*



The axle spacers are removable. This allows the tuner to adjust the trail of the motorcycle independent of other aspects of the bike's geometry. In other words, one can add trail for turn 12 at Road Atlanta while leaving the rake tight for turns 10a and 10b.



Peering down into the top of the fork one can see the roller bearings.



The bike has two tall, skinny radiators up front. Air is also ducted from the front of the fairing through the center of the bike to pressurize the top area of the carbon-fiber seat/subframe area. The high-pressure air above the seat-mounted radiator gets sucked through the radiator by the aerodynamic low-pressure zone created behind the bike. The theory here is that the frontal area can be reduced with smaller radiators (and low frontal area typically translates to a higher top speed for a given horsepower output) and high-pressure air can be routed to the back of the bike to help fill that low pressure envelope in behind the bike. That in turn reduces the size of the aerodynamic parachute that all racebikes tow around behind them (see "higher top speed for given bhp") and would reduce the ability of a following bike to draft this one.

## MotoCzysz Factory Tour

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cles on a limited production basis, MotoCzysz is also investigating licensing some of its technology to other manufacturers or broadening the usage of its technology beyond the motorcycle realm.

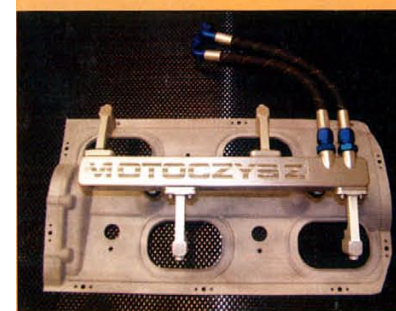
### The Bike

When I was visiting the production facility the parts were largely on the premises but were in the process of being converted into a running motorcycle with a deadline of having it finished in 11 days, to display at the U.S.GP. That said, I was able to examine many of the pieces and look inside the engine but was unable to ride or otherwise experience the finished product. The plan is to test ride the bike at a racetrack in the late summer or early fall. At that time I will be able to give you the full technical write-up because, quite honestly, just the engine alone has enough tasty details and expression of theory for an entire issue.

One of the hardest aspects of the bike's design to get through my head is that this is not a streetbike that has to withstand rain and dust. It is not a production bike with a retail price



Michael Czysz knew what he wanted out of an engine; Adrian Hawkins and Simon Jackson immigrated to the New World from Cosworth to make sure it all worked. Jackson is in charge of anything that goes up and down or around and around, while Hawkins is in charge of making sure it all fits and that it is possible to fabricate. Given the packaging, layout, and performance requirements of the project, Hawkins had to come up with some pretty creative solutions with the castings. In order to achieve the nested narrow V of the cylinders without giving away performance Hawkins had to design a block that contained both the cylinders and the cylinder head. For those of you who do not know what a complete pain that would be to design, it is an enormous pain. On the plus side there is no head gasket and the combustion chamber should be extremely stout with an absolute minimum of upper cylinder flex (upper cylinders often flex in high load situations); on the downside the valves are the last thing out of the engine on a freshen-up and machining and casting are more complicated. The blocks are cast in the U.S.

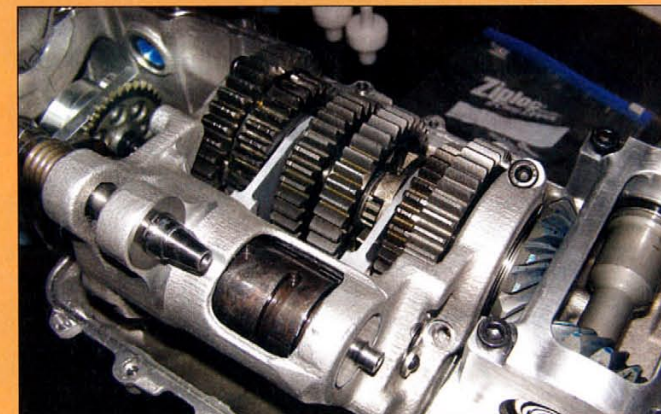


In the modern age there are two battles for racing success, hardware and software. Most of the software comes into the engine management system that incorporates the fuel injection and ignition systems. Of course now those systems are integrated with the fly-by-wire throttle bodies,

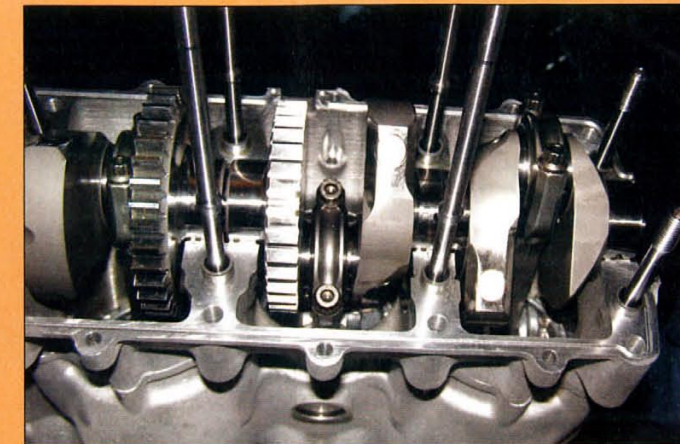
(Czysz uses manual control on two cylinders and computer control on the other two) the all-important data acquisition system and the dashboard display. These systems can also incorporate electronically modified clutch action, launch control and traction control. To solve virtually all of these problems in one fell swoop Czysz teamed up with Magneti Marelli, which is the firm providing many of the top GP and Superbike systems with their electronic and software solutions. This is just a picture of the fuel rail with the shower injectors in place because pictures of black boxes are not very interesting even if what they do is.

### Some Notables At MotoCzysz:

Michael Czysz - MotoCzysz Founder, Former Racer  
 Terry Czysz - Michael's Dad, Former Racer  
 Adrian Hawkins - Alumnus Cosworth  
 Simon Jackson - Alumnus Cosworth  
 Federico Cioni - Alumnus Ducati  
 Nico Reynier - Alumnus Kenny Roberts Race team  
 Jim Rhodes - Alumnus Michelin North America Road Racing  
 Dave Sprinkle - Alumnus Toyota Racing Development  
 Andrea Pretzler - Alumnus Gerg Composites (BMW/ Benelli)  
 Stefano Perotta - dedicated representative from Magneti Marelli Motorsports



The transmission mounts below the crank so the entire engine is sort of stacked up on top of itself. Transmission gears are very difficult to build or source so the prototype here is fitted with GSX-R1000 gears. In recent years Suzuki has drifted from its "great transmission" past but some of those shortcomings are addressed in the MotoCzysz with beautifully made shift forks and shift drum. In the right of the photo you can see the worm gears that convert the direction of power from the crank rotation to the rear wheel rotation. In the distant left corner you can get a fuzzy view of an oil pump and oil level sight window. The whole transmission can be unbolted and dropped straight out of the bottom of the bike for revisions to internal gear ratios or, if they retain the Suzuki bits, replacing the 3-4 gear cluster at regular intervals.



Some of Simon Jackson's work. The cranks are counter-rotating to cancel the inherent gyroscopic effect on handling and the split between the two halves is clearly visible. The drive gear on the right crank is smaller than the left as its power has to feed through an intermediate shaft to reverse its direction before both cranks feed into a torque shaft. The power is then transmitted through a clutch to the transmission. The cranks are fabricated by Cosworth in England while the rods are sourced from Saenz in Argentina. There are many neat bits in this engine that are not found in your average production engine. The rod journals are heavily radiused for strength and there is a massive gap between the rod and the crank webs. This gap ensures that there is no frictional loss between the rod and the crank. The rod is positioned on the crank by having an extremely strong and tightly toleranced piston. This is obviously not the cheap way to do this. The crank's oil passages are not simply sealed with peened-over ball bearings but are instead capped with little allen bolts. This is not just so that the crank can be easily disassembled and cleaned but also so that a machine tool can get into the connecting rod journal of the crank to lighten it internally.



The three cams are gear driven to keep the cam timing as constant as possible up to 16,000 rpm. The two outer cams are exhaust cams, and the center cam is the intake cam. These cams have a huge base circle to allow for copious amounts of both lift and duration. The exhaust cams are waisted in the center to allow clearance for the intake ports. One velocity stack is fitted in back. The combustion chambers and ports are all cut by computer. The cams are fabricated by Cosworth, the titanium valves are sourced in the U.S. and the valve buckets come from France. The cam journals are pressure fed through the block, not internally lubricated from the cam as is common practice. The shiny finish on the cams reduces friction and heat.