

KTM 390 DUKE

KIDS ON TRACK

QUICKSAND TRAINING

# CYCLE CANADA

HONDA CB500  
A PAIR OF TWINS



## YAMAHA'S BOLT

STRIPPED  
DOWN AND  
STREETWISE



Editions  
Jean Robert

cyclecanadaweb.com

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Sales contract no 41147038 CAN \$4.95

TRIALS BIKE TRANSPLANT  
HALIGONIANS GET WIRED ON ELECTRONICS  
+ V-STAR 1300 DELUXE: CRUISER LITE

10 MM AIR GAP

AIR CHANNELS FOR COOLING. REF. NOTE

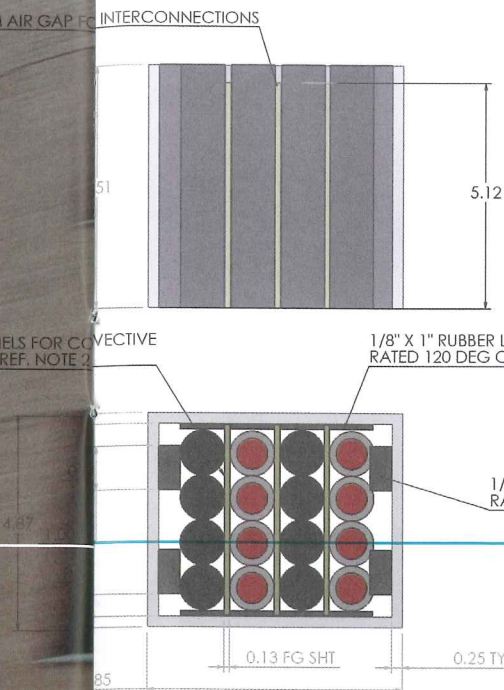
YOU CAN'T RUN AN IPHONE ON GASOLINE. THESE DALHOUSIE GENERATION Y KIDS HAD NO QUALMS ABOUT STRIPPING THE GUTS OUT OF A GAS-POWERED TRIALS BIKE

NOTES:  
MATCHING CAP  
COOLING CHAN  
UTILIZE ONE-SIDE  
94545K59  
EG-SHT - 1/8" PBR  
MIDPOINT  
ISOLATION  
VIBRATION

SolidWorks  
For Acad

# SLOW WATTAGE

By Michael Uhlarik



The team and their electrified project: Sebastian Manchester, Michael Snider, Jennifer Gough, Grayson Swan, and Lukas Swan. It's alive!

DOWN IN DME-P-16  
 IS USED AS NECESSARY. CURRENTLY UNEXPECTED TO BE REQUIRED  
 RESISTIVE RUBBER AVAILABLE THROUGH MCMMASTER CARR. P/N  
 CLASS SHEET MIN. RATED 120 DEG CELSIUS  
 -4X 10 GAUGE CABLING SOLDERED CELL TO CELL  
 TIONS - 4X SOLDERED TABS, BENT OVER 180 DEGREES  
 WITH CARDBOARD WRAPPED CELLS PROVIDES IMPACT AND  
 TION

MATERIAL		TITLE: BESS Enclosure	
FINISH		SIZE A	DWG. NO. DME-P-15
DRAWN G. Swan	DATE 09/01/2012	REV 1	
COMMENTS: See Notes		SCALE: 1:5	WEIGHT: SHEET 1 OF 1

Student Edition.  
 Academic Use Only.

Sitting down in Dr. Lukas Swan's office at Dalhousie University, my eye was immediately drawn to a mechanical fish perched on a shelf. It was a silver, metallic robot with segmented body panels like the interlocking plates on a suit of armour. When I asked him what it was his face lit up and he enthusiastically explained how his team of student engineers had emulated the swimming action of a trout and discovered, yet again, what an efficient vehicle designer nature is. Swan was an engineer alright, but one with that mischievous curiosity essential to invention.

I was visiting Dalhousie's faculty of engineering to examine a trials motorcycle that a senior group of engineering students, working under Swan's guidance, had built. It was based on a Honda TLR 250 from the 1970s (that had actually been Swan's first motorcycle), but the group had replaced its internal combustion engine with an electric drivetrain of their own design. There are a lot of reasons why this shouldn't be newsworthy, not least because today you can order pre-packaged DIY electric conversion kits on the Internet for everything from a Ford Ranger to just about any motorcycle. What makes this one special is that the engineering students developed their own battery modules and electronic manage-

ment system; designed, built, and tested the physical integration of all these things; and came out with a motorcycle that is better than the one they started with. And they did this for under \$10,000 in less than six months.

Four students, Jennifer Gough, Sebastian Manchester, Michael Snider, and Grayson Swan began the project with the aim of improving the breed, without factory support or a big budget. As avid motorcyclists, Grayson Swan and Manchester brought experience to the table, while Gough and Snider would bust their motorcycle cherries on the old Honda. "I'd never ridden a motorcycle before this. But this project has definitely changed me. I want my licence now," said Gough after the fact.

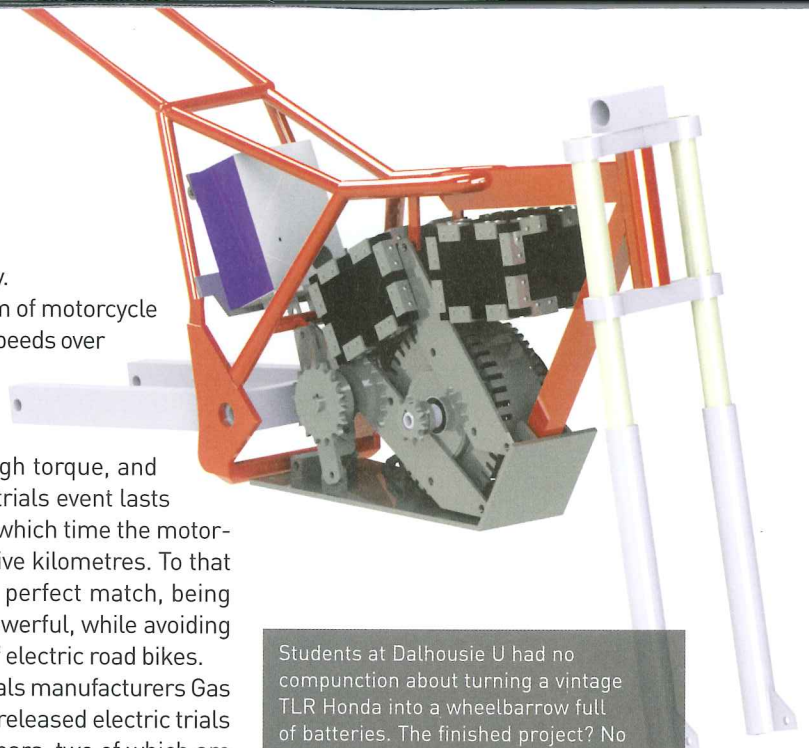
The lure of electric propulsion runs in the Swan family. Lukas's father, David, has been a senior adviser to the automotive industry on all things electric for decades, having participated in programs for Nissan and GM. Lukas did his doctorate on advanced battery chemistry and leads Dalhousie's Renewable Energy Storage Lab, and project member Grayson is his youngest brother. Obviously the men of the Swan clan like to mess with cars and bikes, like many Canadians. But unlike most, the Swans have formalized their knowledge and made significant contribu-

tions to the motoring industry.

Trials is an unusual form of motorcycle competition. Hopping at low speeds over rocks, logs, or other obstacles (typically insurmountable by motorcycle), trials is all about balance, instant high torque, and low-speed control. A typical trials event lasts no more than 45 minutes, in which time the motorcycle might cover less than five kilometres. To that end, electric propulsion is a perfect match, being compact and monstrously powerful, while avoiding the limitation in endurance of electric road bikes.

It's not a new idea, as trials manufacturers Gas Gas, Sherco, and TM have all released electric trials concepts over the past few years, two of which are in production. Emitting no pollutants and being nearly noiseless also means that indoor trials events, typically held in convention halls, are easier to get past health and safety authorities. The biggest attraction to hosting indoor trials competitions is that the motorcycle season is now a year-round affair. I like to imagine an indoor trials event taking place inside the food court of a suburban mall. It would be educational for the mall-loitering youth of the nation (and a boost for motorcycling in general) to watch competitors attempt to ascend the orange-

## DR. SWAN DEMANDED THAT WE BRING A FIRE EXTINGUISHER



Students at Dalhousie U had no compunction about turning a vintage TLR Honda into a wheelbarrow full of batteries. The finished project? No wheelbarrow, but a real real trials bike.

juice stall and hop over the sunglass booth.

I first saw the project when the Honda was stock and leaning against industrial shelving inside Dalhousie's engineering lab. It had been used in the backwoods of Nova Scotia by three generations of Swan men before being volunteered for power-plant surgery. Vintage motorcycle enthusiasts need not cringe at what happened next. The old girl was treated with the kind of respect one gives a family heirloom, with Swan pronouncing that the TLR must be modified only so much as to not preclude reversing it back to its old gasoline-indulging self. In other words, the engineering mandate just got a lot harder. No cutting of frame rails, no massive bespoke parts permanently welded on.

The team made a great deal about the amount of testing that went into the design of what they called the battery energy storage system, or BESS. As a motorcyclist, even one who is developing high performance electric bikes, I think of the battery as a kind of magic box containing about as much interest as the complete Wayne Newton catalogue. In other words, I really didn't get into it. To motorcyclists a battery is just an annoying secondary component that likes to go flat every winter and on days when you really need to get to somewhere quickly. So the explanation about how many cells were in each battery pack didn't really charge me up, espe-



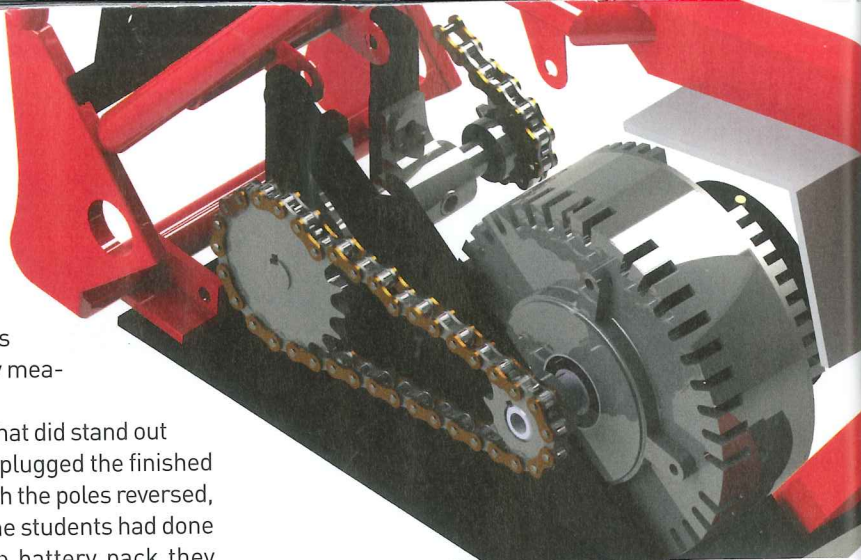
cially the part that dealt with the battery management system, the cell cathodes and just how robust their safety measures were.

The one part of the story that did stand out for me was about when Gough plugged the finished battery packs into a charger with the poles reversed, destroying a \$1,000 charger. The students had done their job well, though, as the battery pack they had laboured over survived. Impressive, but I am a motorcyclist first, and what I wanted to know about more than anything were results. How did the bike come out on the other end?

A sunny day presented itself and I was invited to throw a leg over and see what it was like.

Because the TLR was unlicensed and uninsured, it could only be ridden on private property, which in our case meant the university grounds themselves. Before wheeling the motorcycle outside, Dr. Swan demanded that we don safety glasses and bring a fire extinguisher. Not encouraging. But these are engineers, and in my experience the good among their profession leave nothing to chance. Once outside in the common of Sexton campus in the heart of Halifax, caution was tossed aside as first I, and then

## THE MOTORCYCLE WAS WHEELIE MAD. WHEELIE, WHEELIE MAD



What goes around, and all that. Electrification seems simple: you have a motor, as opposed to an engine, and its torque output is converted to linear motion. Somehow. Uhlarik: "Batteries, schmatteries. How does it run?"

Grayson Swan, pulled on helmets and began hooning around the very public spaces between buildings.

It was immediately clear that the motorcycle was going to be wheelie mad. Even with a gentle throttle hand, the front end went light at once, and despite a pair of tires petrified from age, acceleration was impressive. Of course, like all electric motorcycles (with the exception of the latest Brammo Empulse R), there was no multiple gear transmission system, just a direct final drive. As such, the little bike peaked out pretty fast. Trials motorcycles are geared very low to make the most of the available power to jump like mountain goats, so in this case the added instant torque reinforced the need for sophisticated electronic power modulation. The students used an off-the-shelf power control module and software, so there wasn't much sophistication there, which was fine as that wasn't the point of the project.

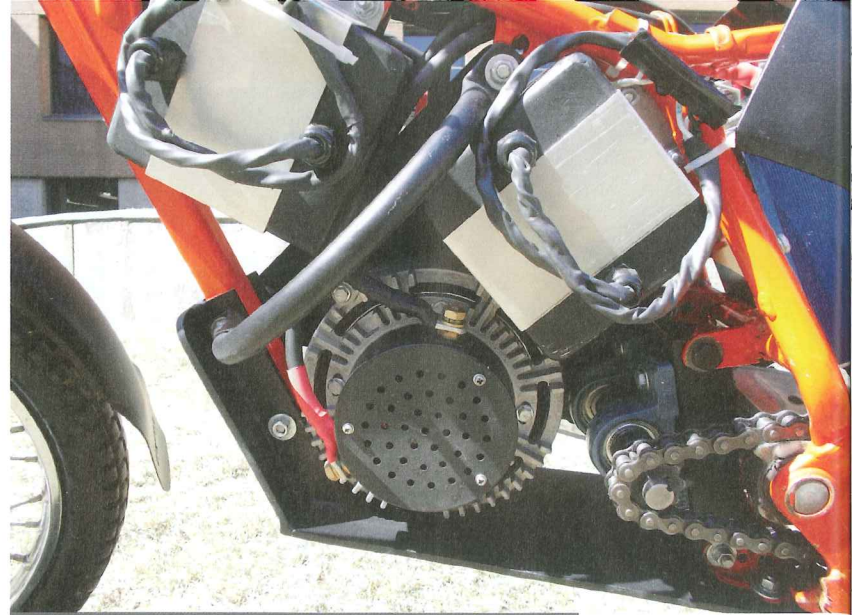
What the Dalhousie TLR did very well was keep the weight low and centralized. And the conversion made riding far simpler. No clutch, no gear change to occupy the left foot, and not much in the way of physical motorcycle to push around made the electrified TLR a sprightly thing, happy to spin around the footpaths and scamp up the grassy hills separating potted flower beds. The groundskeepers were not watching, but I am sure they noticed



## EXPERIMENTATIONS

the tracks pushed into the earth, and the clods of grass that found their way into concrete steps and other places. It didn't matter. The electron-fired Honda was happy to climb stairs, hop down a concrete bollard and pirouette in the drive just as well as its former gasoline-fuelled self, but without attracting the suspicion of the staff or the ire of literature majors standing in the spoken word poetry circle a few yards away. This was a hooligan tool par excellence. It had also run reliably for hours on a wet, muddy, and log strewn trail in rural Nova Scotia a few weeks earlier, easily keeping up with a gas-powered trials machine but using up about a dollar's worth of electricity.

The four grads were in a totally different mood now, during and after the test ride, than when I first met them a couple of months earlier. The university was no longer a source of stress, and the TLR no longer the cause of elevated blood pressure. Dressed in the casual uniform of generation Y, they were coolly standing by, watching the debauching of Dalhousie property with the distant interest of



Weight was kept low and centralized in the Dalhousie TLR, and the result was a two-wheeled mountain goat.

a cat looking at a street from a window. I was snapping pictures and asking questions about the build, trying to frame them in a way that would engage more discussion, but the three of them were talking about what was next. Manchester and Snider were talking about careers in sustainable energy while Gough was talking about additional studies. I instruct at art and design colleges and am familiar with this phenomenon. These are smart, motivated young people at a tipping point in their lives. Today is not nearly as important as tomorrow, and yesterday does not exist.

In many ways, the motorcycle they rebuilt reflects the same philosophy. Aside from Grayson Swan, who told me a couple of stories about the TLR's early life, none of them felt any loyalty to it. They didn't spend a passing moment thinking about the preservation of a vintage motorcycle, nor did they treat it, a complete and fully functional machine, as something precious that should not be torn apart and remade into something new. Generation Y is often berated for being lazy or for having a sense of entitlement, but this group worked very hard and with tools most middle-aged folks would find alien. Regardless of your views on electrification, they have shown that new technology, combined with new brains, can contribute much to motorcycling. 