Electric Auto Association

CURRENT EVENTS

November-December 2004 Promoting the use of electric vehicles since 1967 Vol. 36 No. 11 & 12

EDTA CONFERENCE & EXPOSITION

By Mark E. Hanson ©2004

Executive Summary:

Overall there were incremental improvements in batteries, super caps and drive train efficiencies, which have been fairly consistent with this industry. Lithium batteries, capacitors and power electronic components saw cost reductions realized from spring boarding off of other markets. That will be the long-term success of the industry to alleviate the chicken and egg syndrome. By using high volume laptop computers like Electrovaya has done for Lithium batteries or "D" battery enclosures as Maxwell has done for Ultra caps, results in cost reduction due to volume sales. The EV industry has had low volume sales and profit margins.

September 21-23, 2004 in Orlando, Florida.

The love fest the government and the auto industry has recently had with hydrogen-based fuel cells has been tempered by the realization that with hydrogen as an energy carrier, the electrolysis conversion process from renewable energy (the final goal), solar-wind or electricity is 50% whereas transmission lines exhibit 8% losses for BEV's. This was brought out in a University of Washington study this year pointing out "laws of physics" reality assessment of the hydrogen fuel cell. Presently Air Products (main supplier of hydrogen) etc. extracts H2 from natural gas with a 30% loss and there are already CNG vehicles available with similar overall well-to-wheels 20% efficiency. H2 must be compressed to 10k PSI to have adequate >150mile range which reduces efficiency further. Present cost of H2

Electric Drive Transportation Assoc.

has been 2X of gas per gallon equivalent at $4.00 for hydrogen and the PEM fuel cell vehicles are orders of magnitude more expensive than presently available clean CNG alt-fuel vehicles, EV's and hybrids. Thus there will be more a mix of technologies as time moves on, with battery EV's, hybrids, CNG and some expensive fuel cell vehicles, not a total shift to hydrogen that has been reported in the media recently.

It was noted that the political winds directly affect this industry with the energy bill stalled in congress. Removal of California's CARB EV requirements by the auto industry and federal government has resulted in the crushing of GM EV-1's, Ford's Think EV's and RAV4's. This conference has been the smallest in recent years due to the rollback of these vehicles and clean air requirements. It was easier therefore to spend more time with individual manufacturers.

Important Key points noted by the EDTA are that transportation accounts for 66% of all oil consumed in the US. Over 50% of U.S. oil is imported from OPEC producers and the U.S. spends $200,000 on foreign oil every minute.

The conference was held at the Gaylord Resort in Orlando, Florida September 21-23, 2004. I picked some of the highlights in this three-day conference that showed growth over the previous year.

Technical Improvements:
Drives:

Edward Moore with ENOVA, a California based drive systems company, developed a new series of hybrid drive systems for tractor-trailers. The drive motor & control is for a 60kW diesel-electric system and is claimed to reduce fuel consumption by 60% in large trucks. Peak power drive is up to 240kW on acceleration.

Richard Kasper with GEM NEV's a subsidiary of Daimler-Chrysler demo'd the E2 two passenger and E4 four passenger 25mph vehicles. Improvements for this year included double A arm front suspension, digital drive display, battery indicator and

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COVER STORY

Photos provided by Mark Hanson

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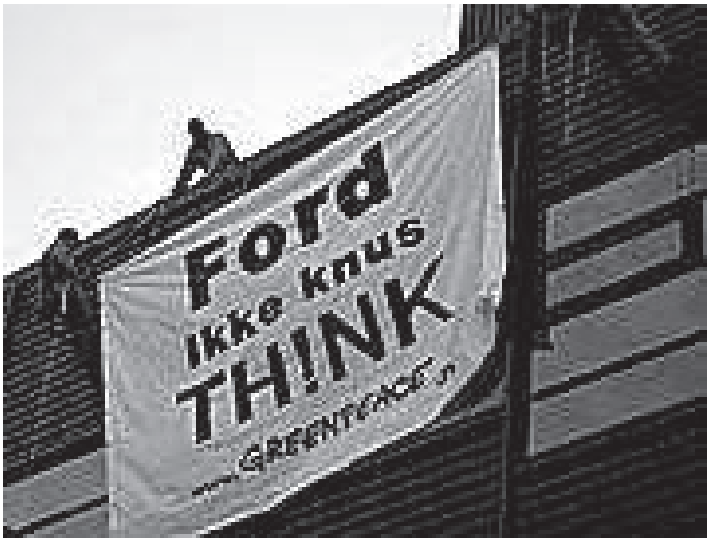


"Ford don't destroy TH!NK"

First return of 18 vehicles by Think Nordic.

TH!NKs ready for true ownership.

"Of the various electric vehicles marketed by the "Big Three", the General Motors' EV1 (manufactured by GM) and the TH!NK City (imported and marketed by Ford) came close to being appropriate configurations for a mass market. However, at the end of their programs GM destroyed its fleet, despite offers by drivers to purchase these EVs.

Ford's Norwegian-built "TH!NK" fleet was covered by a three-year exemption to the standard U.S. Motor Vehicle Safety laws, after which time Ford decided to dismantle and recycle its fleet. The company was, however, persuaded by activists, including Greenpeace, Rain-forest Action Net-work and Global Exchange (working together as "Jump Start Ford") in San Francisco and Oslo, not to destroy its fleet but return them to Norway and sell them as used vehicles.

The approximately 200 Think City electric cars have begun to arrive in Norway, and the activists are monitoring the progress of the vehicular repatriation.

On August 28, Arne Magnus Berge of Norway captured in a photo a RAV4 EV leading several privately owned TH!NK City EVs to the Ford HQ in Norway. The encounter was captured on the web at: http://www.evguide.nu/thinkford.html

EV protest parade in Norway

From the Kewet.com website, updated during the end of October:

Looks like 11 of the TH!NK electric vehicles have successfully been imported from the USA! These are 2000-models, barely driven, 500 to 3000 miles, 5 blue, 5 red and 1 gray. They are being sold for 139.000 crown (about $22,400 USD) plus license, registration, VAT. Come with a 6 month's full warrantee. Cars have been upgraded and checked at TH!NK at Aurskog, Norway. ElBil Norway AS will be selling these vehicles."

Ford Norway will sell the rest of the cars through their distributors. Some 20-30 cars have come to Norway. At the moment they are waiting to find someone to help them with upgrading.

CONVERTING A SNOW BLOWER TO EV

By Christopher Zach

Joel Silverman wrote:
I have a Sears 5hp 2 stage snowthrower that is getting a bit tired. I was thinking that it would be a perfect time to convert it to electric. The motor runs at a constant speed and a transmission is used to control the 6 forward/2 reverse speeds.

I have two options:

1) A plug in snow blower — disadvantage is that I have to drag a cord up and down my driveway in the cold. The cord will become extremely stiff and difficult to handle.

2) Battery powered snow blower — disadvantage is that the batteries may not have enough power to clear 6-8" of snow from a three-car wide driveway on a single charge.

I am interested to hear thoughts on motor size, setup, etc.

Response:
I also have a Sears snowthrower, but mine is a 120VAC corded electric.I've used it for years on a 125' driveway. Even when the drifts are higher than the "mouth" (up to 2' at times), it works fine by shaving the drift so the snow falls in its path. It's a hand-pushed unit — traction is more an issue with my boots than the snow blower, and has never been a problem. It can bog down in very heavy stuff, but I've never tripped a breaker.

The cord is a minor nuisance. After a few tries you'll learn what snow to clear from what outlet and where to run the cord. You can get cords that aren't any more difficult to deal with in the cold than in warmer weather. I will caution you though, when you give the cord a tug to move it, it can slide much farther than you expect — right into the blades. Be ready with the handle release switch.

There are some situations where the cord is a huge PITA, like clearing your sidewalk with a fence between the sidewalk and outlet. There is also the possibility that you might need to clear snow during a power failure, but it's never happened to me. All in all, I'd convert your snow blower to a corded electric and not have to mess with batteries.

Blowing snow is without a doubt, hard. In fact it is the single largest user of power on the Elec-Trak accessory list. This accessory is more popular than the lawnmower deck by a large margin as well as the tiller. Compounding it is that the weather is *COLD*, meaning batteries have less capacity when you need it most.

An EV snow blower from the Ottowa Canada EAA's MUTA show earlier in 2004.

The E20 itself has a 48 inch single-stage blower that is powered by a 3-4 HP shunt motor (constant rating). The motor is the same size as the main drive motor on the tractor. Powering is six T105 batteries off the main tractor. It weighs in at well over 200lbs, possibly 300.

In the cold weather, I can mostly blow out my driveway on a single charge. That's about 30-40 minutes of blowing time. With a foot of snow, it's pegging the power meter (over 100amp draw). Now that I think about it, blowing snow is the only time I have ever run the batteries down to zero on the Elec-Trak.

One thing the Elec-Trak blower has going for it is a lot of mass in the auger. This takes a while to spin up, however when it's spinning it acts as a flywheel when you hit that *HEAVY* snow pile. This helps to keep the peak draw down a bit. With a little Sears blower you wouldn't have this mass to draw on, and the motor would need to pull a lot more current to keep going. Or you couple upgrade to a bigger motor.

Last winter my Elec-Trak did a great job on the snow with tractor, chains, blower, and about 200lbs of weight in the back. This winter I plan to put a dozen Hawker 26ah batteries in series with the main pack to give me some more range as well as more weight on the rear of the tractor.

(Additional comments from Lee Hart)
It depends on your situation. I used a coded snow blower at a place where I worked, to clear a short straight sidewalk and some stairs. It worked great. There were no obstacles to tangle up the cord, and having such a lightweight machine made it easy to use on the stairs. Cord flexibility is no problem if you get the special cords rated for very cold use.

But, a corded snow blower is not a good choice for my situation at home. There are too many turns, trees, bushes, and other obstacles. Plus, my driveway has so large that it would take an hour to clear with the little 120vac plug-in snow blower.

So, I have an ElecTrak electric garden tractor with a snow blade. It does the job quickly and easily. Running out of charge hasn't been a problem, even though I am using about half the battery capacity it normally has.

For a walk-behind snow blower, I think you have another option. You could make it a hybrid, that can run on *either* AC power or on a battery. For the sake of discussion, let's say it has room for two batteries. Drop in two batteries, and use it cordless. Or, pull one (or both) of them, and drop in a charger that is boxed to be the same size as a battery. If two batteries don't give you enough running time, try having two more in the garage, connected to the charger. Do half the driveway, swap batteries, and finish.

Keeping batteries warm is the secret to reasonable performance in cold weather. I have Styrofoam insulation and battery heaters in my ElecTrak. If you build your snow blower with removable batteries, bring them inside when not in use to keep them warm.

DEATH OF AN EV AUTHOR, NOEL PERRIN

By Jim Coate, NEEAA member
www.NYTimes.com

Noel Perrin, a widely read scholar, essayist and critic whose work reveled in the deep, crystalline pleasure of ordinary experience, died on Sunday, November 21, 2004, at his home in Thetford Center, VT. His death was due to a degenerative neurological disorder. He was 77.

At his death, Mr. Perrin was emeritus professor of English and an adjunct professor of environmental studies at Dartmouth, where he had taught for more than four decades.

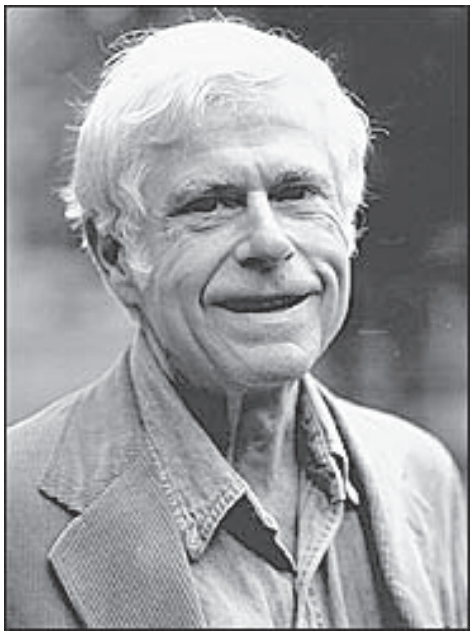
An ardent environmentalist, he wrote "Solo: Life With an Electric Car" (1992), a chronicle of a cross-country trip that turned out to involve very little driving and abundant towing.

EV Perspective
By John Westlund

Having read Solo, I must comment on the statement about his "very little driving and abundant towing."

He got his car to the Rocky Mountains from California, but wanted to make it back home in a reasonable amount of time. The car and Noel were inseparable during this journey, as recorded in the novel. Due to the limited range, after driving a few days he then decided to buy a Toyota truck to tow it with. Later he met up with his wife in Peoria, Illinois, where she flew in. They both made the trip back to Vermont together.

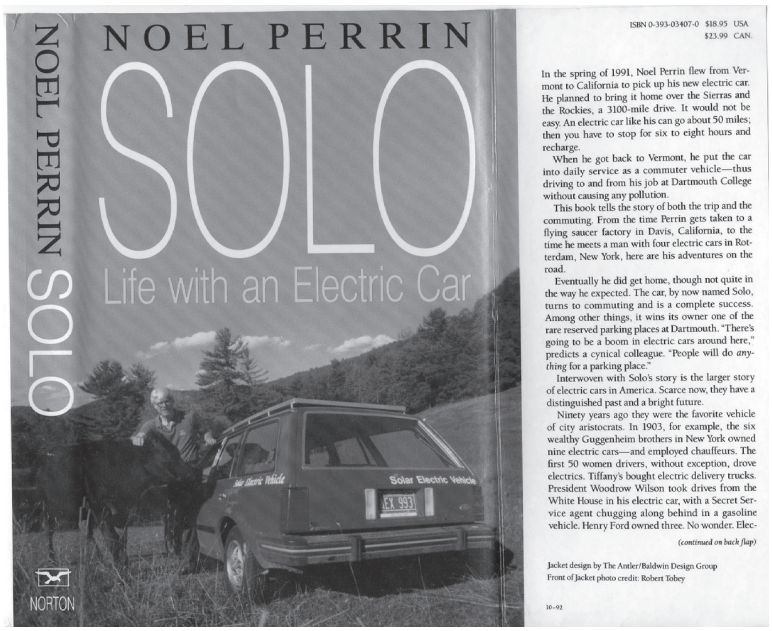
His journey started in Santa Rosa, where he purchased the EV. Along his driving through California, he encountered a few EV enthusiasts. Later, in Utah, he met a very close-minded person who made the comment that he'd like to see an electric car towing a gas car some day. (I think Wayland can comment on that one, towing an electric car with an electric truck and all.)



Noel Perrin.

Another person he encounter during the adventure included an environmental studies student who raised some excellent questions on EVs and the pollution they may or may not be responsible for (Depending on source and energy efficiency of the car). After making it back to Vermont, he finished his book reflecting on his experiences using the car in day to day life. He commented that if the weight off his EV could be reduced fifty percent, he'd have twice the range. This thought was confirmed when another EV enthusiast he knew had a vehicle with twice the range of his Escort and half the weight.

Although it is disappointing that he didn't make the cross-country trip completely by EV, it was an enjoyable read.



Personal Involvement in EVs
By Jim Coate

I too have read "Solo", long before I ever had a 'real' EV to drive and have since re-read it after driving my EV for several years. It does indeed change one's perspective to understand the references to the particular components used in his conversion, but either way it is a good read. Both editions are out of print but generally easy to find used (Amazon, Barns and Nobel, eBay, etc).

I believe he made the move to electric driving, and then to solar produced electric, after students called him to task for preaching environmentalism while still driving his gas car to work. As a professor he had the means ($$) to cover his barn roof with grid-tied PV panels so as to produce all the electricity his car and house used over the course of a year. This is an example I often cite to those asking me the "but what about the power plant and its pollution?" question. Noel Perrin showed that renewable power could work, even in New England, even in quantities needed for a daily EV.

Back in college days I got to meet him at one of the original Tour de Sol races. As I recall he was on his second (or third??) EV by then and had no plans to give it up. I may even have the cassette tape around from the interview for the college radio station. He was very interesting to talk to and inspirational in my formative EV days.

EDTA Conference *continued from page 1*

Test rides in the H2 FCEV by Honda.

GEM nEVs on display.

Electric motor display.

an improved DC converter. They are tested at Arizona proving grounds and have sold 28k to date. I asked him if since they were under Chrysler if that was the reason they didn't want to produce a higher speed competitive EV. He agreed and said that Chrysler kept GEM to meet California mandates but not to compete with their higher speed gas vehicles.

Ultra caps:

Bob Maher with Maxwell technologies based in San Diego develops ultra caps with a 10-20 year life. The newest addition is the 350F "D" cell at 2.5V. This packaging reduces cost from 1cent to 1/2cent per Farad this year. The cells are usually prepackaged in 50V packs. The primary application is to soak up the initial current surge required on acceleration thus extending range by 25% in a typical lead-acid EV. I did a quick calculation on my EV that would need 2600F large beer-can ultra caps at 2.5V or 2.7V surge for 70 cells at 155V max charge voltage on a 120V system for $100 each x 70 = $7K to improve range by 25%.

Chargers and Drives:

Deborah Jelen with Aerovironment went over this prolific company's products. The company was founded by inventor Paul McCready 32 years ago and presently has 300 employees. They have developed the Helios unmanned aircraft for NASA and the original pterodactyl human powered airplane that is at the Smithsonian. Alan Coconi developed the Impact or EV-1 there. They have EV vehicle test equipment, the ABC-5 and DLS 250, AC load simulator, 5kw DC rack mount load testers and fast

Lithium battery pack on display.

Cobrsys NiMH battery pack.

chargers for forklifts. Aerovironment also has wind and solar control equipment products.

Reuven Koter with Eldre Corporation showed his company's laminated buss designs fro EV's and power electronics applications.

Gary Gloceri with WaveCrest showed their electric bikes, motorcycle and electric roadster car. Only the electric bike military 30mph and commercial 20mph versions are in production. I asked about the car and motorcycle and found that they are not intended for production, only demo vehicles to sell their drive systems (similar to UQM technologies, Inc.) WaveCrest has in-wheel BLDC motors, which are more efficient than having the extra hardware (transmission-differential) that is conventionally required and allows for more inside vehicle room as well. They have reduced their unsprung weight to acceptable levels he claimed. However, the major manufacturers, GM, Ford, Chrysler, Toyota and Honda have their own engineers and generally develop their own drive systems, the NIH (not invented here) syndrome.

Customer Roundtable:

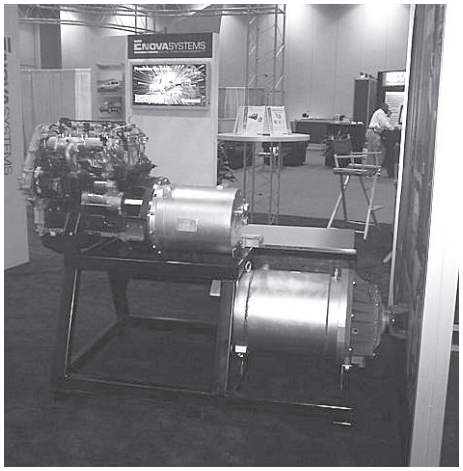
NY Power Authority and US Air Force, and Martin County representatives shared their perspective using electric drive vehicles in their fleets. EDTA president Brian Wynne moderated the discussions.

Gene Zeltmann with the NY Power Authority was appointed in 02 and believes in a mix of technologies, fuel cells, electrics, hybrids and photovoltaic generation to relieve our 60% foreign oil dependence for transportation and (northeast-diesel) heating. He noted that SUV's consume more oil and 2 million were sold in China last year resulting in energy shortages. New York governor Pataki issued an executive order for lean fuel vehicles and clean fuel vehicles. New York has the largest state owned electric utility. More than 700 fleet state EV and Hybrid vehicles have been put in service with more than 3 million miles traveled. Ford's Think EV was a highly successful program used for to & from trains and electric subways. Ford has now abandoned production. New York has implemented 30 electric Postal Vans giving new meaning to the concept of "Email". With 325 hybrid

Vehicles on display n the show hall.

Ford's hydrogen fuel-cell vehicle display.

Toyota's hybrid display.



Enovasystem's hydrid drivetrain system.

busses it has the largest fleet in the country. Electric school busses are now being implemented. Plug-In hybrids would be the ultimate solution for better range, reduced petroleum use, and clean operation.

Rick Ruvolo with San Francisco's Clean Air Coalition started it in the 1980's to purchase clean vehicles and reduce dependence on foreign oil. He noted that we haven't learned our lesson from the first gulf oil war and are still learning in the second war in Iraq. San Francisco has 700 clean vehicles and 57% are electric. He worked to develop the 10% ZEV requirement, which would help our energy security that has been overturned. There is a high demand for EV's and hybrids but there aren't many or any products to choose from. There are not enough products available to meet demand and the commitment to purchase these vehicles is solid he noted. After spending millions on electric infrastructure, (charging stations), the manufacturers pulled out. "We could buy 100's of patrol vehicles if they existed", he said. "We want today's solutions and hydrogen will be a piece of the puzzle but don't want to be distracted by future promises. He would like a return of battery electrics and more hybrids for fuel economy and emissions.

Carl Perrazzola with Robins Air Force Base works with advance power, fuel cells, electric drives, batteries, motors, distributed generation, solar photovoltaic and hydrogen generation. The air force has 500 dual fuel vehicles in use. Average cost to get a gallon of JP8 jet fuel into the theater of operations (aka war) is $400 he noted. By using more efficient vehicles this will have a large impact on costs. He requested to the audience of design engineers to keep the US Air Force informed of new technologies. With the upcoming election, we need funding for renewable energy.

Robert Crowder, sheriff with Martin County in Florida spoke about law enforcement needs in clean vehicles. He started using hybrids in 01' when he noticed that grayish-orange air is not just limited to California anymore. His vehicle fleet of 300 vehicles is fuel budgeted 12-18 months in advance so increases in fuel costs have a great effect on operations. He liked the Prius with 23 in service for administration, civil division, community programs, correction and patrolling but not for high-speed chase vehicles. Reduced fuel consumption by 60% over previous vehicles used has helped his budget. "We are stewards of the environment and taxpayer's money", he said. He also noticed that hybrids are excellent for gated communities and stop & go city traffic where they are preferred.

Opening Plenary:

At the opening plenary session Brian Wynne head of the EDTA noted that we need government as a partner and have been riding on the back of a Dinosaur and now need to ride on the back of an electron. Government needs to provide more incentives to the marketplace, education and regulation. Virginia and California provide HOV lanes to hybrids for incentives. The ZEV mandate and CAFÉ pushed EV's in the 90's. NHTSE is looking at crash standards for compressed H2 vehicles. Educators provide to the public training and emergency responders in H2 vehicle accidents.

Bernard Faultrier from Monaco talked about European EV's available such as Citroen's Berlingo used in France, Italy, Switzerland and Monaco. Saft developed the Ni-Cad for their EV's. France has an electric Renault and Peugot. Italy has an electric Fiat in use. It was noted that the removal of the California EV incentive by our government has put a damper on the EV industry. We need more indirect subsides and tax incentives. He noted that we are at a turning point with high petrol prices and public incentives and though that Lithium-Ion polymer was the most long-term promising battery technology. He pointed out that the Japanese are the technology production forerunners and will accelerate hybrids & EV's.

Some Key Speakers from the three tracks:

Lee Slezak with DOE's Freedom Car noted that we were (a few years ago) sending $2 billion per week out of the country and now $4 billion to support our 63% foreign oil usage. He noted that the PNGV 80mpg car initiative was cancelled and funding for the hydrogen fuel cell was favored (by the present administration).

Alan Bedwell with the State of Florida noted how oil and electric supplies can be disrupted in hurricanes and how alternatives would be desirable. "Using hydrogen and alt fueled vehicles will help", he said. These technologies will help with growth and jobs.

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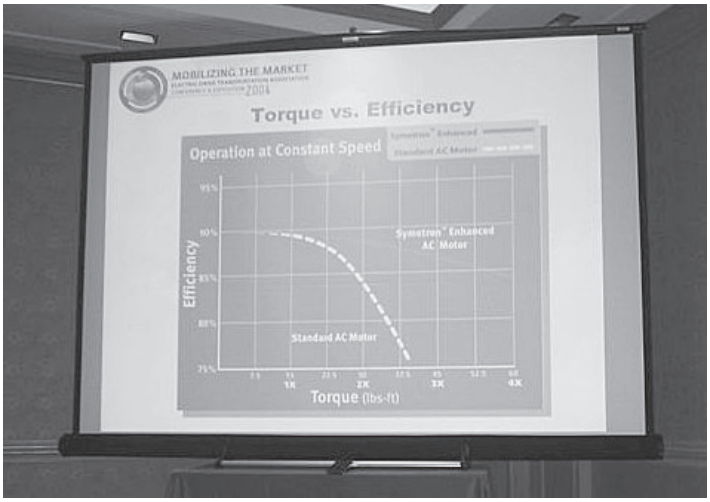
2004 Prius line up for test rides.



Presentation of hybrid performance.

These new businesses keep our environment clean, which reduces health costs. Economic security is at risk with an oil-based economy. There was a run on gas by 3X in the last several hurricanes. Hybrids can take people twice as far per gallon. Government tends to promote these vehicles but ignores its' own advice. This state now requires hybrid vehicles to be purchased for its' fleets to create a market "pull". Hybrids should be limited to passenger cars and extended to diesel hybrids for greatest fuel efficiency. Florida was the recipient of the "Evisionary Award".

Air Products' Richard Goodstein spoke about his hydrogen supplier company (largest company supplier), which supplies 50% of the requirements for hydrogen and NASA's fuel cells. Air Products is a $6 billion global company that uses natural gas to produce H2 gas with 70% conversion efficiency. Presently H2 is used for oil refineries to make clean burn gasoline. H2 can also be made from wind or solar. (I noted that 50% conversion electrolysis efficiency from electricity is why it is not converted in this manner). Fueling with compressed H2 is easy to do at the pump (with a properly designed sealed nozzle like CNG). He noted that energy legislation has been staled in congress and we need tax incentives and vehicles may get down to $500k by 2012. He said, "Republicans are reluctant to promote energy efficiency". He then put up a comparison between the two candidates showing how the policies directly affect us. Under Bush: Hydrogen spending will be increased as noted in the State of the Union speech. Under Kerry: "Since he is not beholding to oil companies," he said, there would be more funding for a mix of technologies and tax incentives for EV's and hybrids. He noted that Wall Street promotes him (fiscal responsibility). (Kerry promised to increase renewable energy usage by 20% over his term through incentives, jobs). Some statements then came from the audience. Presently H2 is $4 per gallon equivalent and can be used where pure EV's can't for long distances. Another noted that even though 80% of daily driving is <50 miles, the public perception is to purchase a vehicle that must have 300 miles per charge or H2. Goodstein noted that natural gas conversion produced Co2 but was a wash compared to direct burning CNG. Bill Moore with EV World noted that there is no interest or capitol available for Biogen H2.

Jake Plante with the FAA noted that for airport transports, 85% are still gas or diesel. Ten percent are electric and five percent are CNG. He thought there is a huge opportunity for more electrics in this area.

H2 has half the energy density of natural gas and must be compressed to 10k psi to get 300 mile required range. But H2 has 2X the burn efficiency of natural gas in direct burn. (So I noticed that its efficiency wells-to-wheels wash either way).

Patrice Dupont with TM4 is making an integrated traction system for sale to OEM's similar to other suppliers like UQM and WaveCrest. It has a 40kw nominal power, 50 kW peak. The motor generator and controls can be used in a hybrid car for a motor-wheel type configuration. The unsprung weight is 21kg, which is good for the Peugeot vehicle tested.

Tim Fehr with Raser technologies talked about his AC Induction motors called the Symetron which he claimed >92% compared to the Siemens 90% and the Prius at 90%. It is a pancake AC induction radial motor. He said his actual method of improving efficiencies could not be mentioned. (Finer, more expensive machining resulting in a smaller air gap between the stator and rotor I noted generally increases motor efficiencies).

Don Francis with Georgia Power noted that "the news of the death of the battery powered EV may be a bit premature". Chris Washburn with Wavecrest went on to talk about his company's hub motors/controls for sale. The high performance Ebike factory in Dulles, VA has 150 employees and was founded by two Russian scientists four years ago. They want to supply industrial drives/ wheel motors in the 1 RPM-1500RPM range with an adaptive BLDC PM motor controlled with linear torque over the entire range. Most will be sold to the transportation market and stealth military vehicles. On the Ebike the motor control and motor are in the rear hub and the NIMH battery is in the front stationary hub. The standard M750 bike is 20 mph but the military version can be tweaked up to 45 mph. Both had a 20-mile range.

Rick Kasper of GEM (Chrysler) talked about his 25 mph NEV and has sold 21K from 01-04. They now have four products. Operating

Foldable Wavecrest EV bicycle.

Maya-100's Electrovaya booth, but no vehicles on display.

at 72V with Trojan 30XHP batteries. Or maintenance free batteries if needed. (I noticed that the maintenance free last about 1/2 as long on the battery manufacturer supplied data). They increased the track width and have better steering this year I noticed while driving it. They noted that there are 11000NEV's in California and the average person takes 8 trips a day 3 miles or less. Rick mentioned that they are a niche market with low volumes and return on investment was adequate.

Sankar Das Gupta, Electrovaya CEO in Ontario Canada partnered with Microsoft to use their Lithium-Ion Super Polymer cells in Laptops to leverage volume production in order to drive the cost down for EV's. He said the typical range in an EV is 150-200 miles with his batteries and cost will come down after volume production in laptop computers. Electrovaya has fault tolerant cell failure which the additional battery monitoring electronics bypasses the offending cell. (It would also have to alert the driver prior to charge or compensate the charger I would think). Life is 100K miles or 7 years he claims. (He said they were low cost but when I asked for some to replace

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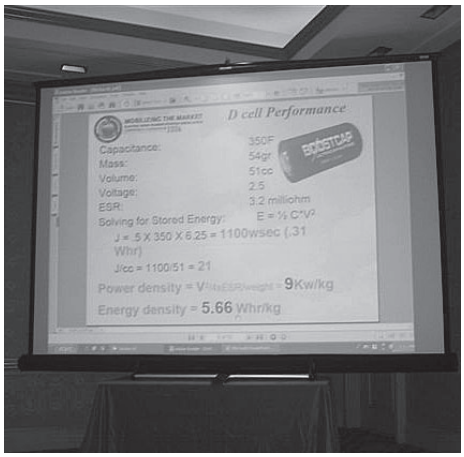
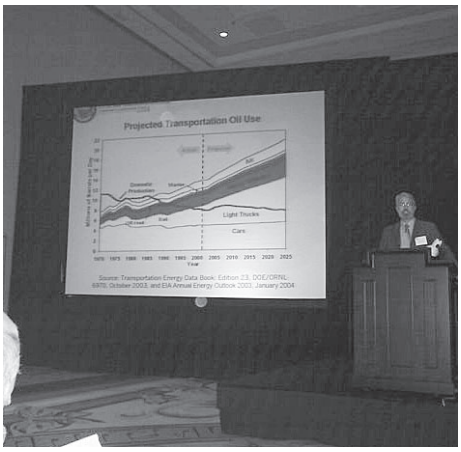


Ultracap presentation.

Refueling stations.



Oil usage in transportation projections.

my 14kWh 120V pack he said I couldn't afford it). Hopefully they'll be more cost effective in the future as commercial use increases. They are at 220-wh/kg whereas lead acid is 50-wh/kg, a huge improvement. He said they have licked the safety issue for lithium fires. In tablet PC use, they are seeing 9 hours vs. 3 hours of run time. They have a Cami-Suzuki econo test car, which he said would be in the $50-70k price range. (A bit high for my level of "economy".)

Rich Schaum with Wavecrest tested their wheel motors at 48V with a 70mph speed showing that their low voltage wheel motors can operate efficiently at a safe voltage and deliver substantial power in a Spark Mercedes vehicle. They used Matlab and Simulink to develop their drive/motor and partnered with Emerson Electric for product development. Unsprung weight is the biggest challenge with wheel motors and they have achieved 2kW per KG, which is adequate for vehicle handling.

After comparing these technologies above I checked with Richard Smith of Maxwell Technologies to compare their ultra caps to battery statistics for combinational usage. Energy storage in their ultra cap is 1/10th that of lead acid batteries but 10Kw per KG for a huge power storage. The result is they will never replace batteries but smooth acceleration current so that range and battery life are increased by 25% as mentioned previously. Besides EV's, wind, consumer wattmeters, digital cameras, fuel cells and forklifts are good applications for ultra caps. Fuel cells can be decreased by a factor of four when used with 90F of ultra caps on a GEM test vehicle he claimed. A nominal 10-second acceleration rate is calculated for optimum performance, which on my vehicle would be 70 beer-can cells 2.5V (2.7V surge), 2600F, and 155V for a 120V pack.

At the closing plenary, Bob Stempel, formerly CEO of GM and now Ovonics was the moderator. Honda (who develops there own components and subassemblies) had Gunnar Lindstrom, marketing manager talk about their environmentally friendly products. They have developed EV Jet skies, Accord SULEV and quiet/clean 4-stroke marine outboards. With the cost of oil being a dinner table discussion and energy security in the general psyche, Honda's goal is fuel efficiency with the variable cylinder management system cutting back to 3-cylinders as needed. The Civic GX (NGV) car is presently available. Honda said they have "PHIL" an H2 home H2 generator that has Natural Gas as it's input with 70% efficiency H2 as the output. The unit hangs on a garage wall.

Lawrence J. Oswald, Director of GEM noted that innovation must matter and customers make the choice, so the product must make business sense. Customers rated from 1st to last, reliability, cost, fuel efficiency and environment last. He noted that with GEM NEV owners, that they used 15% less fuel and had 2-3 less cold starts resulting in 50% less regulated emissions. He noted that a plug-in diesel hybrid would be the ultimate in fuel efficiency. (A 3-cylinder diesel Kubota tractor engine in a British Sprite will get 80mpg by itself for example similar to the VW Lupo).

Ford has a light hybrid Escape SUV that gets 35mpg using previously licensed Prius technology and GM had a truck with a contractor DC-AC inverter from 36V battery. Ken Stewart with GM mentioned that 88% of the world does not have an automobile and that cars will double by 2020 due to population growth and increased per capita income. Hybrid buses save 60% over conventional buses. Garbage trucks make the best hybrids he pointed out due to the stop & go driving. He advocated home electrolysis H2 conversion units similar to Honda's but at 50% conversion efficiency they may not happen.

Toyota's Ed LaRocque indicated that the Prius sold 100k since 2000 in the US and will double next year. Volumes will be 440K by 08' and 2M by 2012. It was noted with exorbitant fuel cell costs that FC buses make the most sense with a 7-year payback possible when they go into operation. Ford noted that H2 direct combustion would probably occur to produce a cost effective vehicle. They are not sure if customers will stay with hybrids or pay a premium for FC vehicles so they will have both available. Plug-in hybrids with a 30-mile range would be great but it increases costs for additional batteries and a series hybrid (bigger motors) as opposed to a parallel hybrid where both motors share for acceleration (but can't be plugged in). Toyota will maintain its' 100k 7-year warranty. Toyota noted that the government must buy the vehicles it wants others to buy to get the industry moving along.

Thanks to Jennifer Watts and the EDTA folk's for putting on a great conference.

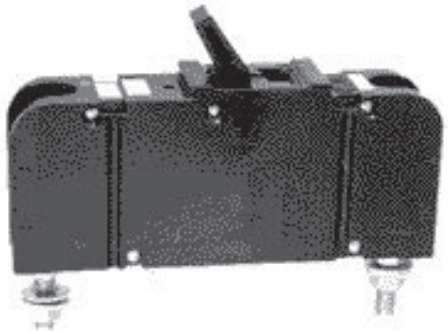
METHODS OF MANUAL DISCONNECTING LOADS

By Lee Hart

What is the purpose of a big high-voltage switch? Does it have to switch under load? Does it have to switch under FAULT conditions?

On most EVs, you want at least one switch/fuse/circuit breaker that you *know* can safely interrupt the worst-case fault current. With high performance lead-acid AGM's or NiCad's, the fault current can easily be thousands of amps!

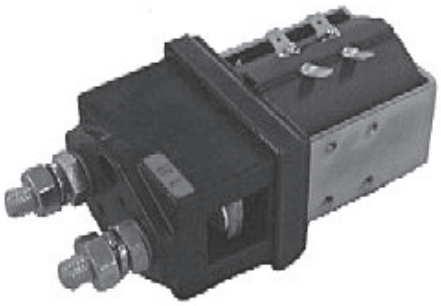
Circuit breakers



A circuit breaker does double-duty. It can serve as a manual disconnect or "off" switch, and it will trip in case of an overcurrent fault condition. You can get them with "relay trip coils" so that an external signal can force it to trip as well.

High-voltage DC circuit breakers usually have 2 or more poles, all connected in series or parallel to get the desired ratings. For example, I have a Heinemann 3-pole breaker rated 300vdc, 200a continuous, with an interrupting capacity of 1000a. You wire the 3 poles in series to get the 300vdc rating. It cost me $60 surplus, and is about 4"w x 8"l x 4"h.

Contactors



Contactor manufacturers publish their worst-case interrupt voltage and current ratings. There is some leeway — at lower voltages, they can interrupt a little more current, and vice versa.

At your pack voltage, a large Kilovac contactor can do it (once). If it ever interrupts a major fault, you'll need to replace it afterwards.

Most industrial contactors have replaceable contacts. They know that faults can occur, and it is expensive to throw away a perfectly good contactor just because its contacts are melted. Most of these are lower voltages (because industrial EVs tend to avoid 300v packs, for reliability and safety reasons). However, you can put multiple contacts in series to increase the voltage rating, as long as all of them are opened at the SAME TIME

Switches

The old classic is the Big Knife Switch. They work by having *huge* spacing between the off-state contacts. But, they are obviously very dangerous, especially at high voltages. You'd have to mount or package them so you can't touch the contacts, and so they can't throw molten metal at you, or blind or burn you from the arc!

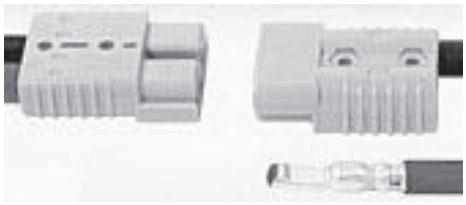
Commercially, these look like the big electrical boxes you see with a big handle on the side. The handle opens several poles of a big knife switch inside the box.

Of course, a knife switch depends on YOU to be there to pull the switch in an emergency. They are actually better suited to just use as an on/off switch, for instance as a way to disconnect the pack for servicing.

Some EV manufacturers make special switches for EV disconnect service. I had an Anderson emergency shutoff in my ComutaVan. It was rated 96vdc 500a continuous, 2000a interrupt. It was about the size of your fist, and had a big red button on top. You pressed the button to turn it on. The button latched down if there was 12v power on an internal solenoid coil. If power was ever lost to that coil, the button popped back up and turned it off. You wired this coil to your keyswitch and emergency shutdown circuits.

The version of it that I see advertised nowadays is a smaller version, but larger ones may also exist.

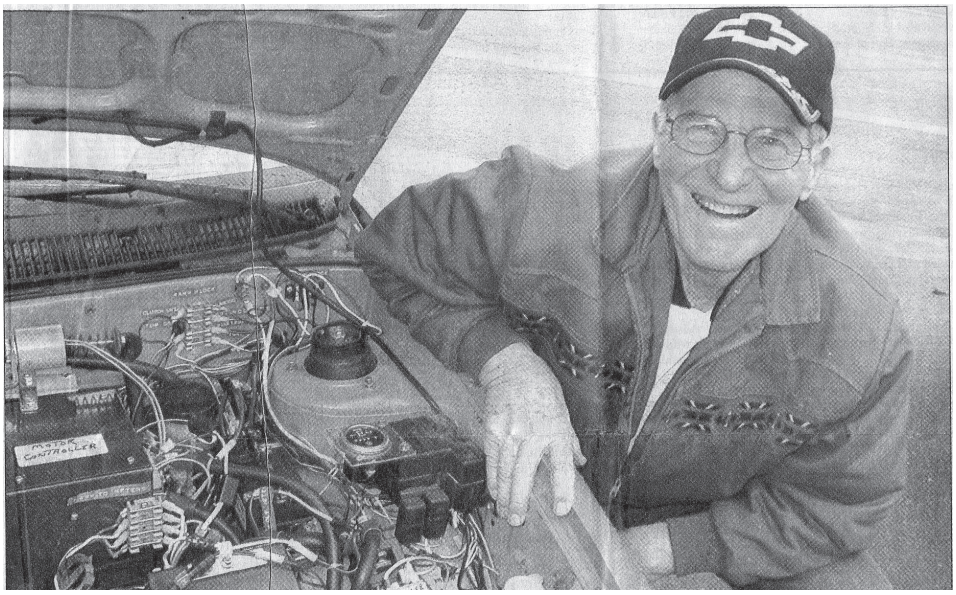
Connectors



Another popular method is to have some sort of big connector that can be pulled apart to break the circuit. People have used Anderson connectors (rated 300vdc), fuses and fuseholders (pull the fuse out to break the circuit), and even homemade links (some kind of rope or cord to jerk a piece out the circuit).

John Wayland has a big industrial fuseholder, which is a completely closed 2-part box. The fuse is in the cover, and the socket for it is in the base. There is a huge handle on the cover that you can pull out to break the circuit. It is about 3" x 6" x 5" high. The design is such that you can't get your hands on any live components either before, during, or after disconnects. They come in arbitrarily large sizes; 500vdc and 2000a units are obtainable.

FORGOING FUEL, ST. HELENS MAN BUILDS ELECTRIC CAR



By April Phillips, The Chronicle (OR) March 10, 2004, front page article

Imagine driving and never running out of gas.

It's like that, literally, for Dave Salzman. Unfortunately for him, he does have to plug his car in every night, however.

Salzman, who lives in St. Helens with his wife, Barbara, has built his own electric vehicle. Using the body of a 2000 Geo Metro, he purchased various parts — some quite unfamiliar to a standard engine — installed them, and wired the whole thing together. Vroom!

"I've got tired of paying the Arabs money," said Salzman, 69, who is a retired Qwest technician. He was company-trained in the telephone industry, where he learned to read electrical schematics — which appear to be an essential skill in building one's own electric car.

But, Salzman said, "Anybody could build one of these things." And apparently, many people are.

Salzman subscribes to a publication, Current EVents (the EV emphasize "electronic vehicles"), which has been "promoting the use of electronic vehicles since 1967."
Salzman started thinking seriously about electric cars during the 1973 oil embargo. When he saw the lines of cars that had to wait until their odd or even license0plate number came up to fill up, it struck him. Today, he still thinks, "this country's got to get independent" from foreign oil.

It took Salzman about a year of working off and on to build his car. From the outside, it looks like a standard Metro. It's small, blue and doesn't outwardly reveal its exotic nature — except that it has a very quiet motor: Salzman actually must take care not to sneak up on people as he drives.

It basically drives like an automatic, Salzman said. It develops all of its power at zero RPM and it can start out in fifth gear.

Salzman's car contains a few items alien to the average car, such as a homemade "kill switch," (formed from a PVC pipe) which will turn off all power. There's also a red switch and a small metal switch to control different power sources.

While a gas-fueled car might have a 300-mile range, Salzman's car only has about a 30-mile range — so, it would not work for most commuters. But, as a textbook Salzman uses, Build Your Own Electric Vehicle (by Bob Brant) says, new technology is always on the horizon. "The battery technology is finally catching up," Salzman said.

A motor controller controls the power of Salzman's 10 batteries; his main batteries are Ever Start wet cell, deep-cycle marine types that he purchased at a St. Helens retail store. He made sure the batteries were manufactured on the same day, to ensure consistency.

He'd prefer to have an AC drive system because of the capability for power regeneration, but those are quite expensive and more complex to work with. He has a dc brush motor, controller and converter under the hood. Some of his batteries rest in the back seat area of the car, which he neatly conceals with a folding wooden shelf.

Salzman fashioned the parts for his car after ones sold in a partial kit that cost $5,300. He got a better deal buying a la carte, piecing together what he calls a "very basic" vehicle for $5,700. Some EV-enthusiasts put as much as $20,000 or more into their cars, he said. Salzman purchased some of the main parts from DCP, Inc. (also called DCP/Altrex), which is based in Grants Pass.

The work of electric vehicles isn't just limited to cars. Some people are using the technology to build boat engines, tractors, lawn mowers, buses, e-bikes, and more. There's eve a Segway-like motorcycle (called the Bombardier Embio).

Salzman has met with others who share his excitement over electric vehicles. "They're all nerds," he quipped.

Want to find out more?
The Oregon Electric Vehicle Association meets on the second Tuesday of the month in S.W. Salmon and 1st St. in Portland. Write to: 2905 N.E. 29th Ave., Portland, OR 97212-3558. The Web site is: www.oeva.org.

For more information on electric vehicles, check out: The Electric Auto Association, 2 Smith Ct., Alameda, CA 94502-7786. www.eaaev.org.

Salzman recommends Metric Mind Engineering, which is located at 10645 SE Malden Street, Portland, OR 97266-8028. The phone number is 503-680-0026. The Web site is: www.metricmind.com.

To contact Salzman about this electric car, call him at 503-366-9081, or you may write him an e-mail at: dbsalzman@columbia-center.org.

Situation proposed by Mark Fowler

I'll be visiting a local school to talk to the Yr 6 kids (~12 years old) about my EV.

I am planning to cover:

- Some history of EVs.
- The science of what makes an electric motor go.
- Some maths (this many batteries gives that many volts, and charger runs at this rate, batteries have that capacity, how long to charge?).
- Some enviro info on where our petrol and electricity come from, renewable resources etc.
- General questions and answers.

Some of you out there have done similar things at schools. Are there any other things that you normally cover? Any good resources on the net? Anything else you can suggest?

Best Out Reach Activities

Response by Lee Hart

That's a fun age group. But, you'll lose 'em if you just stand up there and talk. They will want to see ACTION!

Can you get some videos of the NEDRA dragsters? Or, just bring some pictures to pass around. Include some monster EVs, like an electric train, giant earthmover, etc.

Bring a motor, a battery, and some wire (clip leads are easy). Pass 'em around so they can see how easy it is to hook a motor to a battery and make it go. If you have more "stuff", bring it too!

Describe (or demonstrate, if possible) electrics they can build. Toy car motor, a couple AA cells, and a car made out of recycled materials with a rubber band drive. Electric bike can be built with a car fan motor friction driving the tire, powered by a sealed battery. Give 'em a handout that has a resource list if they want to learn more. Books, movies (Race the Sun), places on the web, etc. One example is our BEST website, www.bestoutreach.org.

The first time I did a school EV demo was a 7th grade class at Barton Middle School in 1996. I took my ComutaVan, which was *definitely* a traveling science project! I also brought a big box of "finger food" including:

- AA batteries
- small toy car electric motors
- clip leads
- a hand-crank generator
- solar panel
- radio
- flashlight

Head Royce Summer School, Oakland, CA EV display.

I started off with a basic description of electricity. I used the little motors and batteries to show that a circuit has to be a complete loop. That an "open" circuit stops everything and a "short" circuit just makes wiring get hot. They got a gut feeling for what "volts" and "amps" mean (volts is how fast the motor goes; current is how much torque the motor makes). The hand-crank generator and solar panel gave them a feel for how you make electricity.

Then I showed them pictures of full-size electric cars, both old and new, big and small, etc. Finally, we went outside and I showed mine off.

As it turned out, the movie "Race the Sun" came out just before this, and some of the students had seen it. This is a movie about a class of "laylows" (Hawaiian slang for the shop class type of kids) building a solar car and competing in the international race. The class asked me if I would help them build an electric car. I foolishly agreed. And that was the beginning of BEST! See >http://www.bestoutreach.org>;

This class went on to build "Sparky the Electric Chair", an electric quadracycle out of old bicycle parts, broken classroom chairs, cafeteria trays, etc. Since then, BEST has helped nearly 100 classes build their own EVs, and discover the basics of science and engineering for themselves.

My strategy has always been to provide the raw materials so the students can discover the principles themselves. I don't tell them the answers; I let them figure it out for themselves. I'll say, "Gee; I don't know if that will work. How can we find out?" It's harder, and it takes more time. But you can't believe how excited they are when they discover the answers for themselves! And you know what? The kids will often surprise you, and discover solutions that you didn't know yourself!

The "subversive" aspect to this is that it teaches the kids to think for themselves (horrors! :-) They discover that authority figures (teachers, parents, etc.) do NOT have all the answers; and that many of the answers they do have are really just opinions that can't be proven. The *best* answers are the ones you can test for yourself, and prove that they are correct.

Provoking Questions

Response by Bob Bath

As a middle school science teacher, I agree with Lee. Another activity would be to get the kids into groups of 3 and have them come up with answers to the following questions (1 question per group):

1) What does it say that a person values when they spend $40,000 on a vehicle that gets 12 miles per gallon of gasoline?

2) What does it say that a person values when they spend $40,000 on a vehicle that emits no carbon dioxide, sulfur dioxide, nitrogen dioxide, benzene, oil spills, or formaldehyde, and gets the equivalent of 100 mpg?

continued on page 14

3) Why do you think that there has not been wider acceptance of electric vehicles nationwide?

4) Where is energy lost in a combustion vehicle that doesn't wind up getting used making the wheels go around?

5) Where is energy lost in an electric vehicle that doesn't wind up making the wheels go around?

6) What would be some of the global consequences if the majority of people drove electric vehicles?

7) Our government predicts somewhere between a 20-40 year supply of oil (which is the raw material that gets refined into gasoline). Do you think it is wise and fair to you that people are driving the largest cars possible? Why/why not?

8) Why do you think that your president is against raising fuel-efficiency standards for automobiles?

9) Why do you think Americans oppose raising fuel-efficiency standards for automobiles, while people in other countries force their governments to have high fuel-efficiency standards?

10) Alaska has a 6-month supply of oil. Do you think it would be wise to drill for it right now? Why/why not?

11) There are hundreds of moving parts in an electric vehicle, and only three in the electric vehicle. What does that say about the reliability of electric vehicles? Give support for your explanation.

12) Right now, the US military is purchasing hybrid vehicles, even though they are unavailable to the public. How do you think these vehicles will help our national security or military capability?

13) To be the most environmentally friendly, what type of power plant would be providing the electricity for the vehicle?

14) Some people say this car is solar-powered. Is it? What are 3 reasons that make no sense to put solar cells on the roof of the vehicle?

15) Japanese manufacturers built a Toyota RAV-4 electric vehicle, and sold it for a year in 2002. Both Toyota and Honda have hybrids, which use both electric and gas power together, to get 45 miles per gallon. Why do you think the Japanese built these cars 3 years before the first American hybrids might be coming out?

Comments by Lee Hart

I have to agree with Ben; you gave some good insightful study questions, but they would get me in trouble with the parents and school. I'm afraid they would consider them "politically incorrect".

You have to be a lot more subversive in how you approach this. :-) Me, I'll provide the facts, and let the kids come up with their own conclusions.

3RD BRAZILIAN ELECTRIC VEHICLE SEMINAR & EXHIBIT

By Antonio Nunes Jr.

I am very pleased to inform you on the "3rd Brazilian Electric Vehicle Seminar & Exhibit" — May 17th and 18th, 2005, São Paulo, SP, Brazil.

The focus will be on economic and clean transportation with battery, hybrid and fuel cell electric vehicles. The two-day Seminar will be informative on technical, political and market aspects that involve the change of paradigm towards electric driven power technologies and will facilitate discussions on the exploration and promotion of viable solutions for Brazil.

In Brazil there are near 30 million 4-wheel passenger and commercial vehicles with annual sales of 1.3 - 1.7 million. The motocycle fleet is almost 6 million, growing at a rate of about 1 million/year. Approximately 60 million bicycles circulate in this country with 5 million annual sales. The manufacturing capacity supplies internal and exportation markets. Electrical and electronics industry is also well equipped to supply EV components. Brazil has, therefore, an important market potential for EV including manufacturing.

There already exist battery electric vehicles and hybrid electric buses and trucks manufacturers in Brazil (http://www.eletrabus.com/english/index_english.htm), and Brazil exports hybrid electric buses. There are also University research on hybrid and fuel cell vehicles.

It is an excellent opportunity to present vehicles, components and EV solutions. It will also be the place to promote business contacts among specialists in the field. Numerous decision makers, consultants, planners, development engineers and technical staff are expected to attend.

There will be large space for exhibition of battery, hybrid and fuel cell electric vehicles, EV components and solutions in the Blue Tree Convention Ibirapuera area reserved for exhibits.

The event is being organized by INEE (National Institute for Energetic Efficiency —http://www.inee.org.br/about_objectives.asp? Cat=about).

A folder on the event is available at http://www.ve.org.br/Downloads/Folder 3rd EV Seminar.pdf and last information on the event is available at http://www.VE.org.br.

We believe that the EAA's members would appreciate knowing about this opportunity for promoting their products.

For further information, please, do not hesitate in contacting us.

Best regards,

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EV BIKERS INVADE HOLLISTER

By Marc Michon, EBEAA member
Photos/text from megawattmotorworks.com

Hollister, California. The birthplace of the American Biker. It's been home to friends like Wino Willie and J.D Cameron, and clubs like the Yellowjackets, the Boozefighters and the Galloping Gooses. Every year thousands of bikers return to Hollister to honor their rebel roots, and this year three outlaw electrics joined the Main Street fun.

As these three lone electric rebels cruised down the street, the crowd milling about silenced. Then it went wild!

Maybe it was the silent wheelies, or the Captain America paint job, but whatever the case... the crowd dug electrics! And as Steve Muskarelli will tell ya, so did the biker babes. Young chicks were jumping on the Captain America chopper as quick as a magnetic arc.

While the Captain America mini chopper got more attention than the $50,000 Customs, he wasn't the only electric in town. I was there with my 36V VFR, and Todd Kolin rode his Electric GPR-72 volter. People would be checking out the mini chopper then look past to see one of our full size electric motorcycles and think, "Wow. Big electrics on two wheels!" Ya just had to be there to see the amazement on people's faces.

When we first arrived we were just digging on the scene and cruising down the street. That's when the police spotted us and waved the E-Rebel over.

Cop: "What's that little bike?"
Steve: "It's electric, man."
Cop: "No low voltage choppers are allowed on Main Street."

So, the E-Rebel was supposed to turn off and stay away from the big bikes. Todd and I went on and scored a parking space right across the street from Johnny's Bar, the epicenter of the rally.

That's when Captain America E-Rebel showed up again. He's still with us after everything. Geez. that kid just won't listen to authority!

So, we landed a great spot we had three electric motorcycles parked in a row. Within minutes the bikers crowded around asking questions... you know the drill. We passed out some EV web links flyers that we had brought along. We answered questions for an hour or so, then went and had a beer, sat back and noticed that the electrics had the largest crowd on Main Street! Eventually we decided to split on over to Corbin's. When we got to the next intersection the cops spotted the E-Rebel again.

Cop: "Come over here. Thought I tole ya I don't want you low voltage types hanging around."
E-Rebel Steve: "I was just leaving."
Cop: "Too late you're getting a ticket!"
E-Rebel Steve: "For what?"
Cop: "Don't give me any resistance or you'll be calling you're pappy to throw your bail."

So the cop goes down list of reasons to give bikers a ticket for, "No, no, not this, no..."
E-Rebel Steve: "I can be on my way."
Cop: "I'm tired of your ampitude, son."
The copper goes back to list, no, no, not this, hum. He peers down the dummy gas tank.

Cop: "Hey there's no gas in this here gas tank!"
E-Rebel Steve: "It's electric, man."
Cop: "Well, that's dangerous! You're getting a ticket for unsafe vehicle."

We headed for a side street to get off Main, riding in the direction of Brother Mike's Harley shop, our base camp for the weekend. When we reached the Harley burnout area Todd just couldn't pass up the opportunity. He did a small tire burn and people turned around to see what was going on. That's when he put the amps to his Electric GPR 72 volter, and lit up the tires in a massive burnout. The place went silent except for the sound of rubber spinning on the pavement and we rode out in a haze of smoke.

Going down the alleys of Hollister, our Captain America mini Chopper clocked 30 mph. Not a bad for a little tike, so I wondered what the GPR might have in it and challenged it with my 36V VFR chopper.

Todd's GPR was about 100 yards away before I even finished twisting the throttle. Man that 72volt eTek is fast! After that we took turns riding the GPR. It's quick and handles very well. It runs just like a song. In fact, my brother Mike liked it so much that he didn't come back. We had to hunt him down and retrieve the bike. I've noticed that when you let someone ride your EV-cycle, they don't want to stop.

We did make it to Corbin's, and he's doing good. He is restoring the electric Bonneville racers he built in the 70's and approved of my own elec-tric motorcycle design.

As the other bikers rode out of Hollister the 5th of July they took something with them... a wild rumor that electric vehicles are on the street!

Marco Michon, Fresno, CA - Where the Sierra Nevada Mountains are Hidden (smog)

PRIUS+ AIMS TO ELECTRIFY HYBRID CARS

By Felix Kramer, founder, CalCars
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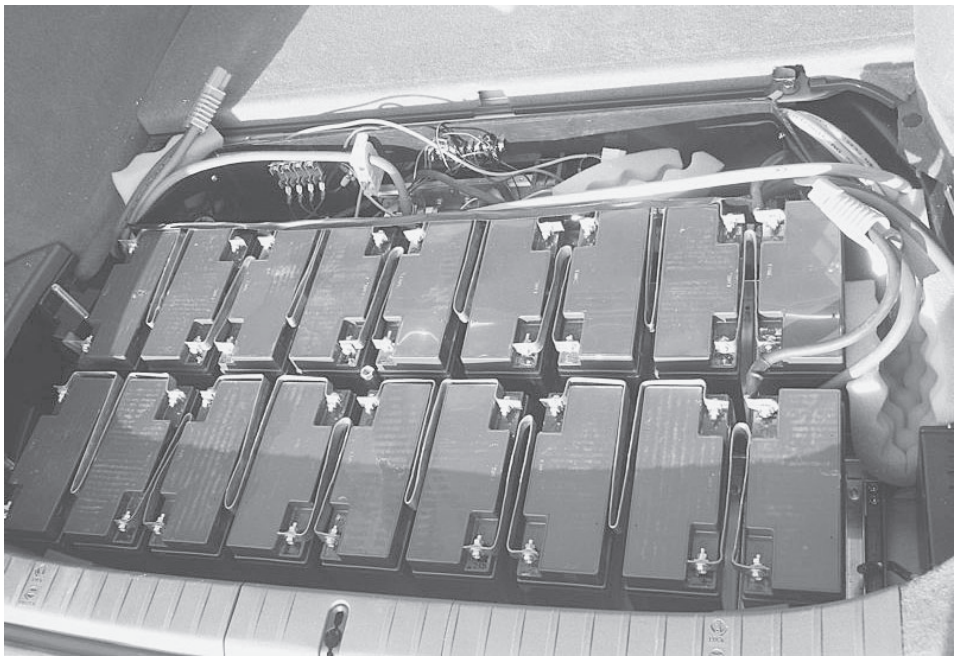
The California Cars Initiative (www.calcars.org), a non-profit group of entrepreneurs, engineers and environmentalists, formed in 2002, has begun working on a dramatic short-term project to demonstrate the benefits of "plug-in hybrids" (PHEVs), vehicles that combine features of zero emission electric and internal combustion engine cars. Well aware of the 20 year history of EVs in California, the group has been working closely with many of the longtime veterans of California's EV community. We aim to persuade auto makers to build PHEVs, which we hope will eventually lead right back to public interest and industry support for production EVs.

The European and Asian versions of the '04-05 Prius includes a button that enables the car to drive in electric-only mode up to 42MPH. The button is unavailable in the US, but experimenters have figured out how to enable it. (The Prius's relatively small battery, designed to maintain 40-60% state of charge, provides only a mile or two of EV range.) Building on the strong interest among Prius owners in the EV Button, the PRIUS+ project has begun to convert the highly popular hybrid by adding batteries and grid-charging so they can be a neighborhood PHEV (15+ mile electric mode at up to about 35 mph), as part of an effort to spur the commercialization of PHEVs.

Our first temporary test version using lead-acid batteries will be followed by nickel-metal hydride and lithium prototypes. In contrast to the Toyota, Honda and Ford ads that proclaim "you don't have to plug it in", our message will be that "you get to plug it in," and if you do, you can start using much less gasoline.

The project picked up speed this summer. In July we set up the online PRIUS+ PHEV Conversion Group to define and discuss specifications, components and design. (The project is modeled on the Open Source approach for software development: all discussions are public, and no one owns the intellectual property that results.)



Extra battery pack inserted into trunk. Used copper bus bar connections and foam spacers to keep plugs from rattling.

Leading the technology development (and volunteering his own car as a test bed) is Ron Gremban, who describes himself as: "involved in electric vehicles off and on for over 35 years. In the summer of 1968 I was one of a team of three builders and drivers of the Caltech entry in the "Great Electric Car Race" between Caltech and MIT, and as such was one of the first three people to cross the continent on purely electric power. I am now an electrical and software engineer currently involved in the sales of solar energy systems in Northern California."

In August, we ordered 18 20Ah sealed PbA bicycle batteries (inexpensive and relatively indestructible), each weighing 15 lbs. In September, we issued a call for hands-on help, and over a dozen volunteers showed up in Corte Madera to build, wire and install the battery pack and electrical components. We connected the PbA batteries in parallel with the existing Prius NiMH batteries, using the Prius's Battery Electronic Control Unit. Photos show the installed pack and some of the volunteers. We owe a big thank you to the EAA members from every Bay Area chapter who helped in person or with advice and tools.

We announced the project at the CA Air Resources Board hearings on regulations to implement AB1493, the Pavley global warming legislation. By the end of September, we'd confirmed that everything works, learned lots about how the Toyota battery management system keeps track of state of charge, tracked down a range of error codes, and ruled out our first configuration.

In our second configuration, our battery pack replaces the hybrid battery for both grid-chargeable traction and regeneration-charged hybrid operation (which is the way Toyota would do it). We're getting help from Energy Control Systems Engineering, co-founded by Pete Nortman and Greg Hanssen, who is familiar in the EV community through his involvement with the EV1 and his advocacy through the Production Electric Vehicle Drivers Coalition (PEVDC). EnergyCS has developed a CAN bus controller/battery management system that can substitute for the Toyota battery ECU. Using the PbA pack, once we've determined the battery characteristics and configurations we require, we'll order a NiMH pack, probably with custom modules.

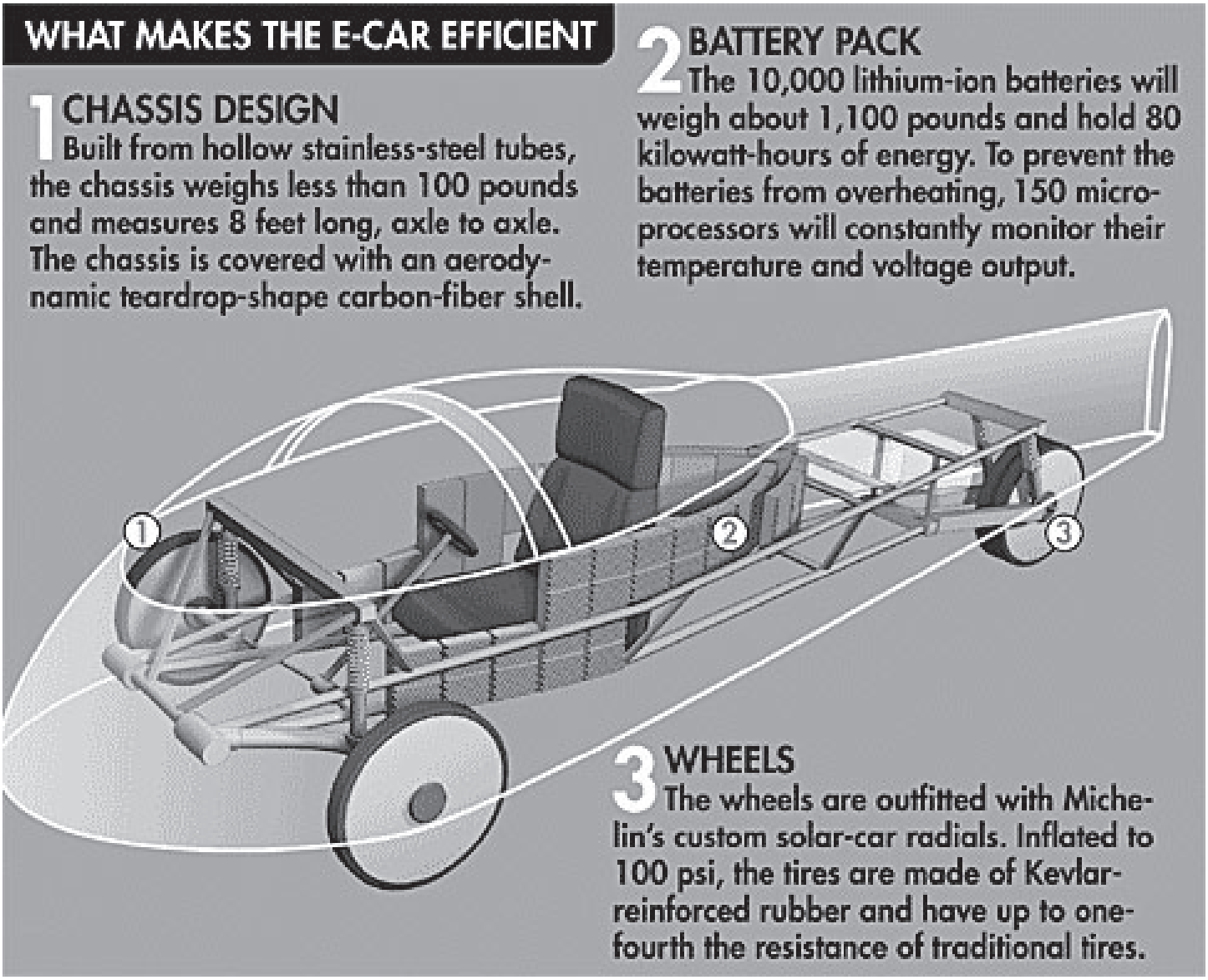
Even with the weight of additional batteries, in addition to providing EV-only range, we hope to improve mileage in hybrid mode by reducing the effective battery internal

resistance. And we hope to show that for the average person driving 20-30 miles a day, even with the PRIUS+'s limited PHEV capability, a large percentage of that travel can come from electric rather than gasoline power.

We've received a commitment of funds to purchase our first components, as well as a small foundation grant, and are looking for more funds from individuals and institutions to fully pay for our first two vehicles and support what has until now been an all-volunteer effort. At the same time, we're working in many other ways to gain attention and support for the project. We hope our efforts will enable PHEVs to take their deserved place in the spectrum of strategies for an evolution to a zero-carbon transportation system.

General information is at http://www.priusplus.org, and technical details and the latest status reports are at http://groups.yahoo.com/group/priusplus/.

The Prius+ battery team of Ron Gremban, Felix Kramer, Marc Geller, Kevin Lyons, Andrew Lawton.



By Michael Stroh
Popular Science ©2004

Stanford students rev up the electric car with laptop power.

When General Motors and Toyota yanked the plug on their electric-vehicle programs last year, citing high costs and weak demand, many proud owners of gas-guzzlers no doubt nodded smugly: Batteries are for flashlights, not family cars.

But now a team of young electric-car enthusiasts is attempting to change that widely held perception by building an experimental battery-powered car capable of highway cruising speeds and cross-country trips-all on a single charge. "We want to dispel the myth that electric vehicles can never travel more than a few hundred miles," says engineer J.B. Straubel of the Stanford Electric Vehicle Project.

The secret to the project is lithium ion, the same technology supplying juice to most laptop computers. Straubel says booming laptop sales have made lithium-ion batteries cheaper and more efficient than lead-acid or nickel-metal-hydride cells, the power sources for GM's EV1, Toyota's RAV4 EV and other now defunct commercial models.

The Stanford car will stow 10,000 lithium-ion batteries under the hood. A standard laptop typically has eight. Wired together, the lithium-ion cells-each roughly the size of an AA battery-will store enough energy to power an average home for four days, says Straubel. More important, the Stanford team calculates the pack could propel its car at an average 45 mph for 2,000 miles, smashing all previous EV records. The team hopes to have the car ready for road tests by July.

Specifications:
- Stainless tube chassis weighs less than 100 pounds.
- 8' long axle to axle.
- Teardrop shaped carbon fiber shell.
- 3 wheels
- 1,100 battery pack
- 80 kWh
- 150 microprocessor BMS

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British Van Buying Guide Honors e-Mercury Electric Vehicle

British monthly van buying guide What Van? recently announced its selection of the electric-powered e-Mercury van, codeveloped by London Taxis, International (LTI), Azure Dynamics, and MSX International, as "Eco Van of the Year" for 2004.

According to What Van?, the e-Mercury, which costs approximately 20,000 pounds (about $36,757), is capable of traveling approximately 100 miles per charge at speeds of up to 50 miles per hour.

What Van? noted that LTI is now considering the development of a hybrid electric version of the e-Mercury, which is also capable of being powered by a fuel cell. (WHAT VAN?: OCTOBER 2004)

Segway Launches At-home Trial Promotion for HTs

Segway LLC recently announced the launch of its "Home for the Holidays" promotion, which allows people to take home a Segway Human Transporter (HT) for a free extended trial.

The promotion runs through January 7, 2005 at Segway dealerships across the country.

"The Segway HT is an experiential product," said Segway vice president of marketing Klee Kleber. "You need to try it to understand how much fun it is and how easy it is to integrate into your daily life. People who ride the Segway HT always find a use for it that's uniquely their own."

Promotion participants must be at least 18, and reservations must be made in advance. Segway is making its HT p Series or i Series models available for one, two or three days, depending on dealership availability and demand.

Arotech Electric Bus Successfully Runs on Commercial Zinc

Arotech Corporation recently announced that a test drive conducted with its all-electric hybrid bus using commercially available zinc has demonstrated performance similar to that achieved with the proprietary dendritic zinc used to date.

According to the company, the electric bus using commercial zinc demonstrated improved system efficiency and achieved a range of 133 miles on a simulated city-cycle drive, similar to the range achieved in a comparable test using proprietary zinc last year.

"Rising fuel prices increase the chances of this technology becoming a reality," said Arotech chairman and CEO Robert Ehrlich. "We are now investigating ways to capitalize on this new breakthrough technology."

Parker Hannifin Invests in Vectrix for Electric Scooter

Parker Hannifin Corporation recently announced an equity investment in Vectrix Corporation to help begin production of a full-size, long-range, low-emission electric scooter.

"As part of our win strategy, we said we would invest in innovative technologies and growth markets," said Parker Hannifin vice president of technology and innovation Craig Maxwell. "Fuel cell technology offers much promise for the future and the hybrid scooter demonstrates Parker's ability to provide customers with integrated system solutions."

The financial terms of the investment were not disclosed.

Valence to Build Long-range Battery Packs for Segway

Valence Technology, Inc., announced last week it has signed an agreement with Segway, LLC to provide customized Saphion phosphate-based lithium-ion battery packs to increase the range of Segway's Human Transporter (HT).

"We are pleased to be partnering with Valence Technology, Inc. in the development of long-range battery packs for the Segway HT," said Segway vice president of design and engineering and chief technology officer Doug Field. "This collaboration promises to substantially extend the range of our products, something our customers have been asking us for."

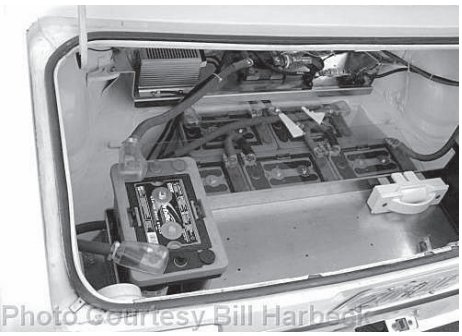
Segway said it hopes to offer the extended-range battery packs starting in 2005 for its HT i Series models. The company noted that it will offer a software upgrade to make the batteries compatible with all previously released i Series models.

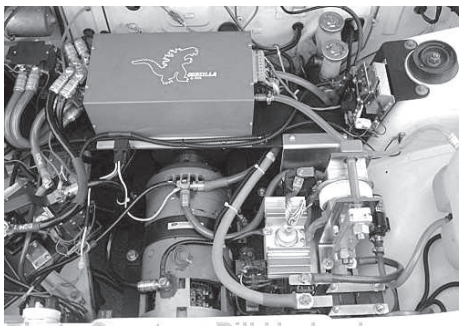
eBikes of Ohio Offers Pukka Electric Minibike in Tri-State Area

eBikes of Ohio, LLC recently announced that its Pukka electric minibike will now be available for sale in the Tri-State area.

According to the company, the Pukka, which costs $329.95 plus tax, includes a 400-watt motor with a deep-cycle, rapid discharge technology battery pack.

"The Pukka is a unique minibike that looks and performs better than many of the more expensive models on the market," said eBikes of Ohio partner James Wilson. "When you combine the Pukka's quality, performance, long-lasting battery life and safety features, you will not be able to find a better product for the money."





By John Wayland

I had been coerced into taking White Zombie to the track by Otmar, even though I had just blown up the big SCR bypass Afterburner, the upgrade to 288V was left unfinished, there would be no chance of the car doing anything spectacular, and it would be a static display only. We had attempted to back the car out of the shop when white smoke suddenly billowed out from under the hood! Geez, now what?

I was out of the car very quickly and looking under the hood with Oat, but by the time we got the hood open, unbelievably, all of the white smoke had vanished....I mean, not a trace of it! There were no smoldering wires, no melted connectors, not a bit of evidence for either of us to find. It was very weird, just like how we couldn't find a matching zorch mark from the SCR mistake. It was as if the gods of EV drag racing were plotting against me. What I did find, though, was an important power cable left disconnected. It was one of the wires from the reversing contactor set that reconfigures the front motor to run in reverse direction (the rear motor freewheels and is simply along for the ride backwards). Minus this cable, the front motor had been sent BIG amps minus any field current.... Da'Ohhh! No wonder the Godzilla was screaming at us!

It was an easy fix, and within minutes, we were ready to try backing up and out the shop driveway again. It bothered both of us that we hadn't found the source of the white smoke, let alone the second zorch mark, but by this time, all we wanted to do was to get the car on the trailer and be on our way to join up with everyone else at Woodburn. I eased down on the accelerator, and this time, the car moved away nicely.... in fact, much nicer than it ever had because the rear end was no longer locked together with a minispool, the Detroit Locker was working beautifully, and the rear end's newly found differential action allowed the car to be effortlessly steered. Minus the extreme load of a pair of sticky drag radials fighting each other, neither one wanted to give up and let loose their grip.

The car was now transformed and smoothly rolled up the driveway with a minimum of pedal effort and with far less required current.... finally, something worked as planned!

Out on the street, instead of trying to muscle the car into position, it was like driving Blue Meanie with light steering and smooth turns... the EV grin was returning. Also gone was any trace of rear tires scraping against the fenders. The Dutchman had pulled through with expert craftsmanship and had done the mods I had requested perfectly. The fat rear tires just barely cleared both the inner and outer limits of the little Datsun's rear fender wells and the Detroit Locker allowed a cool sounding ratchet action to take place where the differential effect now kept the axle from wandering, thus eliminating the fore and aft wheel movement that had the tires digging into either the leading or trailing fender arch on turns.

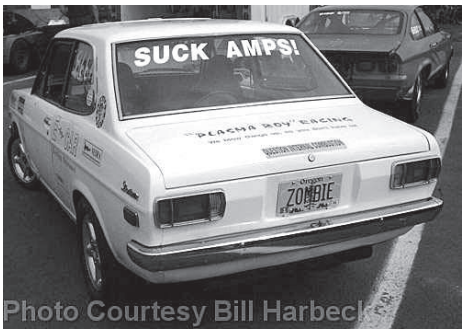
All of the axle problems and tire clearance issues were gone. It was also nice knowing that for the first time since going to the chopped and narrowed Ford setup in back, the Zombie's drive line was perfectly centered in the car's drive line tunnel. In the future, once the motors are repositioned to eliminate the undesirable angle they're currently at, an all new, all aluminum one piece larger diameter super light weight drive line will be made for the car.

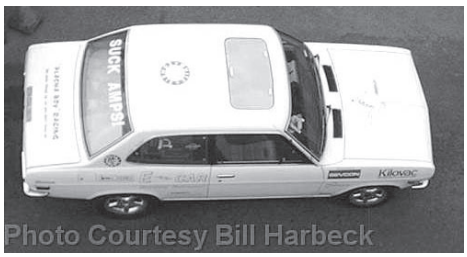
We got the Zombie loaded up and chained down on the trailer, and were off in our mini caravan towards the Woodburn track 45-miles from the Wayland home. Going down the freeway, were two very quick electric street cars on their way to join other amped-up EVs for a day of fun.

At the track, we were met by excited EVers glad to see the two machines and their owner-creators had finally made it to the EVent. News quickly spread about the Zombie's problems as I told all interested that the car would not be making any passes. Like the previous Spring races at PIR, several of my work buddies had come Woodburn to watch the car run and to support my racing efforts. One of them was Tim Brehm, the same guy who had labored under White Zombie helping me take out the old rear end setup, and then later helping to install the new Dutchman setup. Tim's a pretty determined guy, and he would not accept the fact that White Zombie would simply be on display.... "What do ya mean, it's not going down the track?... Can't you do this, change that, put this here, connect this here, jumper this to that?..."

And so it went., with Tim then joined by the other electric fork lift wrench buddies now in a group effort to force me to reconsider things. I answered back that minus the upgrade to 288V, and minus any serious bypass contactor that could handle the high current blast mode, at 240V and stuck in series mode, the car would only run high 14's at best. Tim questioned why I just couldn't rewire the brand new Albright SW200 contactor used to bring on-line the SCR bypass, around the thing and use it as the bypass switch. And so it went, a fury of activity in the pits around the car that many had come to see.... lots of onlookers, lots of video and pictures being taken, all focused on the car that less than an hour before, wouldn't move, had zorched parts and smoke rolling out from the hood. What's a Plasma Boy to do?

I really didn't want to take a brand new contactor and put its life on the line as a





2600-amp (est.) bypass device, as it was surely a prescription for carnage of the device.... after all, doing this with a beefy Bubba contactor took it out in 5 passes. I 'did' have a spare set of brand new contactor tips for it, but that plan was for another use of the contactor. This contactor's role was supposed to only be a series device with the SCR, where it would have been brought on line without a load, and where it would never have to 'make' 2600-amps of current. Rather, it only had to 'carry' current, then open under ~1400-amps less current at the end of a run, where in theory, the twin 140-uf 800-volt film caps in parallel with its contact tips along with the 300-amp flyback diode across the motor pair, would absorb most all of the electrical energy, again in theory, reducing arcing at the contactor's tips to a level where minimal damage was done.

Now, I was being pressured to use this brand new contactor in a way that would certainly destroy its tips, all so that the car could run just 'OK' passes. The battery pack had been pretty stagnant since May of this year, with the car torn down for months on end with all the new mods being done, so I also knew the pack would be pretty wimpy until exercised back to full power. Driving it the 15-16 mile run to the PIR track as I had been doing in Portland had proved to be a good way to 'wake up' the pack, but taking it out here in Woodburn minus any prior road exercise, I figured it would take at least four runs down the track before any semblance of performance would be realized, and, I also figured the SW200 might not even survive that long!

Nonetheless, under pressure from all, and not wanting to disappoint everyone, I began to regain that fire in my gut to make the car run, no matter how many of life's curves were thrown at me.

There was a feverish pace around the car, with many helping out with stuff.... crimp connectors were provided by Joe Strubar, tools were loaned by Tom True, pieces of wire from someone else.... and within a half hour or so, the contactor had been wired around the dead SCR and the control wiring to operate it was reconfigured. In theory, after a few fairly tepid runs down the track, the third or fourth run with warmed-up and exercised batteries should turn in mid-thirteens. This all of course, would only be possible 'if' the SW200 could live that long!

I moved the car over to where it could be teched in. Though still a bit tweaked over the failure mode of just about everything, I was now looking forward to a good 'ol Wayland style burnout with the new electric line lock. Tech in went fine, and before long, I was staged near the tree with Oat in California Poppy opposite me in the other lane. It was 2:42 in the afternoon. I must say, the Zombie delivered a big block punch in the burnout pit, lighting up the drag radials like a pro stocker, the type of power display that had the gasser crowds' jaws dropping open in disbelief. I've got a snippet of Bob Rice's camera work on tape capturing most of it, and it 'was' impressive.

Unfortunately, after catching the attention of just about every gas racer there that day and with all eyes on the little electric car that had just boiled its tires, I followed the burnout with a super wimpy 22.4-second, 45-mph 1/4-mile 'walk' down the track as California Poppy blew past me with a smoke'n 14.1 @ near 95-mph blast. This was just another snafu for the day. How'd it happen?

Well, it goes like this. The car pulled off the line softly, with a horrible 2+ second 60-ft. time. Not expecting to race this day, I had not used ice water in the cooling system for the Godzilla controller, and with rapidly warming up water, the controller rolled back its launch amps to where only 1000-amps or so were on tap. Then, there was the issue of sagging juice from sleepy batteries. Then, when I hit the 'GO' button to fire up the Afterburner effect, the car simply went dead.... zilch, no power... coast time! I selected series mode, and the power came back, but it was lack luster, with none of that kick-in-the-back thrust. I tried the button once more... nothing. Twenty plus seconds later, I had limped to the finish line, where I took the 'slow car' early turn-off and headed back to the timing shack and onto the pit area. I was dumbfounded as to what had gone wrong. I saw the smiling face of my wife as she had run over to greet me on the return, and so I reached over to get this object off the passenger seat so she could get in and sit down.....wait a minute, why was there an object on the seat? About the time I picked it up, it hit me, that the 'object', was the mating half of the emergency disconnect! Yes, it's true, in yet another blunder, I had forgotten to plug it into the receiver half inside the car, the cat required to put the Afterburner on line! As a matter of safety, I never snap in the handle side piece of the disconnect until I'm ready to make a 1/4-mile pass. I had gone out to the track and made the entire run with the disconnect... well, disconnected! No wonder it went dead at the switch-over point!

In the pits, with everyone wanting to know why the run sucked so bad, I had to admit to what I had done... this made everyone laugh.

It certainly wasn't turning out to be a stellar race day for me, that's for sure! Oat showed up, gloating about his low 14-second run and how he had blown my doors off. For those curious, this was the run that was captured on video, the run Oat submitted a link to recently, accompanied by these wise crack comments:

The link to the video showing California Poppy leaving White Zombie in its wake had everyone talking.... lots of fun.

Relieved that I had not blown something else up, I re-juiced White Zombie for its next run. At 3:27 in the dwindling afternoon, I made the second pass, again, next to Oat. This time, I made sure to snap-in the emergency disconnect handle! Oat and California Poppy jumped off the line briskly, once again leaving me behind to stare at his Kerry sticker. The Zombie's not-co-cold controller again, rolled back its current limit at launch; the 60-ft. time was poor at just 1.97-seconds (it's usually in the 1.8-second range). The batteries felt stronger this time, but still not close to their usual power level, and when I hit the button the expected slam into the seat wasn't nearly as forceful as it usually is... this was reflected in a poor by White Zombie standards 72-mph 1/8-mile speed. White Zombie normally runs in the 82-84 mph range for the 1/8-mile, but hey, at least I was out on the track, and geesh, the last minute bypass contactor affair had worked! The time slips reported that California Poppy turned in a 14.02 @ 95.8-mph, White Zombie with a so-so 14.8 @ just 81-mph. White Zombie's batteries were still sagging, so much so, that the 1/4-mile trap speed was slower than what it normally runs in half the distance. The battery pack was not performing well, but only being the second run, this wasn't a big surprise.

In the pits, it was hard to concentrate on checking individual battery voltages, charging levels, etc., due to Oat's big mouth flapping away. I mean.... man, was he ever rubbing it in on me! The good news, was that every Orbital looked to be the same voltage, and there were no signs of one or two of them being bad, so the lackluster power level of the pack was chocked up to lack of cycling and long term atrophy of the pack over the past 4 months. Also the good news was that the capacitors across the contacts of the SW200 bypass contactor seemed to have done their job, with very little evidence of

Photo Courtesy Bill Harbeck

'severe' arcing at the release point. Yes, there was 'some' arcing, as we did see trace patterns on adjacent areas, and, Oat reported seeing a flash through the Zombie's grill as he watched in his review mirror (I hate that he could look in his rear view mirror and see me!). The contact pads though, were in respectable condition after what they had been through.

At 4:38 in the afternoon, the 3rd match-up between California Poppy and White Zombie was unfolding. The battery pack in White Zombie had sucked in a much longer, deeper charge indicating that like always, the pack simply needed to get exercised a bit to flex its muscles. I just knew I was going to clean Oat's clock! Off the line, White Zombie still suffered from a non-iced controller, so the 60-ft. time still sucked at 1.95... This time the Californian had a race to contend with, as we both left the line with nearly identical 60-ft. times and by the 330-ft. mark both cars were neck and neck at 5.6 and 5.7 seconds, with the nod still going to California Poppy. I hadn't hit the button yet, so with an evil 'take this' in mind, I hit it only to feel the car go limp and slow down as Obenhowsherhovenhoffen sped away... damn! I tried a few more times to no avail and finally just stood on it in series mode to finish the run at 15.4 @ only 77 mph :-(

Back in the pits to charge again, I found a suspect loose connection at the bypass contactor (any wonder, having thrown it together at the last minute?). A half hour later, there was time for one more run.

At 5:06 it was Bob Salem in his snappy VW Rabbit pickup next to me, instead of Oat. White Zombie's launch was unchanged at a 1.9-second 60-ft. time, again, due to a non-iced controller, but the batteries felt much stronger during the initial series mode pull up to 60-mph or so, when I hit the button as the 1500-amp meter's needle banged solidly against the peg... yeah, that felt better! I could tell it wasn't going to be a super quick run, but it was nonetheless, a strong run. The 1/8-mile flashed by in 8.5-seconds at just shy of 80-mph, with the 1/4-mile being dispatched in 13.6-seconds @ 94-mph. Time to let up on the throttle as the car continued to pull hard.... bye, bye, SW200! Having been there, done that, and not racing in darkness this time around, the welded contactor was dealt with in a calm manner as I jerked the emergency disconnect handle away from its mount and coasted slower to make the return lane run back to the pits.

In the pit area, I considered changing out the contact tips with the spare set I had brought along in hopes of turning a low 13 ET, but the announcement was made that this year's Woodburn races were closing for the day.

The award ceremony was fun, the dinner afterwards in Portland over zesty Mexican food was a hoot, and it felt good to have gotten White Zombie to run, even though no new records were set, and even though I'm sure its mediocre performance was a let down to many.

In the weeks following Woodburn, the weather in Portland simply did not cooperate with rain finding its way to every weekend I could have possibly made it to the track. In fact, there was only one dry night of drag racing, a Friday late in October that was dry... the same night I was out of town at the Oregon coast on a work detail :-(The next day, Saturday when I was back in Portland, it rained, and Nov. 1st, PIR closed the racing season to reopen in the Spring.

This winter will be a great time to redesign the way the electric motors are mounted up front, and I may have that single piece aluminum drive line built. Come Spring, look for the 288V White Zombie to finally debut, and look for the car to hopefully, run deeper into the 12's.

Photos by Bill Harbeck.

LARRY AND THE ECOTREKKERS

By Larry Wexler, FEAA
www.Greenhouse2000.com

The EcoTrekker, aka Shaun Murphy, and his Australian film crew recently traveled 1,600 miles nationwide using alternative fuels and solar electric power. Shaun's travel trailer and the production crew vehicle van both use bio-diesel. He also has two electric scooters with solar arrays for shorter trips.

During his U.S. trek, the EcoTrekker visited the ranch of celebrity Daryl Hannah and filmed her alternatively-powered ranch for one of the 13 segments which are set to air on the Discovery, PBS, and National Geographic channels in the near future. During his trip to Florida, Shaun filmed a segment on the use of sugar power. He also met with me and two representatives from SEVO (Suncoast Electric Vehicle Outfitters) in St. Cloud to film additional segments on Florida. SEVO is a South Florida company that converts standard low-speed electric vehicles to police, security and fire department ready vehicles.

When his electric scooter ran out of juice after touring South Florida with SEVO, I had to tow this 6 foot 4" veg-a-mite eating Australian and his scooter with my Solarcycle, which provided the EcoTrekker with another memorable segment for his upcoming TV series. We continued on to Celebration, FL where they filmed yet another segment — this time featuring local EV's and Segways that joined us in an electric trek around town and back to the school, where we were greeted by students who cheered us on. After the filming, two members of the EcoTrekker's crew drove my Solarcycle and said it was the best AFV they ever drove.

I recently attended a Florida EAA meeting in Jupiter and saw a good part of the sugar cane that has displaced our everglades water filtration system, but that's another problem for another time. The bottom line is that we're over-populating the planet and over-taxing its resources. Maybe the answer to Florida's fuel problem lies in the waste from oranges, which can be converted from to bio-diesel.

Shaun Murphy, the EcoTrekker, on his solarcycle.

The Eco Trekker's Production Crew in Florida

Alternative fuels and solar electric power is how this Australian TV film production crew traveled 1,600 miles through many of our United States. Daryl Hannah's alternatively powered ranch is the location of one of the other 12 segments filmed and set to air on any of the Discovery, PBS and/or National Geographic channels. The travel trailer and production vehicle van were both using bio-diesel. They also charge their two electric scooters with the solar array on top. The Florida segments title included sugar power. I just traveled across the state from our Florida EAA meeting in Jupiter and saw most of the sugar cane that has displaced our everglades water filtration system, but that's another problem ... we're just plain over populating this planet. There's also a plant here in Florida that makes bio-diesel out of orange waste.

On the first day, I met the Eco Trekker (Shaun Murphy) at a Shell station in St. Cloud. The trekkers were looking for a Texaco (Only the name has changed), so it's a good thing I arrived before them and the other participant —Suncoast Electric Vehicle Outfitters (SEVO). They convert standard low speed EV's to police/fire dept. ready upgraded vehicles. Shawn our Florida EAA president apparently drove Shaun in low speed limit areas far enough to drain some batteries.

Then it was my turn. The Eco Trekker's motorbike broke down. Now, the 6 foot 4" veg-a-mite eating Australian, nor Gus, his Producer was able to get in my solar vehicle in which, I'm quite comfortable at 5'10". So I had to tow him on the electric scooter for enough miles for the needed footage.

The photographer and sound man drove my prototype later and both said it was the best AFV they ever drove. I must've backed up on the tow line which caused a little vibration in the rear brake and yanked apart my brake lights when we proceeded to Celebration, Florida. This little Disney community has many EV's and Segway's which joined us in an electric trek around and ended at their school and the kids made more noise than the SST when they cheered us on.

[Post-script

I guess you should have more information on me and my solar vehicle assembly plant that's going to be news when the plant's erected near Port Charlotte, Florida. In fact that's where I was headed this past weekend (end of July) as I passed the sugar plantations. I think I can start building as funding organizations and Investors start believing I will be able to sell these vehicles at a profit, initiate global enviro-awareness and have an effect on the amount of fuel we earthlings use. There are other counties that would like me to build there. In fact, Sarasota County has incentives, and a building with a solar roof qualifies.

My current totally street-legal 3-wheeled enclosed motorcycle has 200 pounds of lead acid Optima Yellow Tops, and 1/3 of the needed solar array. It's enough to keep the 48 V power and 12-V accessory battery charged. I am going to try to procure a few H2 fuel cells that will go into the next run of vehicles. There will be an H2 filling station here in Orlando. The scale model has been to the wind tunnel and has been photographed and digitized so a full scale vehicle can be in your driveway next year, provided there are no trees in the way. This vehicle will be almost maintenance - free and will include a warrantee.]

Dennis Brandenburg

I became interested in electric vehicles after installing 3kwh of PV on my house. I had the opportunity to see some thing really neat working first hand. In the process of installing my solar system I needed to do an evaluation of my electrical usage, this gave me a new appreciation of conservation and energy use. A friend decided to introduce me to Electric cars via a tour of the Sparrow factory with his car club. Of course this was when Corbin Motors was still in business. Up to this time I had no interest in electric vehicles.

Since I am an old Wisconsin dairy farmer, I know trucks, tractors, and sports cars, but electric golf / cars!?!. I had to do a lot of talking and soul searching. It just seemed like such a good idea, PV panels and electric car seemed like they were made for each other. I leased the Car (Toyota Rav4EV), expanded the solar array to 5.2kwh and became really convinced electricity is a practical "Alternate Fuel". I'll be buying the car when the lease ends.

Energy is taken for granted; just flip the switch, step on the gas and go. Where energy comes from and the cost's are what need to teach to our families, friends and communities. Through my example of daily usage I've have opened up several work mates and friends to the possibilities of some thing else beside petroleum, for personnel transportation.

I am a Unix System Administrator working for a major Defense Contactor. This has given me skills of computer literacy, training, troubleshooting, understanding advanced technologies and explaining them to others. I have driven my car at a previous EAASV rally and have greatly enjoyed telling people about electric vehicles. I would like to apply my talents and skills to helping the EAA educate people about electric cars, photovoltaic panels and expand the driving horizon for EV drivers nationwide.

Marc Geller

Professional background: Self-employed freelance photographer; sales rep for solar PV installation company.

Education: BA, History, Grinnell College, Grinnell, IA

EV owner/driver: Ford Th!nk City (2001-2004); RAV4 EV (2004-)

Relevant experience:
I joined the EAA in 2001 when I began driving a Ford Th!nk City. I began participating in EAA rallies, attending chapter meetings, testified against the evisceration of the ZEV mandate in Sacramento, CA, organized a protest against Ford's cancellation of the Th!nk program, brought together a group of organizations whose actions saved hundreds of Th!nk City electric cars from the crusher, and generally promoted electric cars during the course of my daily life. I became a salesman for a virtually unobtainable product.

The benefits of driving an electric car, personal, environmental and in terms of our national security, are obvious to the membership of the EAA.

Yet still probably 99% of Americans don't know what we know: Electric cars work today, and could be providing zero-emission, oil-free driving for millions.

I would like to work as a member of the Board to increase our efforts "to inform the public and promote the cause of electric vehicles." The EAA needs to be a ready resource, available to the public and the media, as the issues of transportation alternatives garner increasing attention. We need to find allies, and challenge misperceptions.

At the same time, I believe the EAA needs to continue being a vital community and resource for those who build their own electric cars. I hope to work with the Board and membership to strengthen the EAA and work toward the day the average American has the option to purchase an electric car.

Earl Killian

Professional background:
Computer hardware and software architecture, in particular microprocessors, instruction sets, and compilers.

Education: BS in EECS, MIT 1978

EV owner/driver: Yes: Solectria Force, RAV4EV

Relevant experience:
I purchased my first EV in 2001 as part of a program to get direct fossil fuel use out of my day to day life. The other part is a new passive solar home with enough PV on the roof to generate more annual KWH than we use for the home and our cars, which is currently under construction. I am excited that EVers are pioneering a solution that is vital to the health and well-being of this planet and nation, and I want to contribute in any way possible to setting the stage for the eventual market-driven transition. We need to create the options that will be so necessary in just a few more years. In my opinion, the EAA should focus on public education and awareness, infrastructure improvement, and influencing public policy.

I quit my job to manage our house construction, so I expect to have time for EAA activities. Previously I worked in 3 small startups, one of which I co-founded and co-managed and wore many hats. I hope my experience in such situations will be of use on the EAA board.

Other volunteer activities:
I co-taught a course on embedded computing at Stanford University.
I was involved in getting two LPI chargers upgraded to SPI in Berkeley and Napa. My wife and I endowed a Science Exploration fund at MIT with one of its missions being research to benefit the environment.

Scott Leavitt

I was elected as a director on the EAA Board and began my 3-year term Feb. 2002, as secretary. I'm a member of the EAA, Silicon Valley Chapter, and an EV owner/driver since 2000. I've helped run the Silicon Valley EAA Rally each year. I seek re-election for the 2005 term to continue as secretary.

Jerry Pohorsky

I'm running for an EAA board position in hopes of helping the organization with my experience and enthusiasm for electric propulsion.

Experience with electric vehicles:

Member of EAA - Silicon Valley Chapter
Member of Production Electric Vehicle

Driver's Coalition, attended EAA Rally in 2003 and 2004 (Volunteer Coordinator), displayed and drove EVs on rally course each time.
Attended EV Conversion Workshops in 2003 and 2004

Leased EV1 for over 2 years, leased S-10 EV for over 1 year.
Owner of Ford Ranger EV conversion - Performed routine maintenance
Driven over 1000 miles since purchase.

Owner of Porsche 914 EV conversion. Daily driver, driven over 5000 miles since purchase 6 months ago.

Testified at 4 CARB hearings in Sacramento on behalf of ZEV mandate and Production BEVs. Testimony is recorded in public transcript and was broadcast live over the Internet. Testified at 3 Calif. Energy Commission (CEC) hearings on reducing California's Dependency on Petroleum Fuels. Drove EV from Santa Clara to Sacramento on each of these occasions using public charging stations along the way.

Experience with other alternative fueled vehicles:
Owned dual-fuel Propane conversion vehicle for 3 years and gained hands on experience with fueling, smog inspection and maintenance issues. Owned Flex Fuel Taurus and used M-85 methanol fuel for a 6 year period from 1994 to 2000. Had special fueling card for CEC Methanol fuel program. Particpated in several CEC alternative fuel workshops.

Education:
High School: Graduate of Homestead High in Sunnyvale (was in electronics class with Steve Wozniak of Apple computer fame).

College: Graduate of Cal Poly State University in San Luis Obispo (Major was Electronic engineering and was chairman of IEEE student branch. Arranged for several guest speakers including an engineer from HP who gave a presentation on the (then new) HP-35 calculator (end of the slide rule era) and Dr. William Perry who gave a talk on "Microprocessors (and VLSI) are changing the future. He later served as US Defense Secretary).

Post Graduate Degree: Graduate of Santa Clara University (Computer Science)

Professional: Held a variety of test engineering positions including 22 years at ROLM Corp. in Santa Clara (later aquired by IBM, then Siemens), 2.5 years at Sun Microsystems (Newark, CA) and 2.5 years at InVision Technologies, Inc. (Newark, CA). Used workplace charging for EVs at all 3 locations.

Personal: Santa Clara resident and homeowner.

The 4th EVer EAA Chapters Conference

By Jerry Asher, EVA/DC and Events Chairman

This will be a three-day EVent from Friday "No Kidding! 1 April thru Sunday, 3 April 2005 in the warm and delightful Spring climate of Austin, TX. While programming is being worked out by 4th Ever Co-Chairs — Mark Farver, AAEAA President, and Aaron Chocate, AAEAA Treasurer and Webmaster — some details are emerging as follows:

- Possible B-B-Q on Friday (Texan style, no doubt!)
- Green Building Festival in San Antonio, some 45 minutes from Austin with a parallel EV show in the parking lot outside the convention center.
- Speaker Possibility: Mark Capnes with Austin Power; and Mark Kohler with Valens (lithium background) and former EVs of Texas.

Mark Farver also notes that there's plenty of offers from AAEAA members to share homes. And Southwestern Airline has economical flights to both Austin and San Antonio as well.

So far, Terry Wilson, EAA Historian and EVolunteer EAA Registrar EAARegistrar@yahoo.com; Ed Thorpe, CE Editor; Ron Freund, EAA Chairman; Scott Leavitt, EAA Secretary; Dale Brooks, Houston EAA President; and one EAA Chapters Relations — East, EVJerry Asher, are signed "on."

Check http://austinev.org for updates.

Board of Directors 2004

Chairman
Ron Freund
chairman@eaaev.org

Membership Chapter Relations West
Will Beckett
membership@eaaev.org

Secretary
Scott Leavitt
secretary@eaaev.org

Treasurer
Gabrielle Adelman
treasurer@eaaev.org

Chapter Relations East
Jerry Asher
ChapterRelationsEast@eaaev.org

Elections Board Calendar
Bill Carroll
electionadmin@eaaev.org

Education Program Manager
Kim Rogers
education@eaaev.org

East Coast Coordinator
Karen Jones

Nick Carter

Delegates:
Tom Dowling - *EV Charging*
charging@eaaev.org

Charlie Garlow - *Junior Solar Sprints*
juniorsolar@eaaev.org

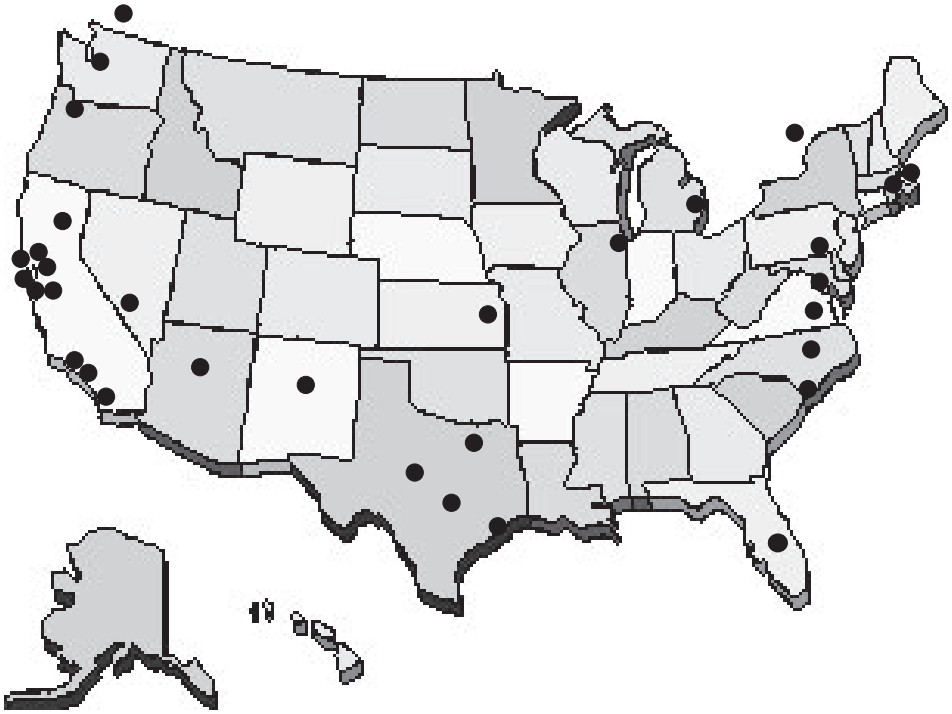
Ed Thorpe - *CE Publications*
ceeditor@eaaev.org

Terry Wilson - *Historian, Awards*
historian@eaaev.org

EAA Board contact:
board@eaaev.org 1-510-864-0662

Notice: IRS requires us to ask for a full disclosure by the donor for donations of $1000 or more. This should include Full Name, Complete Address, Phone Number, and Social Security or Tax ID Number.

ELECTRIC AUTO ASSOCIATION CHAPTERS



CANADA

VANCOUVER EVA (VEVA)
Web Site: http://www.veva.bc.ca
Contact: Haakon MacCallum,1-604-258-9005, info@veva.bc.ca
Mailings: P.O. Box 3456, 349 W. Georgia St., Vancouver, BC V6B3Y4, Canada
Meetings: 3rd Wed./month, 7:30 pm
Location: BCIT Electrical Bldg SE1 Cafeteria - see map on website

EV COUNCIL OF OTTAWA (EVCO)
Web Site: http://www.evco.ca
Contact: Alan Poulsen, 1-613-271-0940, info@evco.ca
Mailings: P.O. Box 4044, Ottawa, ON K1S 5B1 Canada
Meetings: Last Mon./month, 7:30 pm
Location: The Canada Science & Technology Museum, 1867 St.Laurent, Ottawa

UNITED STATES

ARIZONA

PHOENIX EAA (PEAA)
Web Site: http://www.phoenixeaa.com/
Contact: Sam DiMarco, 1-480-948-0719, voltek_2000@yahoo.com
Mailing: PO Box 6465, Scottsdale, AZ 85258-6465, USA
Meetings: 4th Sat./month, 9:00 am
Location: Varies, see Web Site for details.

CALIFORNIA

CHICO EAA (CEAA)
Web Site: http://www.geocities.com/chicoeaa/
Contact: Chuck Alldrin, 1-530-899-1835, calldrin@sunset.net
Mailing: 39 Lakewood Way, Chico, CA 95926-1555, USA
Meetings: 2th Sat./month, 10:00 am.
Location: 1350 East 9th St, Chico, CA

EAST (SF) BAY EAA (EBEAA)
Web Site: http://www.ebeaa.org/
Contact: Ed Thorpe, 1-510-864-0662, eaa-contact@excite.com
Mailing: 2 Smith Ct., Alameda, CA 94502-7786, USA
Meetings: 4th Sat./month, 10:00 am.
Location: 1515 Santa Clara Ave, Alameda, CA

LOS ANGELES EAA (LAEAA)
Contact: Louis Weiss, 1-323-935-2690, warbucks@attbi.com
Mailing: 1811 Hi Point St., Los Angeles, CA 90035-4621, USA
Meetings: 1st Sat./month, 10:00 am
Location: 1200 E California Blvd, Pasadena, CA

NORTH BAY EAA (NBEAA)
Web Site: http://www.nbeaa.org
Contact: Nick Carter, 1-707-573-9361, nick@npcimaging.com
Mailing: 2228 Magowan Drive, Santa Rosa, CA 95405
Meetings: 2nd Sat./month, 10:00 am
Location: See web site or contact for meeting location.

SAN DIEGO EVA (SDEVA)
Web Site: http://home.att.net/~NCSDCA/EVAoSD/
Contact: Chris Jones, 1-619-913-6030, NCSDCA@WorldNet.ATT.net
Mailing: 315 South Coast Highway 101, Encinitas, CA 92024-3543, USA
Meetings: 4th Tues./month, 7:00 pm
Location: 2080 Pan American Plaza, Balboa Park, San Diego

SAN FRANCISCO EAA (SFEAA)
Web Site: http://www.sfeaa.org/
Contact: Sherry Boschert, 1-415-681-7716, shaalub@yahoo.com
Mailing: 1484 16th Ave., San Francisco, CA 94122-3510, USA
Meetings: 1st Sat./month, 11:00 am
Location: Varies, see web site for details.

SF PENINSULA EAA (SFPEAA)
Web Site: http://geocities.com/sfpeaa/
Contact: Bill Carroll, 1-650-589-2491, billcarroll@eaaev.org
Mailing: 160 Ramona Ave., San Francisco, CA 94114-2736, USA
Meetings: 1st Sat./month, 10:00 am
Location: 601 Grand Ave, South SF, CA

SAN JOSE EAA (SJEAA)
Web Site: http://www.geocities.com/sjeaa/
Contact: Terry Wilson, 1-408-446-9357 dongillis@yahoo.com
Mailing: 20157 Las Ondas Way, Cupertino, CA 95014-3132, USA
Meetings: 2nd Sat./month, 10:00 am
Location: 2350 Cunningham Ave., San Jose, CA

SILICON VALLEY EAA (SVEAA)
Web Site: http://eaasv.org/
Contact: Will Beckett, 1-650-494-6922, will@becketts.ws
Mailing: 4189 Baker Ave., Palo Alto, CA 94306-3908, USA
Meetings: 3rd Sat./month, 10:00 am
Location: 3000 Hanover St., Palo Alto, CA

VENTURA COUNTY EAA (VCEAA)
Web Site: http://www.geocities.com/vceaa/
Contact: Bruce Trucker, 805-495-1026, tuckerb2@adelphia.net
Mailing: 283 Bethany Court, Thousand Oaks, CA 91360-2013 ,USA
Meetings: Call or email for location/meetings.

ELECTRIC AUTO ASSOCIATION CHAPTERS

FLORIDA

FLORIDA EVA (FEVA)
Web Site: http://www.floridaeaa.org
Contact: Shawn Waggoner, shawn@suncoast.com
Meetings: Varies, see website

KANSAS / MISSOURI

MID AMERICA EAA (MAEAA)
Web Site: http://maeaa.org/
Contact: Mike Chancey, 1-816-822-8079, eaa@maeaa.org
Mailing: 1700 E. 80th St., Kansas City, MO 64131-2361, USA
Meetings: 2nd Sat./month, 1:30 pm
Location: See web site for details.

ILLINOIS

FOX VALLEY EAA (FVEAA)
Web Site: http://www.fveaa.org/
Contact: Bill Shafer, 1-708-771-5202, assessorbill@cs.com
Mailing: 1522 Clinton Place River Forest, IL 60302-1208, USA
Meetings: 3rd Fri./month 7:30 pm
Location: 2000 Fifth Ave., River Grove, IL

MASSACHUSETTS

NEW ENGLAND EAA (NEEAA)
Web Site: http:/neeaa.org/
Contact: Tony Ascrizzi, 1-508-799-5977, tonyascrizzi@juno.com
Mailing: 34 Paine Street, Worcester, MA 01605-3315, USA
Meetings: 2nd Sat./month, 2:00 pm
Location: Call or email for meeting location.

PIONEER VALLEY EAA (PVEAA)
Web Site: http://geocities.com/pveaa/
Contact: Karen Jones, 1-413-367-9585, pveaa@hotmail.com
Mailing: P.O. Box 153, Amherst, MA 01004-0153 USA
Meetings: 3rd Sat./month, 2:00 pm
Location: 43 Amity Street, Amhurst, MA.

MICHIGAN

DMC-EAA DETROIT MOTORCITY CHAPTER (DMCEAA)
Web Site: http://geocities.com/detroit_eaa/
Contact: Richard Sands, 1-734-281-4087, rsands01@comcast.net
Mailing: 13162 Fordline St, Southgate, MI 48195-2435, USA
Meetings: Call or email for location/meetings.

NEVADA

LAS VEGAS EVA (LVEAA)
Web Site: http://www.lveva.org/
Contact: William Kuehl, 1-702-645-2132, bill2k2000@yahoo.com
Mailing: 4504 W. Alexander Rd., N. Las Vegas, NV 89115-2489, USA
Meetings: 2nd Sat./month, 10:00 am
Location: 1401 E. Flamingo Rd, Las Vegas, NV

NEW MEXICO

ALBUQUERQUE EAA (AWAA)
Web Site: http://abqev.org/
Contact: Tom Stockebrand, 1-505-856-1412, info@abqev.org
Mailing: 1013 Tramway Ln NE, Albuquerque, NM 87122-1316, USA
Meetings: 1st Tues./month, 7:00 pm
Location: 6810 Menaul NE, Albuquerque, NM

NORTH CAROLINA

COASTAL CAROLINAS (EAACC)
Contact: Jayne Howard, 1-910-457-4383, EAAofCC@aol.com
Mailing: 4805 E. Southport Supply Rd., Hwy 211, Southport, NC 28461-8741, USA
Meetings: Varies, call for details.
Location: 4805 E. Southport Supply Rd., Hwy 211, Southport, NC

TRIANGLE EAA (TEAA)
Web Site: http://www.rtpnet.org/teaa/
Contact: Ken Dulaney, 1-919-461-1241, teaa@rtpnet.org
Mailing: 202 Whitehall Way, Cary, NC 27511-4825, USA
Meetings: 3rd Tues./month, 5:30 pm
Location: Varies, call for details.

OREGON

OREGON EVA (OEVA)
Web Site: http://www.oeva.org/
Contact: Ralph Merwin, prizmev@yahoo.com
Mailing: 2905 NE 29th Ave., Portland, OR 97212-3558, USA
Meetings: 2nd Thur./month, 7:30 pm
Location: SW Salmon & 1st St, Portland, OR

PENNSYLVANIA

EASTERN EV CLUB (EEVC)
Web Site: http://members.aol.com/easternev/
Contact: Peter Cleaveland, 1-610-828-7630, easternev@aol.com
Mailing: P.O. Box 717, Valley Forge, PA, 19482-0717, USA
Meetings: 2nd Wed./month, 7:00 pm
Location: 201 E Germantown Pk, Plymouth, PA

TEXAS

AUSTIN AREA EAA (AAEAA)
Web Site: http://www.austinev.org/
Contact: Aaron Choate, 1-512-453-2890, info@austinev.org
Mailing: PO Box 49153, Austin, TX 78765, USA
Meetings: Call or email for location/meetings.

HOUSTON EAA (HEAA)
Web Site: http://www.heaa.org/
Contact: Dale Brooks, 1-713-729-8668, brooksdale@usa.net
Mailing: 8541 Hatton St., Houston, TX 77025-3807, USA
Meetings: 3rd Thurs./month, 6:30 pm
Location: 3015 Richmond Ave., Houston, TX

NORTH TEXAS EAA (NTEAA)
Web Site: http://www.geocities.com/nteaa/
Contact: Paul Schaffer, 1-972-437-1584, pshf@hotmail.com
Mailing: 430 Ridge Crest, Richardson, TX 75080-2532, USA
Meetings: Varies, call/email for details.

VIRGINIA

CENTRAL VIRGINIA EAA (CVEAA)
Contact: Ernest Moore, 1-804-271-6411, ernie_moore@yahoo.com
Mailing: 4600 Melody Ct., Richmond, VA 23234-3602, USA
Meetings: 3rd Wed./month, Call for details.
Location: Westwood Ave., Richmond, VA.

WASHINGTON

SEATTLE EVA (SEVA)
Web Site: http://www.seattleeva.org/
Contact: Steven Lough, 1-206-524-1351, stevenslough@comcast.net
Mailing: 6021 32nd Ave. NE, Seattle, WA 98115-7230, USA
Meetings: 2nd Tues./month, 7:00 pm
Location: See website, call for details.

WASHINGTON D.C.

EVA OF WASHINGTON DC (EVA/DC)
Web Site: http://www.evadc.org/
Contact: David Goldstein, 1-301-869-4954, goldie.ev1@juno.com
Mailing: 9140 Centerway Rd., Gaithersburg, MD 20879-1882, USA
Meetings: 2nd or 3rd Tues./month, 7:00 pm
Location: Building 31-C, 6th, Bethesda, MD.

Listing updated, verified and current as of this issue. Check main web page for any changes in current listing. The Electric Auto Association is a 501 (c)(3) nonprofit organization.

JAN ENGSTROM'S 72-VOLT TRIKE — THE CHARGER

By Jan Engstrom, VEVA

Jan Engstrom has just registered his trike "Charger" as a motorcycle!

Veva members are building a three-wheeled motorcycle. Ready to roll out at the June VEVA event is a three-wheeled Motorcycle car conceived by Jan Engstrom. He invites VEVA members to get involved. Already on board is our young power electronics specialist David Kronstein who is designing the electronics and the controller. Gathering material over some time now, the vehicle structure is now being built. The battery box doubles as a structure connecting the front clip (from a Quad MC) with the single rear wheel. A hatch opens to reveal storage and the electronics. Jan is looking for sponsors/collaborators. Plastic parts fabricators, and manufacturers of the following components are needed: a reversing contactor, disconnect switch/circuit breaker, and battery charger, etc.

Some specs:

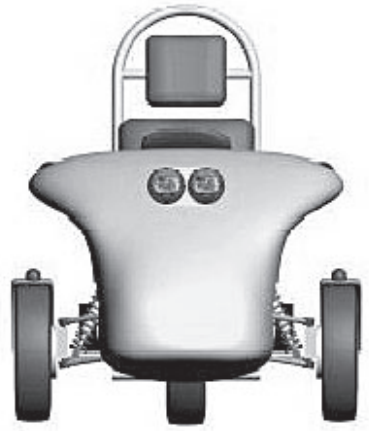
Length	6.5 ft
Width	4 ft
Height	4.5 ft (roll bar)
Weight	540 lbs incl 240 lbs Batteries
Top Speed	70-90 km/h
Acceleration	0-50km/h in 4 seconds!
Range	50-70 km
Charge time	3-4 hours
Drive	Rear wheel, single speed transmission with electric reverse.
Wheels	Lightweight trailer wheels on front, larger modified rear wheel to accommodate lighter motorcycle hub/spokes Motor: Advanced DC 8HP (continuous), 25HP peak
Controller	400A, 72V Regen
Batteries	6 x Exide 34XCD Extreme Deep cycle AGM

Component specifications.

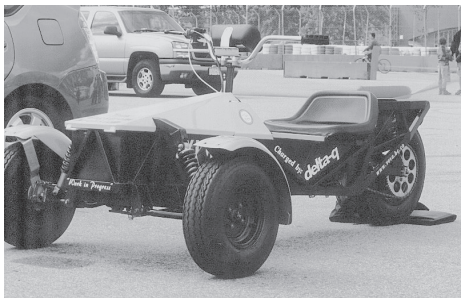
Then we have both a "finished" and work in progress pic's. By the way I have now changed the name to "The Charger". Future work will include securing components, protecting wiring. body panels, fairing etc. Texts still refers to Delta-Q, EXIDE. & VEVA.

Advanced DC 6.7" motor, 72 volts of Exide Orbital AGMs and David Kronstein's 400 amp controller and DC-DC convertor are featured. ICBC had trouble trying to fill a required field, the engine size in cc !

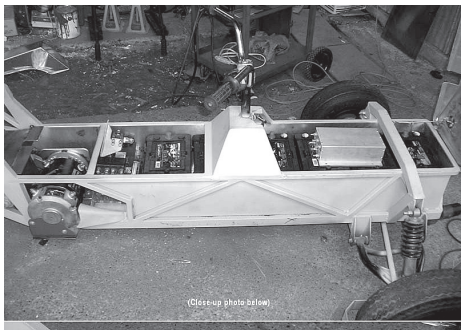
Specs: 7.5' long x 4' wide, 640 lbs curb weight, peak power of 28kW (equivalent to a 60 HP engine in city driving).



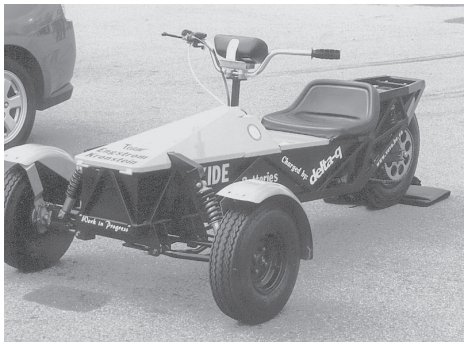
Computer-generated front view of the Charger design.



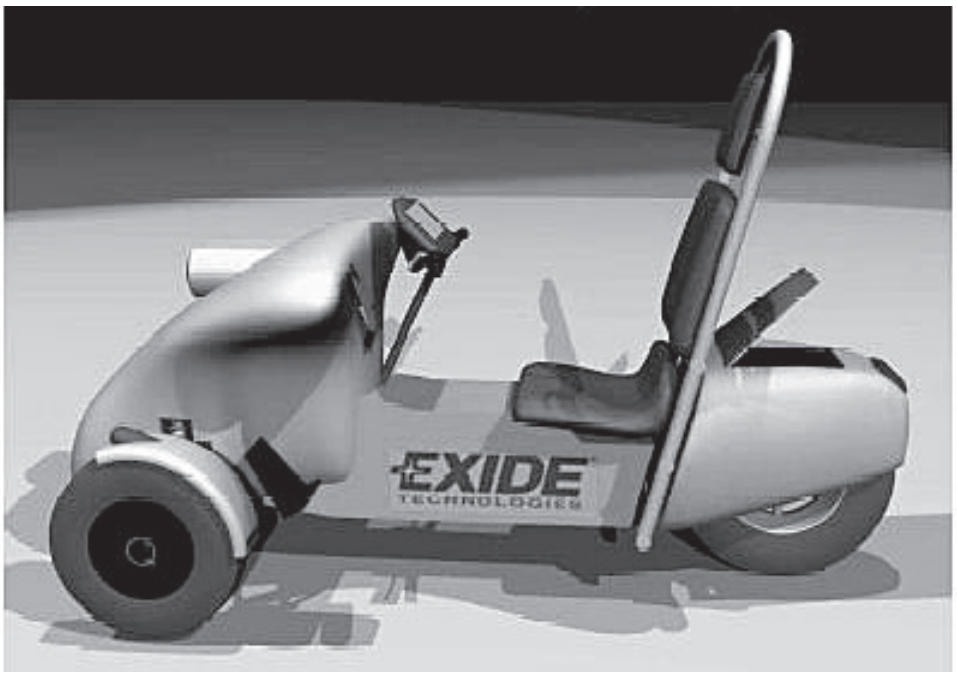
Shot at the June REV!2004 event.



Motor, controller and batteries all fit into the chassis.



Another clean photo.



Computer-generated side view of the Charger design.

EAA MERCHANDISE

-- General Items --

	*License Plate Holder, black plastic frame, white lettering on visible green.*	LICPH1	$10.00	
License Plate	*Motorcycle size, only in metal & black or chrome. (Special order, need additional 6 weeks.)*	Black: LICPH2-B Chrome: LICPH2-C	$14.00	
	*Embroidered Sew-On Patch, white. (Special order, allow an additional 3 weeks.)*	PATCH1	$ 9.00	
	*Embroidered Sew-On Patch, green. (Special order, allow an additional 3 weeks.)*	PATCH2	$ 9.00	
	*Embroidered Bucket Hat, comes in: small/medium & large/xlarge.*	S/M: DCP01-SM L/XL: DCP01-LXL	$25.00	
	*Ceramic Coffee Mug.*	MUG003	$ 5.50	
	*Insulated Car Coffee Mug.*	MUG02	$ 6.50	
	*Embroidered Polo Shirt (Forest or navy S,M,L,XL,XXL), 10 weeks for all colors other than Forest.*	SHIRT01-F-S SHIRT01-F-M SHIRT01-F-L SHIRT01-F-XL SHIRT01-F-XXL Same for SHIRT01-N-…	$40.00	
	*EAA Car Window Shade.*	SS001	$ 8.00	
	*EAA Bumper Sticker #1 (10.5"x3.75").*	BS800	$ 2.00	
	*EAA Bumper Sticker #2 "The Switch is on"(15"x3.75")*	BS002	$ 2.00	

-- EV Buyers Guides --

	**Electrifying Times Preview 2004 *Electrifying Times Preview 2000 *1997 EV Buyers Guide *1996 EV Buyers Guide *1995 EV Buyers Guide*	ET2002 ET1999 BG1997 BG1996 BG1995	$ 5.95	

-- Literature --

	*Convert-It EV conversion Book*	CONV01	$24.95	
	*KTA Electric Vehicle Kits & Component Parts Catalog*	CATAL1	$5.00	
	Window Literature Holder (light plastic)	WL002	$15.00	
Indicate Month/Year and/or Vol #, back 20 yrs.	*Back issues of CE (Current EVents) magazine*	CE001	$ 3.00	

-- Special --

	*AVCON to 14-50 adapter kit - sheet metal box, 14-50 outlet (2 hots and a ground, no neutral), for 220 VAC chargers, no 120 VAC (6weeks)*	ADAPT1	$255.00	
(fill out complete membership form on flip side of page)	***Electric Auto Association Membership ($10 rebates to local chapter.)***	***6 /year of Current EVents, member voting rights***	$39.00	

Shipping: USA 10%, Canada 15%, All Others 20% of subtotal
Handling $2.00 Send check (USA dollars) to:

EAA Merchandise, 5820 Herma St, San Jose, CA 95123 USA

Electric Auto Association (EAA) Membership Application Form

Copy and fill out this form, attach a check or money order or use PayPal in US funds only for $39 ($42 Canada) ($45 International) payable to **Electric Auto Association** . You can fold this form as indicated and mail it with your payment enclosed. Use tape to seal the form before you mail it. Or send information in this form and pay through PayPal using http://eaaev.org/membership.htm.

New Member: ❑ Renewal: ❑ Country (if non-USA):_____ Date: _____

Name: _____ *email: _____

Mailing Street Address: _____ Home phone#: _____

Mailing City, State & ZIP: _____ *Work phone #: _____

*Do you ❑ own or ❑ lease an Electric Vehicle? ❑ Production ❑ Conversion ❑ Bicycle ❑ Other:_____ ❑ No

I support the _____ EAA Chapter, or please select an EAA Chapter closest to me. ❑

(*optional) All information in this application is for the exclusive use of the EAA and not be sold or given to any other organization.

(fold back ward, this will protect your personal information, placing it on the inside)

Please Identify your primary areas of interest relating to the EAA (check as many as you wish):

❑ Hobby/Builder ❑ Professional (income) ❑ Competition (Rallies, Races, Records) ❑ Owner/Driver
❑ Environmental/Gov. Regs. ❑ Social (Rallies, Shows, Dinners) ❑ New Technology & Research
❑ Promotion & Public Awareness of EVs ❑ Student or General Interest ❑ Electrathon/Bicycle/other

The Electric Auto Association www.eaaev.org

'Providing free Electric Vehicle information to the public since 1967'

The Electric Auto Association is a non-profit, 501(c)(3) for the promotion of electric vehicles. Membership includes the informative complementary EAA publication, **Current EVents** . Donations are tax deductible. All information and statistics in this application are for the exclusive use of the EAA and is not sold or given to any other organization or company.

From your membership dues, a percentage goes to the EAA Chapter you support for public Electric Vehicle promotion EVents like rallies, shows and EV rides.

(fold the bottom half under. This will now be the front of the letter. Be sure to seal it with tape)

Return address

_____

_____

_____

membership@eaaev.org

1st Class Postage Here

Electric Auto Association
Membership Renewals
4189 Baker Ave.
Palo Alto, CA 94306-3908 USA

EV CONFERENCE AND EAA CHAPTER EVENTS CALENDAR

November 1 - 5, 2004
The 2004 Fuel Cell Seminar
San Antonio, Texas, USA
The Fuel Cell Seminar offers technical papers, exhibits and coverage of the latest technical advances.
E-mail: fuelcell@courtesyassoc.com
Web Site: http://www.fuelcellseminar.com

November 2 - 7, 2004
38th Tokyo Motor Show: Commercial & Barrier-Free Vehicles
Makuhari, Chiba
Web Site: http://www.tokyo-motorshow.com/eng

November 4 - 9, 2004
International Hydrogen + Fuel Cells Group Exhibit, Shanghai
Pudong, China
International Industry Fair
The first Chinese Group Exhibit on Hydrogen + Fuel Cells will take place annually at the Shanghai International Industry Fair.
E-mail: arno@fair-pr.com
Web Site: http://www.fair-pr.com

November 20 - 21, 2004
GEORGIA EV RALLY
Jefferson, Georgia, USA
Student teams will be competing in the 8th Georgia Electric Vehicle Rally.
Web Site: http://www.eveducation.org/

December 2, 2004
2020: California's Transportation Energy Future Conference
Los Angeles, California, USA
This forum will discuss California's actions to become the first state to establish a petroleum reduction goal and plan. This one-day conference will present the need, technologies, methods, and modes for reducing California petroleum consumption and increasing the use of non-petroleum fuels by the year 2020, as recommended in a joint report by the California Air Resources Board and California Energy Commission. CALSTART will also present its prestigious Blue Sky Awards for 2004 at the luncheon.
E-mail: mpeak@calstart.org or malcaraz@calstart.org
Web Site: http://www.calstart.org

January 7 - 16, 2005
Greater LA Auto Show
Los Angeles, California USA
Located at the Los Angeles Convention Center, this New Years event will unveil many new cars, including the 2005 Venturi Fetish (a Monaco-based EV), Commuter Car's Tango (first production results), and Louroe Electronics EV (from Los Angeles area). There might even be a Volvo C3
Web Site: http://laautoshow.com/

January 15 - 21, 2005
FC Expo 2005
Tokyo, Japan
The first international tradeshow specialized in exhibiting fuel cells and hydrogen related technologies/products.
E-mail: fc@reedexpo.co.jp
Web Site: http://www.fcexpo.jp/english

February 19, 2005
EAA Annual National Membership Meeting
Palo Alto, California, USA
Annual meeting, for review of 2004 year, looking foward to 2005 and installation of new Board members. For those who cannot attend in person, use the toll-free (USA only) teleconference numbe to participate.
10-12 PST, call in starts at 9am
Teleconference: 1-888-583-9625, Code: 303303#
Web Site: http://www.eaaev.org

April 2005
Earthday Events
Everywhere
Various local celebrations of Earthday. Plenty of opportunities to participate with EVs, from display to presentations and rides.

April 1-3, 2005
4th EVer Electric Auto Association Chapters Conference
Austin, Texas, USA
Hosted by the Austin Area Electric Auto Association.

April 2 - 6, 2005
EVS 21: The 21st Worldwide Battery Hybrid and Fuel Cell Electronic
Monte Carlo, Monaco
Vehicle Symposium & Exhibition
Developers and investors will explore and present viable solutions of advanced vehicle technology towards their vision for sustainable mobility.
E-mail: info@evs21.org
Web Site: http://www.evs21.org

April 11 - 15, 2005
International Hydrogen + Fuel Cells Group Exhibit, Hannover Fair
Hannover, Germany
The world's biggest commercial exhibition on Hydrogen + Fuel Cells, with 24 countries representing their latest H2/FC developments and products. .
E-mail: arno@fair-pr.com
Web Site: http://www.fair-pr.com

Note: EAA Chapters.
Any major event information should be sent to cenews@eaaev.org for inclusion in the newsletter, at least 2-3 months ahead of event date. If you have recurring annual events, please provide New Year schedule at the start of the year. We want to maintain focus on EAA-specific events.

EAA **Chapter** Event =
EV related **Event** =
EV related **Conference** =

KTA SERVICES INC.
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Since our beginning in 1984, KTA SERVICES has been dedicated to supplying the largest variety of safe and reliable components to our EV clients. We provide individual components or complete kits to electrify 2, 3, or 4-wheel vehicles weighing from 200 through 10,000-lbs. total weight.

Our components and tech support have enabled hobbyists and others in 23 countries to create nearly 800 on-road electric cars, pickup trucks, motorcycles, and various racing vehicles. Our technology has found its way into electric powered boats, submarines, aerial trams, golf course mowers, amusement park rides, robots, and even a window washing rig. Nobody knows the components or their application better than KTA. All components are new, competitively priced, and come with full manufacturer's warrantees. We stock and sell the largest variety of the very best.

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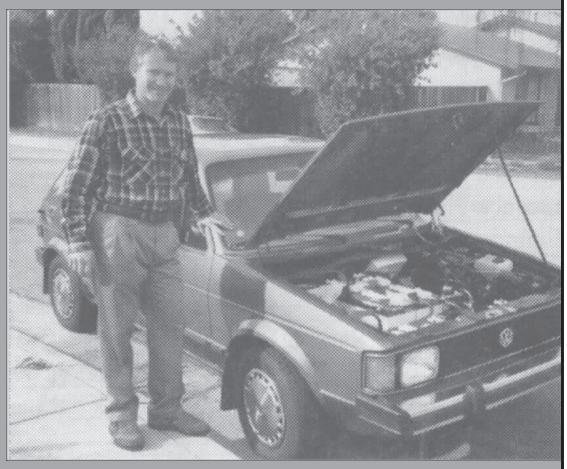
* CURTIS-PMC Motor Controllers from 48 V/175 A to 144 V/500 A
* DC POWER Motor Controllers from 48 V/600 A to 336 V/1200 A
* ALBRIGHT ENGINEERING Main & Reversing Contactors in 5 models
* GENERAL ELECTRIC & HEINEMANN Circuit Breakers
* WESTBERG Automotive Style Gauges in 12 configurations
* KTA SERVICES Expanded-Scale & Dual-Scale Meters
* CURTIS INSTRUMENTS Battery Fuel Gauges in 7 models
* CRUISING EQUIPMENT E-Meters, Prescalers, & DC-DC Converters
* LITTELFUSE Safety Fuses in 4 models from 200 to 800 A
* DELTEC Meter Shunts in 5 models from 50 to 1000 A
* DC POWER & CURTIS DC-DC Converters from 50 to 336 V input, 25 A output
* K&W ENGINEERING Onboard Battery Chargers and Boosters from 48 to 168 V
* BYCAN Battery Chargers for 48, 120-132-144 V
* EVCC Adapter Plates, Couplings, Clamps, Brackets & Motor Mounts
* Electric Vehicles Heating & Air Conditioning
* MAGNA Welding Cable Lugs in 3 sizes from #6 to #2/0
* PRESTOFLEX Welding Cable in 3 sizes from #6 to #2/0
* Battery Cable Assembly Tools
* K&W ENGINEERING TD-100 Tachometer Drive/Rev Limiter
* 5 Conversion Kits for vehicles from 500-lbs. to 5000-lbs. total weight
* 4 Conversion Kits for Go Karts – up to 90 mph
* High performance Drive Systems for drag race vehicles
* Complete ELECTRATHON Drive & Instrument packages
* The latest in EV publications with a growing lineup of videos
* Project Consulting/Engineering Design
* Project Overview with Schematic & Recommendations
* Computer-Base EV Performance Predictions



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