Electric Auto Association

CURRENT EVENTS

SEPTEMBER-OCTOBER '98 Promoting the use of electric vehicles since 1967 Vol. 30 No. 9 & 10

EVS-15 in Brussels

INSIDE REPORT

Following the Leaders - to Where ?

By Hank Ryan

The 15th Electric Vehicle Symposium in Brussels, Belgium was the "biggest event ever", according to event officials, with 1447 registered event participants, continuous ride and drives and a vast array of speakers delivering papers on every aspect of EVs. Speakers discussed technical developments, demonstration program efforts and results and possible future trends.

What was not addressed, though, at least in any major sense, were the effects of the continuing "VCR/BetaMax" conductive/inductive battles between auto manufacturers. It seems the standard, if there will be one, for EV charging must come from the manufacturers of the chargers themselves, and can only be the development of "all-in-one" charging stations. Something is very wrong here.

This issue was addressed last year prior to EV-14 in Orlando as being the central issue to be worked out from that convergence of interested parties. No cigar. Moreover, in researching the Brussels event from a basis of manufacturer announcements prior to EV-14, I am hard-pressed to find the growth, with a few notable exceptions, one would expect from an effort with so many major players.

I can't help feeling that the zero emission mandates here in California are not only the sole reason for some of the "Big Boys" to enter the EV market, but that the conditions for "softening" the demands of those mandates, often portrayed in terms of slow consumer uptake of available products, are once again being allowed to develop. I offer no conspiracy theories; however, one only need gaze at the array of different chargers installed at our local Bureau of Electricity, here in Alameda, to get the message. It is like having every gas station selling only one or two types of fuel that can only work on a few different

Continued on page 20

In This Issue

PHOTO CREDIT - COVER

Toyota says this E-Com is ready, and it ran in the ride-and-drive.. Why isn't there a price on it yet? - Photo by Bob Wagner

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Letters to the Editor

Editor:

The Shunt Controller Breakthrough article in the July/August issue is very exiting news. I feel that regen is the critical next step for the individual EV builders to take in doing their conversions.

There is one thing that concerns me, though. It appears that Zapi, an Italian company, has very little in the way of distibution/service here in the United States. Jerry Halstead's Electric Conversion homepage (http://www.sover.net/~jerryh/convert.html) chronicles the trials and tribulations of Jerry getting his EV built. He chose a Zapi controller because of its ability to do regen. Jerry had all kinds of problems getting support once his controller broke down. I think he is using a Curtis controller, now.

In defense of Zapi, the information contained in Jerry's saga is a couple of years old. I think Zapi was just breaking into the US market at the time Jerry purchased his H3 controller. Hopefully, they have a better suport network set up today for the SEM3.

If any of your readers have information on Zapi's distribution/service network in the United States, I would sure like to hear about it. I am sure that other potential builders would be interested in this information as well. Support is always an issue of concern when selecting parts.

Thanks for a great newsletter.
John Handis
MRINTENSITY@worldnet.att.net

EAA member John Schaefer is preparing a study of electric vehicle commercialization for the City of Palo Alto. He asks anyone who drives one into or out of town to call him at (650)3229337.

Editor:

It's been a long hot summer and I'm finally back and reading my Current Events. Due to the good old US mail we just got the May-June issue about 2 weeks ago and I just got the July-August Issue today. Please correct the North Texas Electric Auto Association web page address and my email address.

The NTEAA web address is
www.engr.tcu.edu/nteaa (NOT ntega)

My email address is
pshf@cyberramp.net

My phone number and address are correct and I have had people contact me by phone so know they are looking at the chapter listings. I got your message about sending in articles. We all need to help. I'm going to bring this up at our next meeting and try to elect someone in the group as news editor and make him/her responsible for sending in information. We had a wonderful solar car race here this summer (Winston Solar Car Challenge) and we always have a good EV showing during earth day. I'll try to get pictures and a writeup from the Solar Car Challenge.

Thanks
"Paul Schaffer" <pshf@cyberramp.net>

Editor:

Dear Folks,

The local Goodyear dealer said that the Invecta GLR are no longer made. He offered no comparable replacement. What is THE low rolling resistance tire for 1998? We drive a 1982 Rabbit.

Gordon Schaeffer
ggschaeffer@juno.com

Editor:

It is election time again, why should I vote?

Last election only 27 votes were received. I can only speak for myself, but what difference does it make? The candidates have not addressed the reasons to vote for them "for the board". Non-controversial issues, such as a plan to make it easier to volunteer (and there are plenty of jobs that people could help with) or a plan for better communication between chapters ,and an indication of programs favored or disliked would be helpful ! While there may not be competition for these positions ,there should be some accountability.

I cannot and will not vote for anyone who will not tell me why I should vote for them to serve on the board.

Terry Wilson
eaa.historian@juno.com

A Call for Letters to the Editor

Read something in CE you would like to comment on? Do you feel something is being left out? Send us a "Letters to the Editor". You can E-mail us, Fax us or use snail mail at the addresses below:

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The Fine Art of Dump Charging

By Scott Cornell and Clare Bell

Scott Cornell of the East Bay Chapter has often shared his EV expertise in CE, including discussions of APU power trailers, testing batteries, and others. He also has unparalleled experience and qualifications for speaking about dump charging, since he has been a key player on various race teams that have developed and used the techniques. In a recent presentation at East Bay EAA Chapter, he enlightened and entertained members, providing the material for this article.

What is Dump Charging?

Dump charging is a rapid charging method that uses a very basic electrical fact: current flows from points of high voltage to points of low voltage. One can think of voltage as water pressure (or gravity pressure) in two tanks. If one has higher pressure than the other and one connects the two with a garden hose, water will flow from the high-pressure tank to the low pressure tank until both pressures are equal. At that point the flow slows and stops.

EV racers have recharged vehicles from 15% full to 80-85 % full in 5-8 minutes during dump charge pit-stops.

This works for battery packs, substituting DC voltage for pressure and current for water flow. A stationary pack sitting at, say, 168 volts can source high currents when cabled up to a 144 V pack in a car. This is a very rapid recharge method, involving currents as high as 800-1000 amps. EV racers have recharged vehicles from 15% full to 80-85 % full in 5-8 minutes during dump charge pit-stops.

If rapid recharge developed to the point of being able to put a car back on the road FASTER than refilling with liquid fuel, that would provide an additional incentive to switch to EVs.

Large track-side chargers can and have been used, but they are almost as large as a dump pack and have to be either driven from a large roaring diesel or fed off a 480 AC line. Moreover, they have not been able to source as much current as a dump-charge system, maxing out at 300-400 amps.

A Five-minute Amp Fill, Please

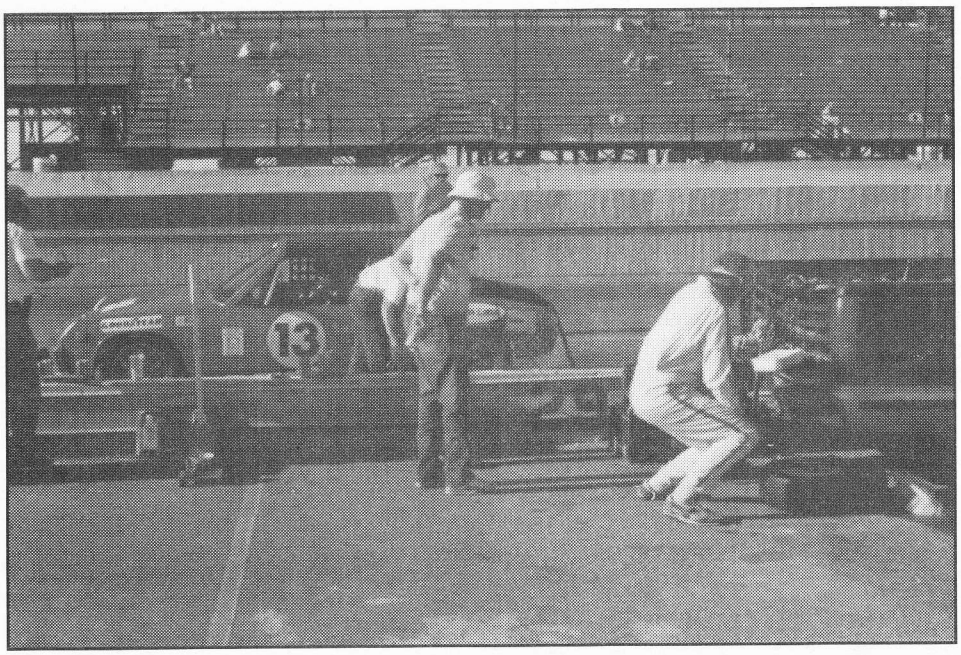
Dump charging has the potential to eliminate or reduce the limited range perception problem in EVs. If a vehicle could pull in to a rapid recharge station and fill up in the same time or less that it takes to pump gasoline into a tank, then it would function more like an ICE car and the general public would be more willing to accept it. The technique could put shorter-range or older EVs with less capacity back on the road instead of being taken out of service. An example would be to increase the utility of vehicles such as the US Electricar S-10 pickup trucks that were bought by cities and utilities.

In addition, setting up a dump-charge station could be done fairly inexpensively and quickly as compared to installing a fast-charger. Dump-charge batteries could be continuously charged from a renewable source such as solar or wind. Or from the grid at overnight rates as low as 4 cents per kilowatt-hour. One could envision neighborhood rapid recharge facilities located at convenience stores or existing gasoline stations. Even enterprising individuals could have recharge packs at their homes, integrating them into existing off-the grid renewable energy systems. These could be come part of EAA's informal "friendly plug network" for cars equipped with dump-charge connections

NiMH will, in Scott's words "blow off into outer space if you give it this much."

If rapid recharge developed to the point of being able to put a car back on the road FASTER than refilling with liquid fuel, that would provide an additional incentive to switch to EVs.

So, with all its potential and promise,



Team ElectroAutomotive's 1993 attempt to dump-charge #13 Porsche with a PWM controller. Scott Cornell crouches behind the pickup truck containing the dump pack. Driver Ron Rasmussen stayed in the car, since there was a metal firewall between the passenger compartment and the batteries.

why hasn't it been done commercially? Why don't EV1s plug into a dump-charge system rather than a Magnecharger? Well, people in the commercial EV world either don't know about or haven't paid attention to the technique. In addition, conventional wisdom holds that rapid recharge will fry batteries.

"a cannonball, she needs fuses and circuit breakers?" philosophy.

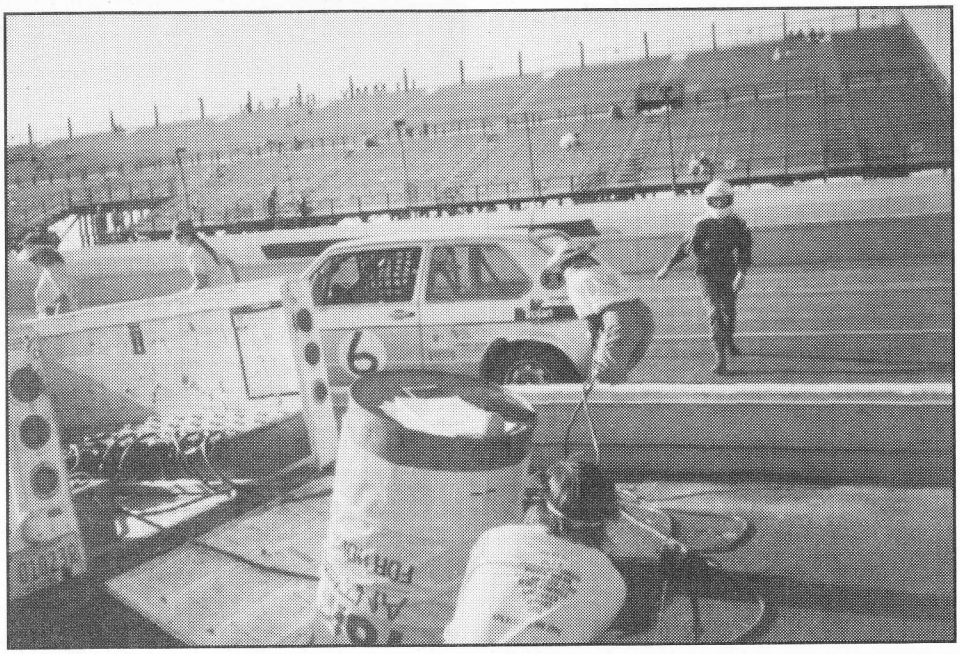
Yes, it can, if done wrong. However, it can be effective if done right. The method has mostly been demonstrated in electric racing, specifically the Arizona Public Service Phoenix races run by the Solar and Electric Racing Association (SERA) and later Electric Vehicle Technology Competitions (EVTC). Battery types that have been successfully dump-charged include nickel-cadmium and lead-acid. Most of the experience has been with lead-acid, so that is the emphasis here.

Perhaps another reason is that the commercial producers are jumping on the nickel-metal hydride band-wagon. NiMH will, in Scott's words "blow off into outer space if you give it this much."

Conventional wisdom holds that lead-acids like to be charged slowly and gently. Dump charge and other experience has shown that lead-acids can be recharged rapidly from 15%-20% up to 60-80%. Above that, the plate surface starts to gas, hydrolyzing water and releasing hydrogen and oxygen. It gets harder to push charge onto the plates and the final charge rate drops, taking 2 hours to complete. However, if batteries are worked between the 15% - 80 % level, they are stressed less and can survive longer. Trying to cram in the final 20 % takes additional time, causes the most damage and is the hardest to do. The small effective reduction in capacity by charging to 80-85% would be offset by a 5 minute fill-up that sends the vehicle on its way again.

Why It Works

When lead acid batteries are 85% discharged, they are hungry for current and can take surprising amounts, especially if one follows the charge acceptance curve of the battery. In the region from 15% to 85% full, the acceptance curve is basically full-bore on, the battery charging as fast as it can discharge. In the case of big 6 V golf cart cells,



The Women's Electric Racing Team (WE'RE-IT) used the Cornell "Quickie" to successfully dump-charge #6 Rabbit in the 1994 APS race. Driver (CB) had to exit the car before charge started. One team member connects the car while another team member operates the Quickie.

this is on the order of 150-200 amps per battery. Some of the low-resistance sealed lead-acids can do better, on the order of 600 amps. In addition, the charging reaction is endothermic, or energy absorbing. Lead acids can actually cool under charge. Most of the heating seen in batteries during charge is caused by the increased resistance seen in cells during the final 20% fill (ohmic heating).

"One test is worth 10,000 calculations."

During the talk, Scott drew a discharge curve of volts under load versus percentage full. It started at 12.6 volts under load as equivalent to 100 percent and rolled in a gentle hill down to 11.7 volts under load as equivalent to out of juice or dead (see figure 1). He also sketched a recharge curve, using the same axes, and generated a flattened horizontal "S" form, showing the 14.5V "knee" (see figure 2) where the cells start gassing. The idea is to stop the dump-charge at the gassing point. When the first battery starts bubbling, the dump-charge should be shut down.

Swiss Go-Karts

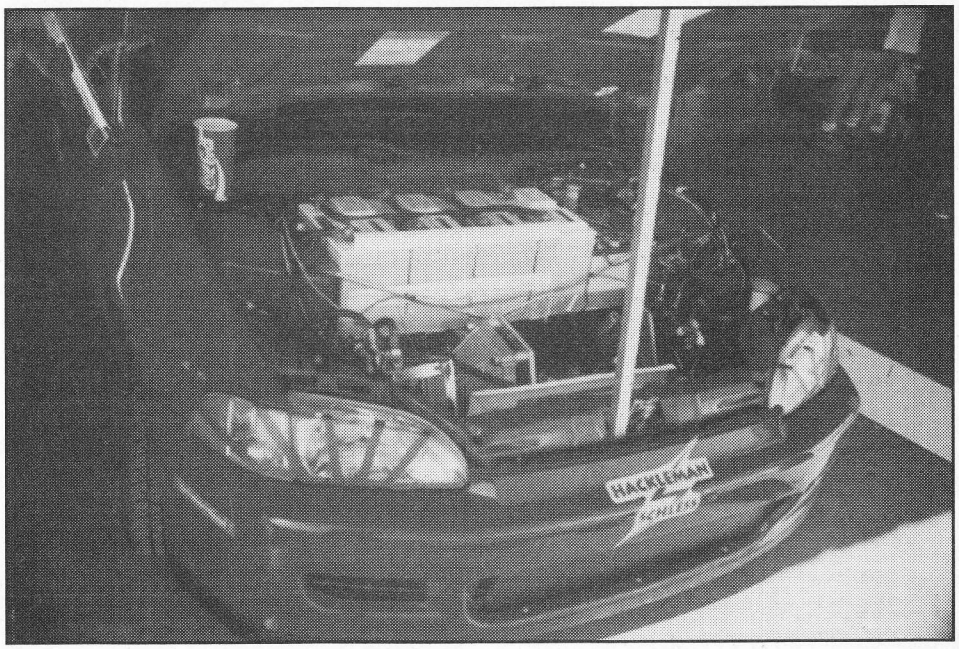
In Switzerland, a fast-charging regimen is used for electric go-karts. When a kart is depleted, its Optima batteries are fed 75 amps for 15 minutes, which refills them to the point that the kart can be sent out again.

Amp-Jammin' Lead Sled Adjusts Attitudes

Scott was introduced to dump charging during his second year at Phoenix through Michael Hackleman's "Lead Sled" entry - a big white Ford station wagon done as an EV. It was crammed to the gills with batteries (there was no gross vehicle weight limit in the early electric racing days) and was looked upon by the other competitors as "a joke on the track". They quickly underwent a radical attitude adjustment when competition started. Hackleman instructed his driver to go pedal to the metal, coming in at intervals for rapid recharge from a track-side stationary pack. The Hackleman team jammed 1500 amps into the Lead Sled for 4-5 minutes and then disconnected and waved the car out. In Scott's words, "Out of the pits he pops and he's going like mad again!" Meanwhile, other EV drivers are cutting back on speed and feeling their batteries sag like the springs in an old mattress. Scott's Karmann Ghia was one of those pasted by the Hackleman landyacht. Intrigued by the technique and the results, he decided to investigate and get involved.

Wimpy Frills?

The pioneering Hackleman "Sled" established many of the parameters that were used later in setting up dump-charge packs and vehicles. The team set the track-side recharge batteries up at 36 volts over the main pack. They used heavy 4/0 welding cables with humongous Anderson connectors. Current interruption devices were regarded as wimpy frills at this point - "a way off. The Peukert exponent gets you on this one.



The Hackleman-Schless entry in the 1992 Phoenix race was a pioneering dump-charged Honda DX. Hackleman's 1991 "Lead Sled was the first EV to be dump-charged at the Arizona Public Service Phoenix races.

No Fuel Gage Yet

In running a dump-charged vehicle in a race, one might think that an electric "fuel gage" such as a kilowatt-hour meter, could indicate when the car was full and when it was empty, just by counting up when the vehicle was recharged in the pits and down during discharge on the track. Nope. The kilowatt-hour meter is no good, due to the disparity between charge and discharge rates. If you are charging at 800-1000 amps and discharging at 150-200 amps, a kilowatt-hour meter is cannonball, she needs fuses and circuit breakers?" philosophy. Intrepid pit-crew members shoved the cables into the car and let the current rip. Disconnect was even more macho, involving two people, one wielding a set of cable cutters with well-insulated grips while another hauled on the cable to yank the ends apart. They chose not to just yank out the Anderson because doing so risked starting an arc between positive and negative terminals (flashover) at the connector. Lewd and crude the technique was, but it WORKED. It showed that rapid recharge

could win races.

In subsequent years, Hackleman refined his technique, successfully dump-charging the Hackleman-Schless Honda DX using heavy butt-connectors used in welding to separate positive and negative connections to eliminate the risk of flash-over. The cable cutters gave way to a bank of car solenoids acting as relays. The techniques worked, but they were still fairly crude.

A good rule of thumb is to size the dump pack to 3 times the capacity of the vehicle being charged.

Having learned from Hackleman and Schless how to do it and how not to do it, Scott developed a more sophisticated technique involving a dump-charge controller, a unit that sits between the dump-charge pack and vehicle pack, providing some monitoring and control of the high current. His Cornell "Quickie" design met the safety specs that were generated by SERA, and later EVTC, as a response to the Lead Sled and other dump-charged entries. The Quickie successfully and safely controlled recharges on two cars during the 1994 stock competition. However, Scott got briefly sidetracked before arriving at his Quickie design.

Overloading a Controller

Using a PWM controller between the dump pack and the car sounded like a better idea than using cable cutters or even relays. In 1993, Team ElectroAutomotive, running the Ron Rasmussen Porsche #13, set up their dump pack using a modified Curtis 1221B. Scott was involved as their expert dump-charger and pit-crew chief. In practice, the job was too much for the 400 amp controller. It quickly hit its various safety cut-outs, including, high-voltage cutout, thermal cut-back, and low voltage cutout. Even heat-sinking the controller on an aluminum plate floated on a bucket of ice-water wasn't enough. The car only got partially recharged and lost time in the pits due to the dump-pack controller problems. Even so, it did well, but the experience showed that the silicon of the time (1993) could not handle the kind of demands dump-charging required. (This was before general availability of high-current controller designs such as the Jefferson Clipper, the Auburn Grizzburger, the EVCL Godzilla and others.)

Want a Quickie?

Enter the Cornell Quickie, a low-budget, yet effective and safe solution. Scott's device used three big magnetically quenched Albright relay contactors, a remote control pendant on a LONG cable and a current monitor (see figure 3). The operator could stand well away from the dump pack and car during the high-energy transfer. To initiate and continue the dump charge, the operator had to hold down a button. If something did happen and the operator had to high-tail it over the wall, dropping the pendant, the relays would shut off, hopefully saving both car and excess adrenaline.

Theory

The three relays tap the dump pack at different points in order to counter the voltage sag that develops as the car fills and the dump pack declines. The charge starts with the lowest voltage tap and moves up sequentially as the current falls off (as detected by the current-monitoring remote meter). The operator does this manually, using a selector switch on the remote pendant. The charge finishes on the highest voltage tap. When the dump pack voltage sags, the car is full. The operator shuts off the charge, the pit-crew pulls the de-energized plug and the car is off.

Try It First

If one is going to do dump-charging using a Quickie-like device, Scott adds, TRY it first if you are going to do it. "One test is worth 10,000 calculations."

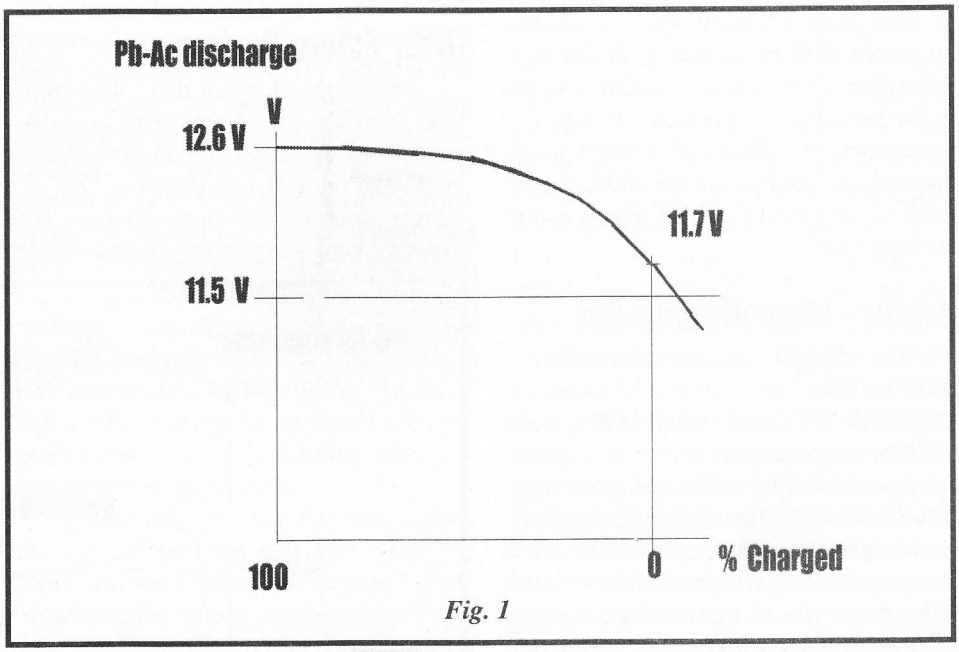


Fig. 1

24-36 Volt Differential

Racers usually set up their dump packs at 24 - 36 volts above the nominal pack voltage in the vehicle. A larger differential is difficult to control (and can pose real safety hazards). A smaller differential will result in a slower charge and perhaps an incomplete fill.

Fast, But Not Efficient

Dump-charging is NOT an efficient method, at least as done by EV racers. Dump-charging vehicles sacrifice 35-40% of the source-pack's energy in heating. To get effectively charged at high amp rates,

you have to put in 50% over the vehicle's pack capacity. Peukert's exponent gets you again.

The Tale of a Rabbit

In the case of one 1994 entry, the Women's Electric Racing Team's (WE'RE-IT) #6 Rabbit, an unforeseen problem developed. Fortunately it didn't stop the show. The car had a circuit breaker in the middle of the pack which tended to overheat during high-current flow during the system. In order not to overload and trip it during the initial acceleration after dump-charging, the pit-crew pushed #6 out of the pits, reducing the current demand needed by the car to get going again. It worked and the Rabbit stayed in the race, but the problem showed that dump-charged vehicles should not locate their circuit breakers in the middle of the pack or anywhere in the high-current recharge path.

Needed - Magnetic Blow-Out

The Albright contactors are expensive, more-so than, say, car-starter solenoids (used by the Hackleman team in 1994). Scott used them due to their ability to magnetically quench arcing on the contacts ("magnetic blow-out"). The Albright has a permanent magnet around the contacts, which is always generating a magnetic field. The idea is that an arc will act like a current-carrying wire in the field - it will want to move according to basic induction theory. The magnetic field shoves the developing arc right off the contact surfaces, blowing it out and extinguishing it.

These contactors can carry and open under 250A DC (continuous duty). They will handle 1500 A for a short time only and will interrupt that current one time without getting destroyed. The Albrights don't mind opening and closing at 1500 amps if the contacts are clean. During Scott's talk, the question arose why you can't use capacitors to suppress arcing. The answer is that the capacitor would have to be on the order of 1/4 of a farad and end up being the size of a battery. Another complication is that the cap would have to be switched in and out under load at precisely the right instant. An easier way to cope would be to use today's (1998) silicon in the form of IGBTs, which would "eat the switching transients" and thereby suppress the arcing.

The Quickie has fuses that are rated for 1200-1300 amp inrush current, but Scott operates it at a safe margin below that. Yes, the fuse can blow to safeguard operation at those rates. However, that large a fuse can take out more than just itself when it does go. As Scott puts it, "I don't blow fuses because I don't want to rebuild the Quickie's Lexan case."

Other Safety Devices

During the Q and A that followed his talk, Scott also mentioned other safety devices recommended for dump charging systems used on lead-acid batteries. One is a battery core temperature monitor. If a battery's core temperature exceeds 90 degrees F, it can get into thermal runaway, a condition in which the under-charge voltage drops instead of rising, and the battery starts sucking more amps ("current-hogging") until it fails. Experience at Phoenix and elsewhere indicates that you can't start a quick charge with a battery core temperature above 85-90 degrees F. With 6 V flooded cells at 37 degrees C or less, the dump charge can start at about 1000 amps (the exact figure depends on the battery's internal resistance.)

Quick-charging in a hot climate would require either water- or air-cooling the battery pack. Someone suggested that dry ice and water would work, with the perhaps dubious benefit of creating "an impressive vapor trail". Another participant countered, pointing out that the first element in carbon dioxide is carbon, a substance you do NOT want on your motor brushes.

For sensing the gassing point, where you want to stop the dump-charge, a manifold on the pack would allow the first gassing battery to be detected.

If the dump source pack is not sufficiently large, some of its cells may suffer reversing. This is a condition in which a battery ceases acting as a current source and becomes a resistive load, switching polarity on its terminals and becoming very unhappy. As a cell makes the transition from source to load, Scott explained, it will gas wildly, creating "a bunch of distilled H2O bubbling merrily."

During one dump recharge, the team smelled battery gassing and thought it was the pack in the car —but the car had already gone away. The source was some over-

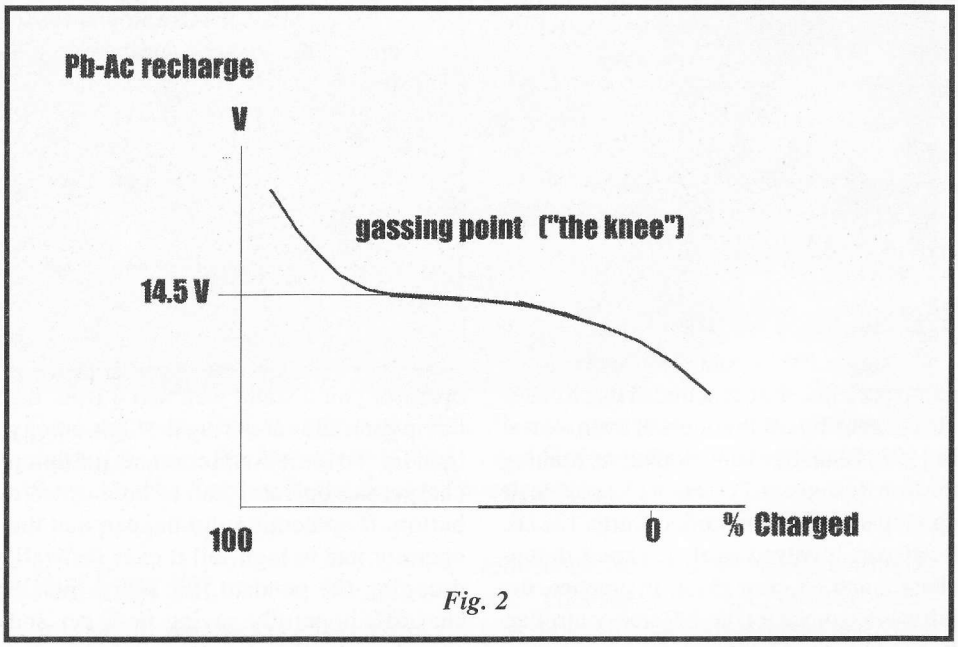


Fig. 2

stressed cells in the dump pack. One way to avoid reversing dump cells is to use really big batteries. D-8 truck starter batteries weigh in about 120 lb. apiece. These big honkers barely notice being drained to fill a bunch of (comparatively) iddy-biddy golf-cart cells. A good rule of thumb is to size the dump pack to 3 times the capacity of the vehicle being charged.

Super-Caps?

During the discussion someone also suggested that super-capacitors (capacitors with huge amounts of effective plate area and thus large time constants) could be used as a dump pack. Being totally electrical, these would not be limited by the constraints of chemical reactions as batteries are. However the discharge characteristic of a battery tends to be fairly flat, with a roll-off or "knee" at the very end. Nicads stay flat until they hit their end of capacity and then "fall off the cliff". Lead-acids decline slightly through discharge and then have a more gentle roll-off. Super-caps are completely linear, thus dumping from supercaps would probably require more sophisticated control and more engineering to match the vehicle to the dump-charge source. Charging super-caps in an EV with a super-cap stationary source would be easier than trying to dump from super-caps into batteries. However the other advantages of super-capacitors would make it worth the attempt. -CB and SC

Scott has credentials as an EV racer since 1991, and has been involved in EVs since the mid-1980s when he built an electric Vega. Currently he is known for his show-quality electric Karmann Ghia. Scott witnessed the first race dump-charging by Michael Hackleman's team in 1992. He then participated in dump-charging of the Rasmussen Porsche 914 in 1993, and developed the Cornell Quickie for dump-charging two WE'RE-IT cars, #13 Porsche and #6 Rabbit in 1994.

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Gasless at Green Lake Sep. 13th, Seattle

By Steven S. Lough

Its a saga of bureaucrats and environmentalists, of business people and EV zealots. Its E-Bikes and E-boats, Its a story of polished GOLD battery terminals, and duct-tape and bailing wire. From $495 a copy to $24,995. In other words its an EV and Alt. Fuel Festival. The ground on which the Seattle EV Association held its 1998 EV Festival was City Park land, which would normally require lots of red-tape, fees, and insurance riders. But since the Seattle EV Association, Eco-Motion, and Evs North West have joined the Puget Sound Clean Cities Coalition, gaining favor with the city bureaucracy has become a little easier. Clean Cities is a program run by the Department of Energy, and there are over 63 cities now in the club. Their mandate is to promote the use of AFVs in fleets and municipalities. Its working. Seattle City Light, has plans to buy several Evs during their next vehicle procurement cycle.

I counted 27 electric vehicles as I walked through the tree lined walk way where the event was held. There were also 3 CNG vehicle exhibits, along with several environmental groups, and a solar power provider, who was charging more than one EV.

Greenlake is a wonderful park, right in the heart of the north end residential area of Seattle, and has a 2.7 mile jog, skate, ride, walk path around its perimeter, and thousands partake daily, rain or shine. 90% percent of our visitors were walk in traffic.

Too many vehicles to outline each and every participant, but I will attempt to hit some of the high points.

Jason Hills, a young Microsoft programmer, brought his recently completed Toyota MR2 EV, complete with Gold Plated battery terminals. Wilde Evolutions brought their record smashing Red Maniac Mazda, Dave Cloud of Cloud Racing brought his Ginnis World Record Holding E-Boat Hydro. Olof Sundin and friends from EVs Northwest, brought the TWIKE, a Swiss NEV, which no one can touch for quality, engineering, and efficiency. Father Time, a.k.a. Don Crabtree brought three of his outrageous E-Drag Bikes. Jim Waite brought his impeccable Electric BMW 320I. There was a magnificent dark silver gray OPEL GT Electric. Rich Rudmund showed the crowd just how much rubber a 1200 amp RAPTOR controller could burn, when put in a light Ford Festiva. And of course yours truly showed off the venerable Ferrari Red ION-1, complete with a recent picture of Seattle's mayor Paul Schell and I standing next to the car at a recent civic event.

But most of all I feel the positive feedback from the general public, made it all worthwhile for me. Many folks were seeing current, available electric vehicles for the first time. The common remark was, "I didn't know they were so available, and affordable !" This tells me that we have a long way to go in the field of public awareness, and education. It also tells me that the public is warming up to the idea of electric vehicles also. Lets all keep those EVents coming.

For those in the Pacific NW who would like to keep up with activities and meetings of the Seattle EV Assoc. check out their web site at: http://www.halcyon.com/slough/seva.html --- or call me at: (206) 524 1351, or e-mail at: slough@halcyon.com

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Electric Moose Herd Crashes Concours

by Clare Bell

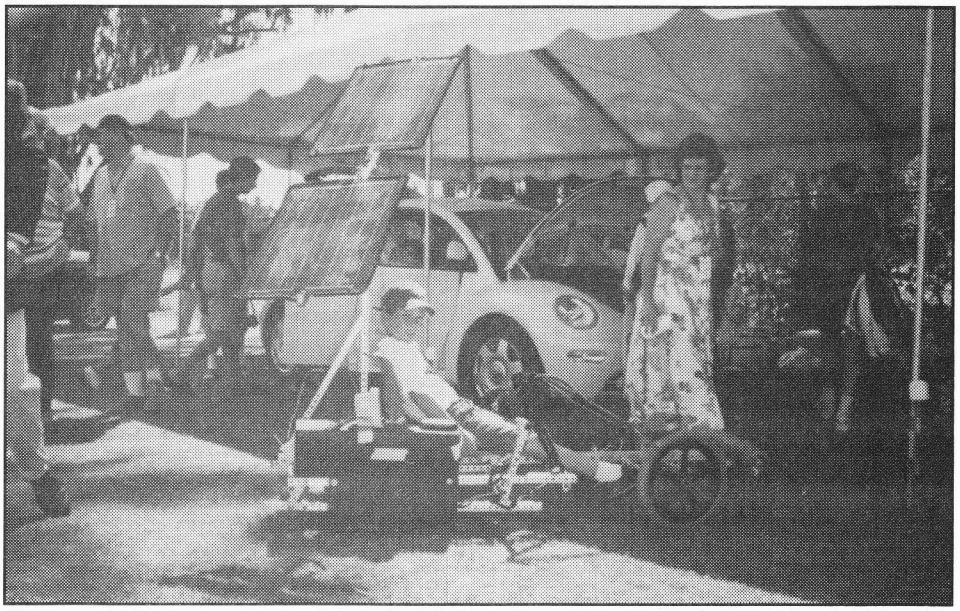
Jane Lathrop Stanford Middle School's pioneering Electric Moose Club (in Palo Alto, CA) continues to grow and generate "Mooses", kid-built, kid-sized solar cars. Each Moose is constructed from re-useable parts that look like an oversize Erector set. The solar car club started up from a project in teacher Brad Booth's 7th and 8th grade classes several years ago. Aided by Palo Alto EV enthusiast Bob Schneeveis, Booth and his class constructed a little solar car that the kids could sit in and drive. At Bob's suggestion, they used Jorgenson box-beam, pre-drilled square aluminum tubing that bolted together (for additional information on box-beam construction, check out Home Power's review of the Box Beam Sourcebook by Phil Jorgenson, Home Power vol. 43, page 86.) Out of this effort emerged "Solar Moose", a cute and efficient little solar runabout. (See "Electric Moose Runs Wild", Current EVents, 1994.) The "Moose" designation came from the solar panels, which are mounted on a pole and spread out horizontally. To the kids, the panels on their first solar vehicle looked like something that belonged on Bullwinkle, and thus the "Moose" monniker.

Inverting the Process

Teacher and Moose Club advisor Brad Booth developed a strategy that was different from the usual sequence of design from scratch, build, debug and test. The first Moose went together that way, but things were different for subsequent Moose evolutions. Instead, Brad and the kids turned the process around backwards, beginning with testing.

Honest EValuations

Each fall, at the start of the school year, a new group of JLS "Mooseketeers" inherited what was built the previous year. Teacher and Moose Club advisor Brad gave them the first and perhaps most important task; to test and evaluate the existing vehicle. Since the incoming kids had little or no emotional stake in the car built by the previous year's group, they could be mercilessly unbiased and give an honest judgment. Then, using the existing performance benchmarks, they proposed improvements and attempted to achieve them by re-designing and rebuilding.

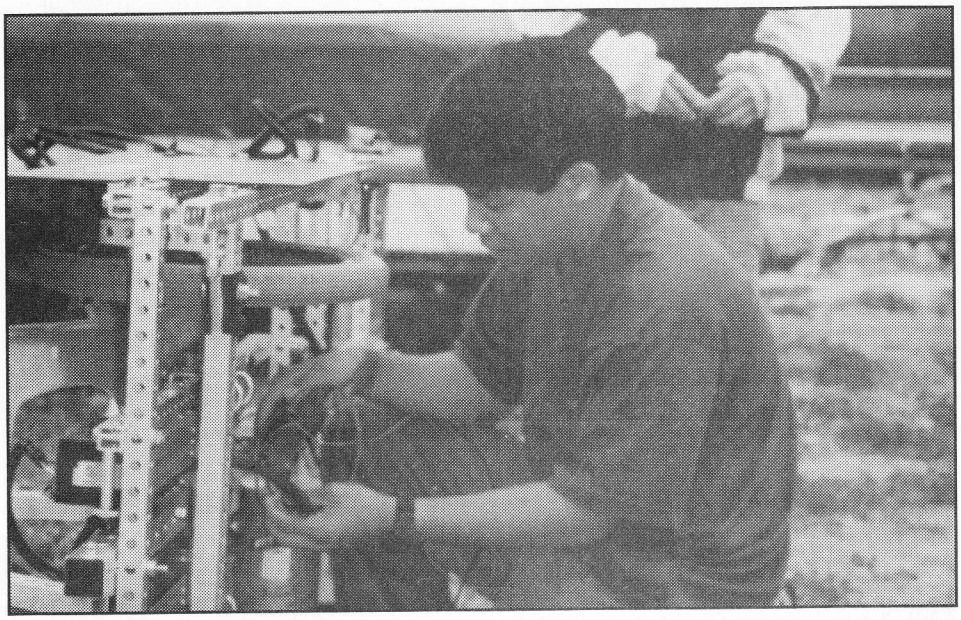


Sunny Bug meets Solar Buggy (Concept One VW). JLS kids at Palo Alto Concours d'Elegance with Moose 1.

Best Training Ground

This was a great way to start the team off. Instead of starting with a completely blank slate, they had the example of last year's Moose-mobile. It served as inspiration, model, and challenge. The Moosers could develop their analytical skills and have fun at the same time by driving and testing the original. Having an existing vehicle made the project seem more real than starting with lines on paper. And the lines on paper would, appropriately come later, after the kids had experienced and documented the advantages and deficiencies of their predecessors' design. Those lines would also be the product of some realistic thinking as opposed to pretty pictures straight out of the imagination. The imagination was definitely there, but much more productively directed.

In that way, Brad and the Moosers avoided some of the pitfalls that can bedevil long-term projects done by young designers. With the existing vehicle, the kids stayed interested and the initial part of the project seemed to move faster. The car wasn't a long way away, seeming like an impossibility. It had been done before; it would be done again, but better. If the young designers "got lost" in their project, they could step back to the old design and start again. It was the best training ground, combining a fairly protective environment with a realistic challenge. Anyone thinking of starting a solar or EV car club for middle or elementary school kids would do well to emulate the Moose-builders of JLS.



Closeup of Mike working on Moose 1 shows Jorgenson box-beam construction.

Dissolution and Re-Birth: Moose as Butterfly

Initially the kids would plan just to upgrade the previous Moose, but as they got deeper into the project, they tore the car completely torn apart and re-did it from scratch. This same pattern developed each year, with the Moose teams going from proposed modifications only to a complete teardown and rebuild. Each car started out as a running vehicle, only to end up as a pile of parts by the middle of the year. Then, from that parts pile, a new Moose, or Mooses, took shape. It was interesting how the kids envisioned the process initially as a gradual upgrade, like a grasshopper or snake molting to move on to its next stage. In reality the process was one of total dissolution and reformation; resembling the metamorphosis of a caterpillar forming a chrysalis and emerging later as a butterfly.

The Moose (and Squirrel) Herd

Each year Booth's kids redesigned and rebuilt the first Moose and created additional ones, using friction drives built by Bob Schneeveis and more of the Jorgenson box-beam that they prepared themselves by drilling holes spaced one inch apart in thin and thick-walled alumi-

These youngsters are definitely "Charging Into the Future - Moose 1 wears EAA hat on its instrument support arm.

The She-Moose and her captivating creators.

num box tubing. This year (1998) they are up to four Mooses (Meese?). And, or course, if you have Moose, you have to have Squirrel, at least according to Boris Badenov, so the kids built two Squirrels.

Target: Concours

Although the solar panels do resemble antlers, one would think they were too fragile to butt through much of anything except tissue paper. Wrong. This year the doughty little Mooses and their young creators crashed through a barrier that was impenetrable to any other electric vehicles, namely the exhibitor entrance gate to the Stanford Concours' d'Elegance.

Previously the premiere classic and show-car event had invited and encouraged high-quality electric cars from EAA and various individuals for display and demonstration. My #13 and Black Magic were both displayed in the Concours along with other well-known EAA cars such as Mike Slominski's Rabbit, Scott Cornell's Ghia and others. Bob Lang showed his three-wheelers and silver "leaner" car. EV "toys" such as shopping carts, bikes, scooters, "fast furniture" and various other contraptions also joined the fun. And of course, JLS proudly displayed their latest Moose.

Money-Grubbing Meaness

This year, the policy changed. The Lion's Club sponsors got serious about making money and to preserve the elite and expensive image of the Concours, they debarred any of what they called "electric vehicle junk" from the show. That decree also applied to the JLS kids and their solar Meeses.

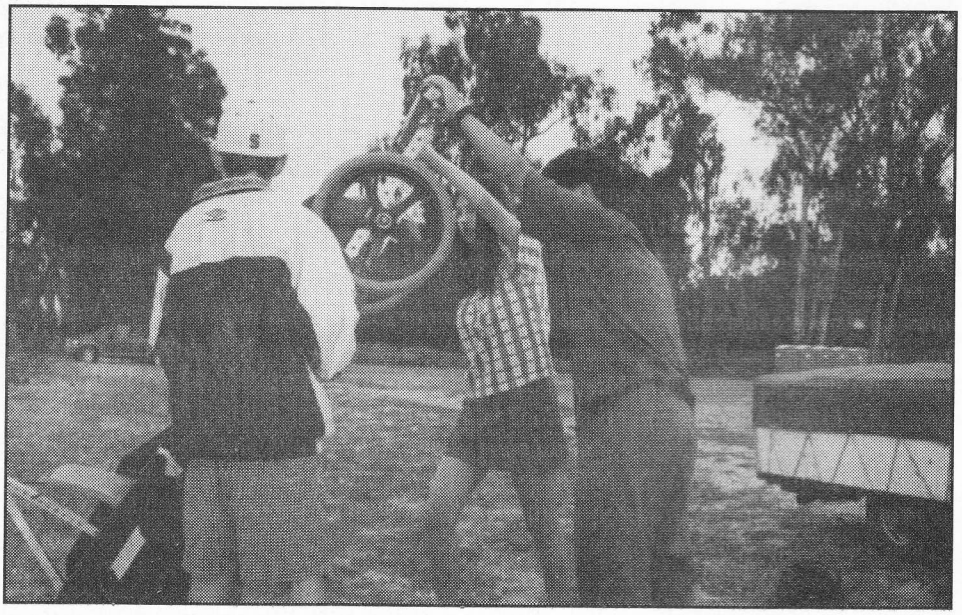
The EV community wasn't delighted, but we didn't want to force ourselves where we weren't wanted. Most of us shrugged it off. It would be the Concours' loss, and besides, there were always other events.

Major Downer for JLS

For Brad Booth and the Moosers, the policy change brought major disappointment. Showing the latest Moosecar at the Concours was a highlight of each year; an opportunity to reach the thousands of showgoers and attract the media. Besides, it was just plain fun and a little bit subversive -- sort of like an EV mini-convention amid the ranks of all the shining gasoline Merecedes and Dusenbergs.

Laying it on the Lions

But the Concours hadn't reckoned with the persistence and tenacity of the Moose-builders or the adults associated with the solar car club. Bob Schneeveis and Brad Booth laid it on the Lions, so to speak, via some brisk phone calls to the top cats. These kids had worked so hard on the solar cars with the expectation of being able to demo them at the show. It had become almost a tradition for the school. Were the Lions



Practical Moose-wrangling. She-Moose and She-Mooser unload to prep for Concours.

Moose #3 tours Concours. This harmless little cruise brought down the Concours' ire again, since the solar cars were supposed to be a static display. C'mon, Concours, loosen up!

going to let money-grubbing meaness and snooty snob-appeal kick the JLSers out?

When put that way, with hints of a story possibly going to the local press, the Lions turned in to kitty-cats and backed down before the four Mooses. JLS was in!

Practical Moose-Wrangling

On the morning of the 28th, the Moose Club and several adult chaperones drove down to load the cars and take them to the show. Bob Schneeveis had invited me to come along to help and interview the kids.

I began with the team that had built Moose 2, which was now sitting in the back of a pickup truck, ready to depart for the Concours. It had been built by a team of mostly 7th graders. Youngsters Ben Sanders and Mike Foote gave a run-down on the car. This one, they said, had the best braking of all the Mooses and other Moose teams had copied the idea. The car used a t-bar, with the arms of the "T" sitting behind the tires and the shaft running down the center of the frame. A lever attached to the shaft pulled the t-bar forward, bringing the two arms up against the rear tires, stopping the vehicle instantly. Simple, easy and effective. This application was actuated by a hand control, but it could have been adapted to foot control just as easily.

Basketball Stand Eats Antler

When asked what were some of the challenges in building the car, Mike and Ben agreed that drilling all the box beam in preparation for assembly was the most laborious chore. Even doing it on a drill press took a looong time. Next year, they said, "Gotta get the mill". I am sure they will, and they'll probably learn how to run it too. I also notes some creative use of duct tape, especially on the bumper. Recounting some set-backs during construction and test, the boys added that their "voltmeter sparked" and had to be replaced, and that on an initial voyage on the playground, the solar panels "got ate" by stands supporting a basketball hoop.

The mishaps didn't discourage them unduly. Moose 2 went together and Mike Foote is now building an electric scooter on his own.

They also told me about a car built by another team; one I was very curious about, since the team was all girls. When I got to the show, I would see the "She-Moose". Whether it was jealousy or praise, I am not sure, but the boys described the girls' vehicle as "a bad car".

Ugliest Car in the Concours

The vehicles bearing the Mooses and the kids mingled with the sparkling Porsches and chuffing antiques that were going in the exhibitor gate from El Camino. I drove my

She-Mooser Ina was enthusiastic about their car, which was the most efficient Moose of the herd.

Sentra in past the striped tents and parked it beside the pickup truck that had #2 Moose. Since my Ratha-car had been bashed in the rear and was looking the worse for wear, I dubbed her cheerfully "the ugliest car in the Concours" and went to interview the kids. (She was later chucked out for the crime of visual pollution by the aesthetic enforcers at the Concours - "get that heap out of here!"

Moose Anatomy

In the meanwhile there were more Mooses to see and kids to hear.

First was "The Cadillac" or "Stretch Moose", which was Moose 1 rebuilt from last year. Team member Eric Clibo sat in the driver's seat while detailing the more interesting portions of the car. A rather clever innovation was the swing-away instrument mount, made from the support of a folding desk lamp. Another was the portable killer sound system being run off the batteries. These kids clearly had their priorities right.

The Moose 2 team had donated their t-bar brake design to Moose 1 and a sliding seat helped accommodate the various sizes of growth-spurting 7th and 8th graders. Because it was an older design, Moose 1 uses a chain drive instead of the friction units that run the other Meeses.

"Hello, She-Moose"

And now it was time for the She-Moose. I was especially looking forward to that one, since I'd been specializing in stories on EVs built by all-female teams (not to mention having been part of one myself.)

Remembering the boys' description of "a bad car", I turned to find a trim little vehicle with its solar antler stuck up in the air and plastic fenders that reminded me of a ring binder cover over its wheels. From the ignition protruded a key with a very large proud red "Electric Moose Club" tag that was almost the size of one of the solar panels. And, of course, the "She-Moose" license plate.

"Hello, She-Moose," I said. "Who built you?"

Adi Greif and Inna Zakharevich were delighted to talk about their car and their team. The She-Moose team had begun with a deficit of 7th grade girls, so Brad Booth had invited Inna, who was in his regular class, and a group of her friends. Soon there were 13 girls on the team, which helped while they were preparing the Jorgenson box-beam for construction. Not only were the parts carefully drilled, they were filed to eliminate sharp edges that might cut or scratch. Teacher Booth and advisor Schneeveis made safety the primary concern for everybody.

An EV mini-convention amid the gas-mobiles.

The girls took it seriously. When everybody got together, said Adi and Inna, they weren't sure what to do. We said "Ok, you're here, so start filing".

She-Moose is Most Efficient

They did and they produced the most efficient Moose yet. The She-Moose draws only 1.5 amps at slow cruise. When asked how much the car weighs, the two girls thought a minute and one replied, "Not more than us,"

Which isn't a bad estimate, if you don't have a bathroom scale handy.

The girls added that they wanted to build a really good car, better than Moose 1, because "Moose 1 broke all the time."

At this point I was summoned to remove my ugly-mobile from the Concours' pristine fields, so the interview had to end. I gave the girls copies of Current EVents with an article about the Nova Scotia girls' team that built and raced an electric Formula Ford in the APS Electrics event ("Nova Scotia's Rolling Thunder", Current EVents, Mar./April 1998).

I was sorry to leave the kids, but elated by talking to them, even though the time had been short.

Moose in the Tour de Sol?

The Electric Moose Club at JLS helps these kids not only touch the future but build a good strong part of it. Who knows what its members will go on to create? Maybe someday we'll see a Moose or She-Moose in the Tour de Sol or other major event. Keep birthing electric Mooses, JLS!

As for next year's Concours, Moose-lovers, level those solar antlers and....charge!

CB

E-Bull 914 Triumphs in TdS

by Chelle Myrann

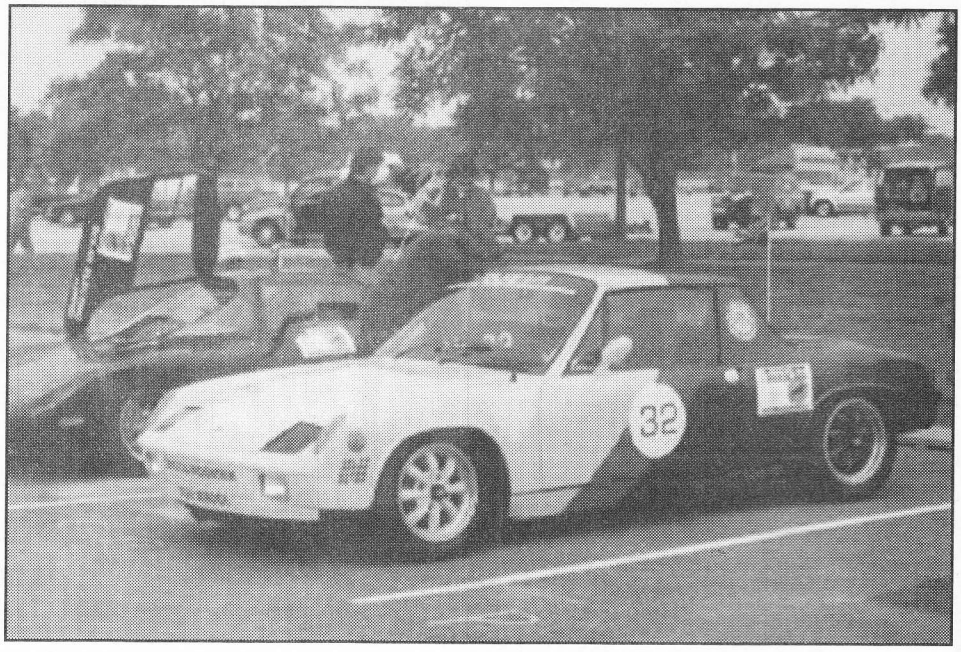
Shadow Mountain High School, of Phoenix, AZ, returned to the Tour de Sol this year with a new and improved car that put their 1996 TdS entry to shame.

The 1996 entry was a handsome Royal Blue Porsche 914, purpose-built for track events with a six-point roll cage. It had placed in numerable electric races and rallies on the West Coast. Back then, the Arizona team had arrived on Pier 17, beautiful downtown New York City to the rude realization that tech inspection was indeed a serious business. The car needed to pass tech before it would be allowed to compete. That meant bathing and drying batteries to clear ground faults created in transit, until 2 a.m. amidst legendary sized rats (Pier 17, after all, sits next to the famous Fulton Fish Market) and other local "wildlife". After this rough start, the team, lead by Michael Golden (faculty advisor), drove on to Washington DC to a 3rd place finish in the educational class and 4th in the American Commuter Division. Driver Randy Salo adhered to all rules of the road and followed route signs impeccably under the direction of Navigator Jesse James (electric car fan and battery guru from Sunbelt Battery). When the team returned to Phoenix, analysis of data taken during the event tantalizingly showed that increasing the Porsche's efficiency, even slightly, under some traffic conditions and at some specific speed would have meant finishing one or even two places higher in the order.

1996 Car Mortally Wounded

This re-energized the team and created a determination to optimize a vehicle specifically for the ATdS American Commuter Class. Their plan for a 1997 ATdS return came to a "screeching halt" in turn one at Firebird Raceway in the '97 APS Electrics when the Royal Blue Porsche traded paint, gallons of it, with another entry in the HS Stock Division, and was mortally wounded. With the forced retirement of the vehicle, perhaps the toughest decision had to be faced by the team...Complete a quick "organ transplant" into another donor car in time for the '97ATdS and hope for the best, or, put the excitement of another East Coast trip in the back of their minds and wait another year? The latter would at least allow time to properly prepare their vehicle. Under the guidance of their advisor, the students demonstrated enviable discipline and maturity, and unanimously chose to conserve their resources and do their very best for the '98 event.

Over the next months, the team put together another 914,but this "Electric Bull" (a nod to the high school's usual nickname "The Matadors") was built to rally! No roll cage and hard racing seats for this beauty!! The team designed stronger and lighter battery boxes; completed sheathing the underside with a belly-pan; relocated the headlights to clean up the front-end aerodynamics; installed an all important digital E-meter and other instrumentation and splashed on eye-catching yellow, fuchsia, & purple paint (the school's colors) provided by PPG and Jugans Custom Paint. With the help of another area high school, East Valley Institute of Technology, Shadow Mountain students fabricated a spiffy tweed and leather-appearing interior. The Am/Fm CD Stereo donated by Kustom Kar Sound was an additional amenity that one doesn't find in the average race-car.



Waiting for the start of Sandy Point State Park, MD to Washington, DC leg.

Tested BEFORE It Competed

In addition to these design and construction improvements, the team realized that preliminary practice runs would not only allow them to test their reliability under all weather conditions (thanks to El Nino for providing uncharacteristic Phoenix rain in which to test), but would also give an ample set of baseline data. This information, transferred into the club's laptop computer (donated by M.S. Millenium) allowed the team to formulate their strategy and anticipate daily progress back East. Thanks to their very supportive Paradise Valley School District, the Electric Bull was licensed and insured in plenty of time to do extensive research before the car was shipped by Reliable Carriers. The high school students, Club President Jillian Golden, Brennan Maxwell, Rick Hocking, Lance Mills, and last year's President Tony Esposito knew that the hours of hard work in anticipation of arriving prepared would pay off. This preparation would hopefully alleviate working until all hours of the night in a city far from home and workshop support.

Now numbering 12 with the addition of middle school student, and Jesse's son, Jayson James, driver Chelle Myrann (faculty advisor for another Phoenix team, Camelback High School) and logistical support/chaperones Brian Maxwell, Jo Hodgkins and Steve Branch, the team arrived Thursday in the New York City area . No sightseeing time for these "turistas"! That would have to wait while all spare time Friday and into the evening was spent setting up camp under the Brooklyn Bridge, pre-teching the car and, again, clearing those pesky ground faults, caused by bouncing around in transit for the last couple of weeks. Lesson learned from 1996!!

Microwaving Socks in Big Apple

Sure enough, the Shadow Mountain Team strolled through tech inspection, starting at 10:00 Saturday morning. The only detail worth noting is the 10 points accrued for passing on their first effort! The only thing that could have better prepared this team for the days ahead would have been if all the rain that has fallen in Phoenix over the past 10 years had been collected and dumped all at once for 5 consecutive days. Yep the Tour de Sol would have been better dubbed the Tour de Plue this year (although the team did develop innovative "dry techniques" such as microwaving their socks and putting plastic bags in shoes). Done by 4:00 that

Back L-R: Dr. Rob Wills (NESEA), Jo Hodgkins, Rick Hocking (obscured), Chelle Myrann, Jillian Golden, Mike (Wookie) Golden, Jayson James, Secretary Pena, Steve Branch. Front L-R Tony Esposito, Jesse James (Not in picture: Brennan Maxwell, Brian Maxwell, Lance Mills)

afternoon, rain or no rain, these desert rats were gonna' see some of the Big Apple! A couple of subway rides, a trip to the top of the Empire State Building, and a stroll up Broadway to Times Square (Psssst...Kid, wanna' buy a watch?? Real gold...) was an authentic "taste of NYC" that all the students appreciated.

Proud of Their Baby

During the well attended, but still wet, display at Pier 17 Sunday morning, prior to the 1:00 start, the student team members explained their project and answered the whole range of how, what and why, EV questions to the general public and, as is often the case at ATdS, to other students from area schools. This was the regimen at all the numerous display periods scheduled during the Tour, and it was obvious to all, these students knew what they were talking about and took justifiable pride in their "baby". The 1st day of driving was through wet, stop and go, heavy urban traffic during much of the 30 mile route to Morristown, NJ, for display, then 41 more miles to Princeton, NJ and the first overnight stop and display. Chelle Myrann allegedly badgered Jesse James with questions just to make navigating and figuring the arcane battery charge/distance/speed calculations a bit more challenging. Already difficult for the team to stay on schedule (points deducted for late arrival) because of traffic and weather, the only thing worse than missing the turn-in for the finish line the 1st day was missing the same turn on day two's +100 mile run from Princeton to New Castle, DE. The initial goal of winning the Commuter Class seemed to be senselessly slipping from the hands of this promising crew but comparison with the 1996 energy consumption data for the first two days showed the new Electric Bull to be operating almost 10% more efficiently at an average of 160whr/mi. Part of the '96 and '98 course near NYC was identical and on this particular section, #32 was using almost 20% less energy and we were running lights and wipers this year!

One Tired Steer

Day 3 brought the chance for redemption and a charge for the lead with extra laps scheduled in Dover, DE, after the 57 mile morning run from New Castle. This was the day the team had targeted to go 150 miles on a single charge but the weather was less than optimal with the rain continuing and now compounded with winds. This was certainly no "parking lot" range event as the laps were run on a busy divided highway with traffic lights every mile or two, and each lap had a maximum time assigned so that any lap run too slow did not count for range miles. The electricity gods smiled on this ambitious group as they picked up a total of 130.6 Tour Miles (138.7 odometer), surpassing all the EVs but the Ovonic-Solectria Force (182.2 Tour Miles). The Electric Bull was a tired steer by this time and, during the last 100 yards to the finish line, it took every bit of remaining power and gear shifting to cross at a lethargic 15mph.

Passing Gas (Cars) - Wahoo!

On day 4, Jesse budgeted energy use so that he and Chelle, after running the first 60 miles of the leg from Dover to Sandy Point, MD, at 37mph average, could cruise up the grade over the +4 mile long Chesapeake Bay Bridge with specific instructions to use whatever power was necessary to pass and wave at every ICE vehicle they could see: wahoo! Slow electrics indeed...! It's fun to think that perhaps some highway travelers are still remembering this purple, pink and yellow Porsche apparition, emblazoned with names, numbers and "Electric" flying past them quietly enough to hear the tunes coming out the open windows.

Barring any unforeseen mishaps on tomorrow's short run to Washington, this timely arrival at Sandy Point clinched the victory in the American Commuter Class for the Electric Bull.. Sitting in the middle of blue crab country, the temptation for blowing the "one nice dinner out" budget was too great for mere mortals and desert rats to resist. A great crab dinner on the waterfront, and old and new EV friends and acquaintances from Team New England and Spyder Juice to bench race with made for a delightful evening on the Eastern Shore.

Cruisin' to the Winner's Circle

Day 5 culminated the TdS with a leisurely cruise into Washington D. C. and a spot right behind the official pace car for the dashing 914 Electric Bull during the last three mile motorcade to the ceremonial finish line in front of the Capitol and into the winner's circle.

It took almost two years of planning, dedication and hard work to move the Electric Bull those 478 Tour Miles, but if there was any doubt of it being worth it, the faces in the photo of the Shadow Mountain Electric Matadors accepting the perennial First Place Trophy, from Secretary of Energy Federico Pena, say it all. The next day at the awards luncheon, the team was further honored with the NESEA Commuter Category: Range Award (PbA), Best Sedan (PbA), and Best Overall. NESEA also presented the team with a very much appreciated Could-Not-Do-It-Without-You-Award for "helping other teams with advice and equipment loans".

Back Row L-R: Lance Mills, Jo Hodgkins, Brian Maxwell, Jillian Golden, Steve Branch, Mike Golden. Front Row L-R: Jayson James, Jesse James, Brennan Maxwell, Tony Esposito, Rick Hocking Car Targa Center: Da' Cup

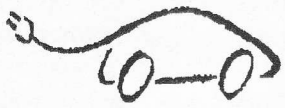
160 Whrs/mile, 59 + MPG Equivalency

For the 1998 ATdS, the Electric Bull traveled 446 miles at a average of 160whr/mile, propelled by a +4 year old motor and controller, fueled by +2 year old batteries, refueled by a +5 year old charger, operated at 100% reliability with no breakdowns under very adverse conditions, achieved over 59mpg equivalency and had the good looks and character to make it a desirable vehicle in anyone's opinion. Says a lot for EV's...

Winners from the Start

The Shadow Mountain Electric Matadors student team traveled 5000 miles, over 18 months, propelled by a dedicated faculty advisor, fueled by support from their school, their district, their parents and their sponsors, operated at 100% reliability with no breakdowns under very adverse conditions, picked up memories and learning that will last a lifetime, and displayed the enthusiasm and character that help make them a winning team before any trophies are handed out. Says a lot for teachers and students today...

Last heard from the team was a discussion of how to trim 160whr/mi down to 150. They did, after all, get a 1999 ATdS entry as part of their prize...-CM



#32 Electric Bull

1972 Porsche 914
9" Advanced DC Series-Wound Motor
Curtis PWM 1221B Controller
120VDC Trojan Battery T-125
Lester Electric 120VDC Charger
Tires: Michelin MXV4
Energy Consumption: 160whr/mile average
NEC MPGe: 59.2mpg

EVS-15 in Brussels *Continued from page 1*

Solectria steps out at EVS-15. - Photo by Bob Wagner

car brands.

Michael Gage, CEO at Calstart, does not seem to share this view. During a symposium session on "EV Commercialization - Stimulating Market Driven Demand", I asked Paul Kasick of Southern California Edison whether he had insights on the potential for Congressional action relating to the Kyoto Accords.

Considering the current political climate, the short and subdued reply I received was no surprise. However, as Mr. Gage began the Calstart presentation entitled, "Using the EV for Environmental Positioning: The Auto Industry's Battle to be the Green Leader", he offered his opinion on the Kyoto Accords question.

"They don't matter."

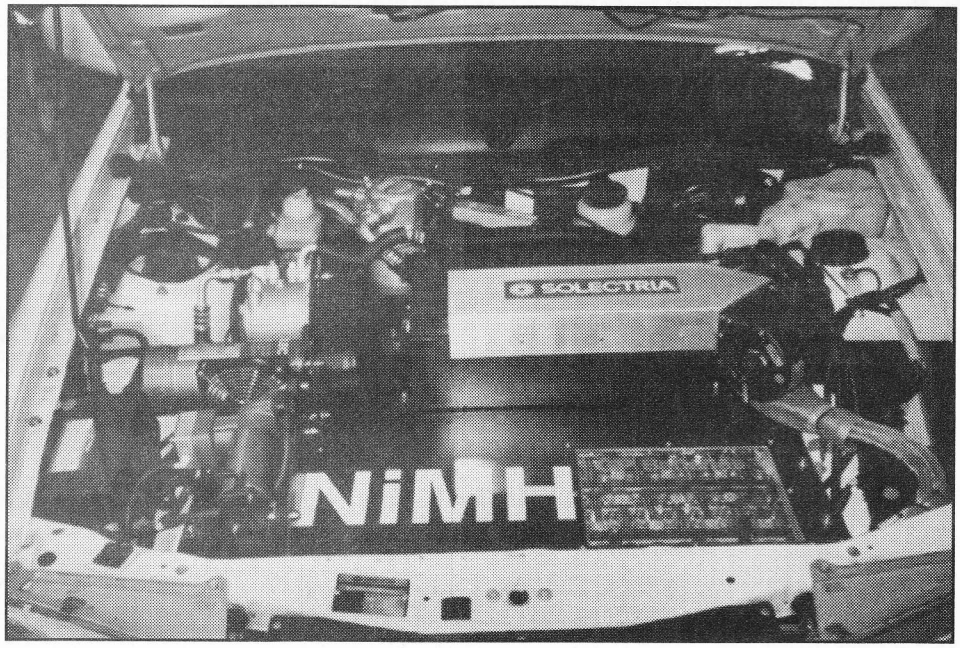
He continued by explaining why Toyota's leadership in the HEV and EV marketing push is forcing other manufacturers to follow suit. The "globalization" of the auto industry is far more important than anything the U.S. Congress may decide on emissions reduction, simply because many models manufactured today are geared for distribution in Brussels as well as Baltimore, or even Bejing. Toyota has been gearing up "eco-advertising" at a pace that demands other major manufacturers follow suit. Gage suggested the Toyota E-Com is setting a new pace for the establishment of a small car consumer niche.

Judging by the demand for ride/drives at EV-15, the E-Com was the clear winner with all available time slots sewn up before noon on the first day of the symposium. Through luck and perserverance, I managed to get a ride in the car (Toyota was only encouraging the ride portion of the ride and drive experience...), and found it to be a comfortable two-seater with good acceleration and a global satellite positioning system accurate to within 2 meters. Too bad I won't be driving it soon.

It's not because I wouldn't enjoy the opportunity. Toyota, according to the representative at the wheel, still has not decided on a price for the vehicle. Why, I have to wonder, is a car that was featured at the EV-14 symposium in Florida last year, still not available ?

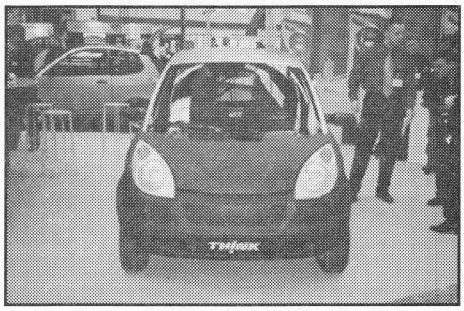
Two potential surprises emerging in the current race for EV marketing supremacy, according to Gage, might be Pivco of Norway and Solectria of Massachussetts.

I drove the new "Think" two seat entry from Pivco (**www.think.no**), and came away with a sense that solid lessons were learned from the two year experiment with the original Pivco models here in California. The suspension has been completely re-designed and the handling is smooth and tight. The interchangable plastic body offers the ability for inexpensive replacement when a new color is desired. Most of all, the "Think", having already passed all necessary tests, is ready for market and due to be offered here



Solectria pioneered the use of nickel-metal hydride, offering the NIMH Force two years before the big guys got on the wagon. - Photo by Bob Wagner

Startled rabbit or new PIVCO? "Th!nk" about it. - Photo by Bob Wagner



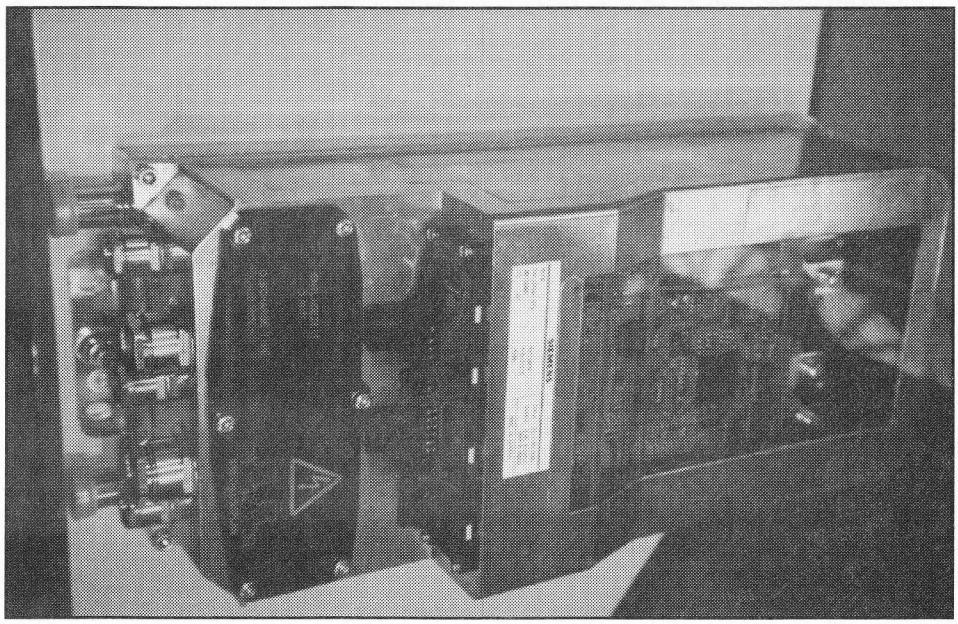
Top and Bottom - This Blue "Th!nk" lit up EVS-15, in more ways than one. - Photos by Bob Wagner

in California within a few weeks. I hope one thing remains from earlier models. Opportunity charging using standard 3 prong 110 volt outlets is a blessing, at least until the "Big Boys" get around to agreeing on a standard charging protocol. If the "Think" is approved for tax credits here in California, Pivco may just find it's own place in the sun here.

Solectria (**www.solectria.com**), is a company that has existed within the mini-free market here in the U.S. for several years; in fact they probably have the current lead with the most cars sold as they've been at it since 1991. Still, it's a jungle out there with the ups and downs of changing legislative mandates and Solectria has come up with an interesting survival tactic: Do things others won't touch and you have the field to yourself.

The Solectria CityVan is a larger than UPS truck sized box van capable of carrying a 3500 lb. payload over relatively short distances. I was told the 40 mile stated range is very conservative. Perhaps zinc-air technology would be helpful here. The truck has a GVW of 11,000 lbs. and is powered by a single-speed automatic 70 Kw Solectria AC Induction Direct Drive motor with regenerative braking which produces 94 hp.

By reaching beyond the consumer market to commercial use, Solectria may be helping to quantify where EVs are able to win the time and motion contest. Vehicles that increase productivity for companies while at the same time lowering measurable emissions will help create a level competitive playing field for EVs. That's real progress. -HR



This Siemens controller forms part of the guts of the new PIVCO "Th!nk". - photo by Bob Wagner

Chrysler Minivan Production in Fall

AUBURN HILLS, Mich., June 17 — Chrysler Corporation announced today that production of the world's only electric minivan will begin in October at the company's Windsor Assembly Plant in Ontario, Canada. EPIC (Electric Powered Intra-urban Commuter), an electric version of the 1999 Dodge Caravan and Plymouth Voyager, will be made available to fleet owners in California or New York.

"With EPIC, we're combining our latest ZEV (Zero Emissions Vehicle) technology with the utility of our minivans," said Craig Love, Chrysler Corporation's Executive Engineer for Electric Vehicles. "The result is an electric vehicle that offers unsurpassed passenger/cargo carrying flexibility and the clean, quiet power of electric drive."

For the 1999 model year, Chrysler will manufacture approximately 2,000 electric minivans and make them available for fleet leasing at $450 per month for a three-year period in New York and California. In Windsor, EPIC production will take place on the same production line where gasoline-powered minivans are manufactured. The only noticeable difference in the production process is that an electric motor and battery pack are installed as opposed to a gas engine.

The Dodge Caravan and Plymouth Voyager EPIC models are powered by an AC traction motor. "Fuel" for the EPIC is provided by a nickel metal hydride (NiMH) battery pack, which is conveniently located under the floor of the minivan. Top speed for EPIC is 80 miles per hour and range on a full charge is projected to be between 80 and 90 miles in moderate conditions.

To maximize vehicle range and reduce road friction, EPIC uses P205/75R/15 low-rolling resistance tires. In addition, a regenerative braking system is activated when the brakes are applied and works to charge the battery during vehicle deceleration.

Chrysler was the first major automaker to begin manufacturing electric minivans. From 1993-1995, Chrysler sold first-generation TEVan electric vehicles to fleets across the country. The real world experience and valuable customer feedback gained from these initial sales allowed Chrysler engineers to work toward improved performance and reduced costs for the EPIC family of electric minivans.

"At Chrysler, we're constantly exploring alternative fuel technologies and the energy conversion systems that use these fuels to provide environment-friendly automotive transportation," said Love. "The EPIC minivan is our state-of-the-art entry into the electric vehicle segment. While there's still a gap in cost and operating range between electric- and gasoline-powered vehicles, we're working hard to close that gap."

Since 1983, Chrysler Corporation has sold nearly 7 million minivans. The company sells approximately 700,000 minivans worldwide every year and has a 45 percent market share of the North American minivan market. Industry-wide, minivans account for 8 percent of all new vehicles sold in the United States. Chrysler Corporation minivans, which include the Plymouth Voyager, Dodge Caravan and Chrysler Town & Country, are manufactured in St. Louis, Missouri, Windsor, Canada, and Graz, Austria.

SOURCE: Chrysler Corporation
Thanks to our EVangel (by way of Don Devlin)
Company Press Release SOURCE: Chrysler Corporation

Zap Receives $425,000 Order From Taiwan

SEBASTOPOL, Calif.—June 29, 1998—America's leading manufacturer of electric bicycles and scooters, ZAP Power Systems, announced the opening of a representative office in Shanghai. With recent efforts to cut air pollution, the company expects China to be a big market for low-powered electric vehicles.

'With the growing global interest in ZAP Bikes, we thought the timing was right to open this office in Shanghai,' said ZAP managing director Gary Starr.

China's recent economic growth has brought about the proliferation of polluting two-stroke gas scooters as a step-up from bicycles. The gas vehicles are so widespread, cities like Shanghai have plans to curtail their use and replace them with electric bikes, which offer a silent, no emissions alternative. The electric bicycle offers the opportunity to replace the most polluting vehicle in the world, with the least polluting vehicle in the world. With the recent international treaty on global warming and the adverse health effects of urban smog, ZAP is hoping to prove that electric bikes are the most appropriate solution for urban transportation. Last week the company announced a $425,000 order of ZAP units to Taiwan.

ZAP, located in Sebastopol, California, has delivered over 10,000 electric vehicles to over 50 countries. ZAP (which stands for 'Zero Air Pollution') received its start at the electric vehicle incubator at the former US Alameda Naval Air Station, and has been a member of the CALSTART electric vehicle consortium. Since its inception. ZAP has worked closely with the Chinese business community for the past

three years. The bicycle that is available in Shanghai represents a bilateral partnership. The bike is Chinese and the electric motor system is `Made in the USA.`

'The President's visit to China represents a unique opportunity to highlight this successful China-USA partnership and demonstrate to the world the exciting possibilities that exist between the U.S. and China,' said Star. 'With technology developed in the USA and mutual cooperation, China can leap-frog conventional polluting vehicles and jump directly into the electric vehicle age.'

Test drives of Zaps electric bikes are available to the media and the President by contacting ZAP at its Shanghai office or at 707/824-4150 or by accessing their web site at http://zapbikes.com.

ZAP Power Systems and Z-Mark of Taiwan announced on June 15, 1998 that the two companies have agreed to open electric bicycle and electric scooter outlets in Taiwan. Z-Mark has placed its first order which is valued at more than $425,000.

"I have spent many years researching the electric vehicle industry," said Louis Shih, managing director of Z-Mark and a 30 year veteran of the bicycle industry. "What is important to the consumer is reliability and low cost. ZAP has the best reputation and the best product. We expect to sell both the ElectriCruizer bicycle and ZAPPY scooter through our outlet store as well as motorcycle and automotive dealers."

ZAP has sold over 10,000 units and recently introduced its ElectriCruizer(TM) bicycle and ZAPPY(TM) scooter which are both priced at $649.99. The company is also working with local businesses to open electric vehicle outlets worldwide; stores are already open in San Francisco, Maui, Santa Barbara, Michigan, Shanghai, and Scotland.

The Z-Mark purchase represents the second significant order received this year by the electric vehicle company. In April, ZAP received a $1,000,000 purchase contract from the global electric utility, Central and South West Corp.

ZAP Power Systems develops, manufactures, markets, and distributes a full line of competitively-priced electric vehicles to over 45 countries worldwide through distributors, dealers, business partners, the Internet, and franchise stores. Founded in 1994, ZAP products include electric bicycles, tricycles, powerboards, scooters, and motorcycles.

CONTACT:
ZAP Power Systems, Shanghai
Chen Yi, 862-165-959509, E-mail: zapzapbikes.com

Honda EV Plus Offered to New York Consumers

NEW YORK, June 4 — For the first time New Yorkers will have an opportunity to drive electric vehicles under real-world conditions beginning in July as part of a new consumer lease program announced today in New York City by American Honda Motor Co., Inc.

Until now, electric vehicles in New York state have been available only to utility and government fleets. This new program will lease the Honda EV PLUS, the first production electric vehicle to feature advanced battery technology, directly to consumers through a local New York dealer-Paragon House of Honda (Woodside, NY). The EV PLUS has been available in California for more than a year.

"Our goal with this program is to get real world feedback directly from consumers on the viability of electric vehicles," said Robert Bienenfeld, manager of electric vehicle sales for American Honda. "In the long run, consumers will decide the value of electric vehicles."

Using advanced nickel-metal hydride batteries, the EV PLUS achieves an EPA city driving range of 125 miles. Under real world conditions, owners in California have been averaging about 70-80 miles range on a full charge, depending on driving conditions. With New York's more severe weather conditions, EV PLUS range is expected to be somewhat less.

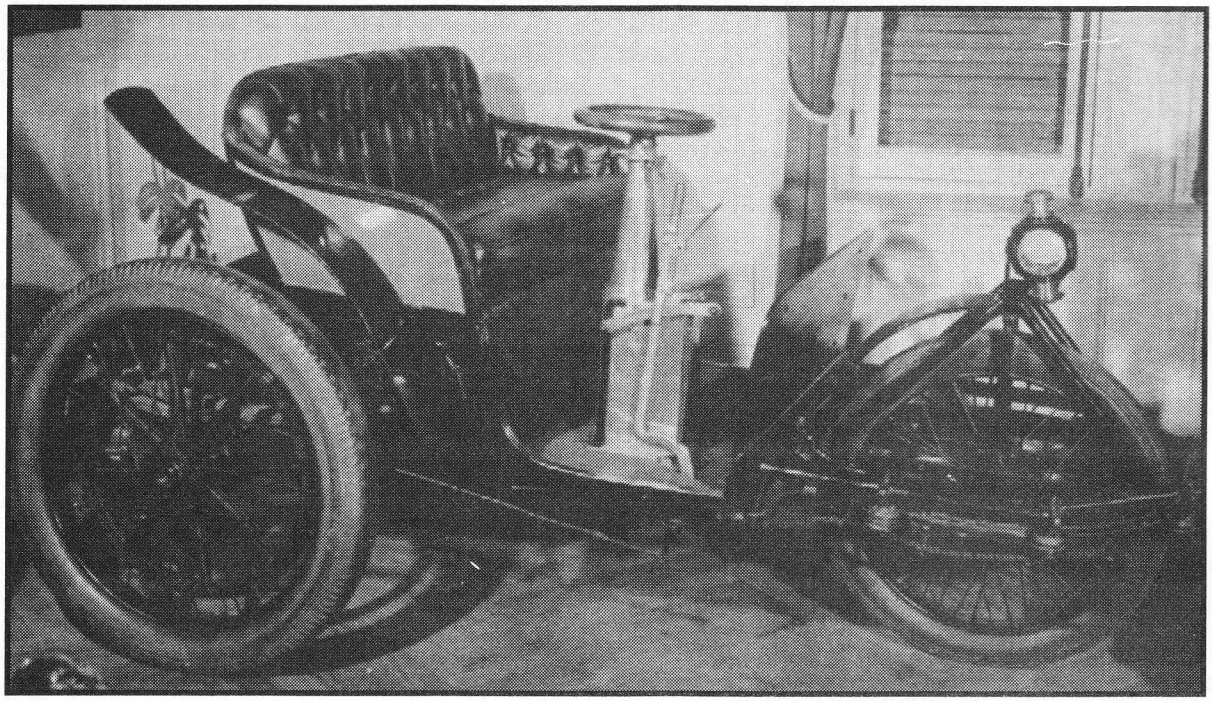
The Honda Charter Lease Program features a "full-service" package which includes all maintenance, including tires, brakes and batteries; 24-hour roadside assistance; comprehensive and collision insurance coverage; a full warranty and unlimited mileage. This full service program leases for $455 per month, inclusive of state and federal incentives, has a term of 36 months and requires no down payment.

The purpose-built, four passenger EV PLUS is equipped with numerous standard features that include regenerative braking and anti-lock brakes, dual airbags, multi-function remote keyless entry, CD-audio system with four speakers, power window, door locks and mirrors, electric power steering and energy-efficient projector type headlights. For New York, the automatic climate control system will be supplemented by a cold-weather kerosene-fueled combustion heater.

Overnight charging is accomplished through a compact on-board charger. Recharging requires customers to install a 220 volt circuit and an Electric Vehicle Connecting Device (EVCD). The EVCD pricing as well as Honda's installation partner will be announced at a later date.

Leasing is expected to begin in July and will focus in the community around the Woodside, New York dealership. This new consumer program expands on Honda's Northeast evaluation effort which began in 1997 with EV PLUS deliveries to the Commonwealth of Massachusetts and the New York Power Authority.

SOURCE: American Honda Motor Co.
Thanks to: (Ray Holan)
mactivity@macconnect.com



This little three-wheeler is a curiosity of the Rochetaille~e museum. With two electric motors it could travel at 12.5 mph for about 2 hours.

Milde Electric Car

1900

The name of Charles Milde' is nowadays virtually forgotten, but from the end of the 19th century until 1909, his factory in the Rue Desrenaudes in Paris turned out excellent motor cars and commercial vehicles powered by electricity. Milde also built some "gasoline electrics," with gasoline engines driving generators, which in turn drove electric motors.

The 1900 three-wheeler at the Le Mans museum is perfectly preserved and typifies the sound, sturdy Mild~ approach to design. As far as the body is concerned, it is little more than a seat for two people, mounted on three wheels, but the mechanism is of considerable interest.

The batteries are placed under the seat, and there are two electric motors, one for each of the rear driving wheels. They are geared down through a small pinion on the motor and a large, internally geared crown wheel applied directly to the wheel. The whole electrical unit forms part of the rear axle, suspended on leafsprings. The motors are of the composite band type, and from a combination of the two in series and parallel, a large number of forward speeds and reverse can be obtained, with the car running very sweetly.

The frame is a tubular structure with some semblance to a modern space frame. The steering is through a wheel, a stout vertical column, and a complex arrangement of wheels and chains that turn the front wheel on rollers running in fixed circular guides- a sound but heavy process. The wheelbase between the rear axle and the single front wheel is 61 inches and the rear track is 45.5 inches. The rear tires have to support a concentration of weight on the axle, and measure 880x120, but these are possibly not as originally fitted.

The weight of the Milde tricar is given as 320 kg (over 700 pounds), and in view of the scanty capacity of the batteries, its range cannot have been more than 20-25 miles, at a maximum speed of 12.5 mph. Certainly the small lantern above the front wheel does not suggest long-distance driving!

Used Battery Exchange

Recycle Batteries – Back into Vehicles!

When EV-ers change a pack, there are frequently some good batteries among the clunkers. The San Jose (CA) EAA Battery Test/Exchange program was set up to rescue these and re-direct them back into EVs that need them. SJEAA member Don Gillis will capacity-test all batteries from an old pack, and return an equal number of bad ones so that the EV's owner can return them as cores. He keeps the good ones to supply EAA members with batteries at no cost.

Recently Don has been running low on used batteries due to a decline in donations.. So, if you are changing a pack, give Don a call at (408) 225-5446. Help your fellow EAA EV drivers keep their vehicles on the road. And who knows —the car you help may EVentually be your own.

Areas and chapters who do not have such a battery program are encouraged to start one. For more information call Don. Thanks!

Call (408) 225-5446

Revised Bylaws (9/1/94)

Electric Auto Association

(A California Nonprofit Public Benefit Corporation With Members)

I. CORPORATION PURPOSES:

A. To act as a source of information for the membership, other organizations and the public on developments in electric automobile technology worldwide.

B. To encourage experimentation in the building of electric vehicles, particularly in the area of reducing weight by the use of lightweight body construction with quality and safety in mind.

C. To promote and organize public exhibits of electric automobiles built by members and others for the purpose of informing the public on the progress of electric automobile technology and conducting public opinion polls.

D. To publish newsletters, information packages, and other materials designed to promote the cause of electric vehicles.

II. OFFICES:

A. The principal office and any other office(s) shall be located at such place(s) as the Board of Directors shall authorizes [5160]*

III. MEETINGS AND VOTING RIGHTS:

A. REGULAR MEETINGS: The annual meeting of the members of the corporation shall be held each year at a place, date and time arranged by the Board of Directors. Notice of the meeting shall be sent to each member of record, as of the date of notice, by mail not less than 20 nor more than 90 days prior to the meeting date. At each annual meeting directors shall be elected and any other business may be transacted which may properly come before the meeting. [5510(b), (c)]

B. CHAPTER MEETINGS: For the convenience of participation, groups of members may form EAA chapters in geographic regions. Meetings of EAA chapters shall be held at times and places determined by the chapter officers and members. [5510(a)]

C. SPECIAL PURPOSE MEETINGS of members may be called by the Board of Directors, the Chairman, the President or by 5% or more of the members. Special purpose meetings shall be held not less than 35 nor more than 90 days after receipt of a valid request. [5510(o),5512]

D. NOTICE OF SPECIAL PURPOSE MEETINGS of members shall be sent by EAA to all members of record, by mail, not less than 20 nor more than 90 days prior to the meeting date. Meeting notices shall state the business to be transacted and nominees for positions, if an election is to be held, as well as the time and place of the meeting and date by which proxies must be received. Business at special purpose meetings shall be limited to that stated in the meeting notice. A proxy form shall be furnished to each member with the meeting notice with which the member may vote absentia on the business or the candidate. [5511]

E. QUORUM FOR THE TRANSACTION OF BUSINESS: At any meeting of the members those present plus those represented by proxy shall constitute a quorum, if 5% or more of the members are represented. The affirmative vote of a majority of those voting in person and by proxy shall be the act of the members. [5510(d),5512]

F. ACTION BY WRITTEN BALLOT WITHOUT A MEETING: Any action, including election of directors, which may be taken at a meeting of members may be taken without a meeting by mailing to each member of record a ballot describing the proposed action with an opportunity for the member to specify approval or disapproval of the proposal(s). A reasonable time limit for the return of the ballots shall be stated. Approval on a majority of the ballots received by the stated time shall be the act of the members if 5% or more of the members voted. If directors are to be elected by mailed ballot, without a meeting, the number to be elected shall be stated and that number of candidates receiving the highest numbers of votes on ballots received by the stated time shall be considered elected. Written ballots are irrevocable. [5513(d)]

G. VOTING: Each member shall be entitled to one vote on proposals and for candidates at general meetings of members in person or by proxy or by mailed ballot it a meeting is not held. [5610]

H. PROXIES: Each member entitled to vote may do so by sending a proxy to the Secretary of the corporation which must be received by the date set in the meeting notice. A proxy shall be valid only for the specific meeting and proposal(s) stated in the meeting notice. Proxies must be delivered in a sealed envelope and are to be opened only by a teller committee appointed by the Board of Directors.[5613]

IV. **BOARD OF DIRECTORS:**

A. POWERS OF THE BOARD: The activities and affairs of the corporation shall be conducted by or under the direction of the Board of Directors subject to any limitations in the Articles of incorporation or these bylaws. [5210, 5150 (a)]

B. NUMBER OF DIRECTORS: The authorized number of directors of the corporation shall be an odd number not less than three(3) nor more than eleven(11). The exact number of directors shall be set within these limits from time to time by affirmative vote of a majority of the directors or by affirmative vote of a majority of members voting at a duty held meeting and by proxy or by mail received by the time limit stated in the notice. The maximum and/or minimum number of directors may be only changed by approval of the members. [5151]

C. DIRECTORS NOMINATION, ELECTION AND TERM: Nominations of candidates for director may be made to the Board of Directors by any member at any time to fill vacancies or to replace members whose term has expired. Nominations shall close 60 days prior to the date of the meeting at which the election is to occur or the date by which written ballots must be received. The Board shall provide nominee a reasonable opportunity to accept or reject nomination, communicate to members their qualifications and reasons for candidacy and to solicit votes. Directors shall be elected at each annual meeting of members and shall hold office until the expiration of the term for which elected and until their respective successors are elected and qualified or until death, resignation, or removal. Directors shall be elected for terms not exceeding three(3) years. Terms shall be arranged so that no more than one half will expire in a single year. Any bylaw amendment increasing the terms of directors or extending any director's term must be approved by the members. [5220]

D. RESIGNATIONS: Any director may resign effective upon giving written notice to the Chairman of the Board or to the Secretary of the Board. However, no director may resign if such resignation would leave the corporation without a duly elected director in charge of its affairs. [5224, 5226]

E. REMOVAL: The Board of Directors may declare vacant the office of a director, elected subsequent to the adoption of this bylaw, who fails to attend or otherwise actively participate in three consecutive board meetings. If not in attendance, active participation may be by written input to the upcoming meeting. The entire Board of Directors, or any individual member of the board, may be removed from office by affirmative vote of the majority of members voting by written ballot or in person and by proxy at a duly held meeting for which such removal was stated in the meeting notice as a proposal to be decided at the meeting. If the members act to remove the entire board they must immediately elect a replacement board. [5221, 5222]

F. VACANCIES: A vacancy(s) on the Board of Directors shall be deemed to exist whenever there are fewer directors than the authorized number. Such vacancies may be filled by a majority of the remaining directors or by a sole remaining director. The members may elect a director at any time to fill any vacancy not filled by the Board of Directors, [5075, 5224(b)]

G. REGULAR MEETINGS: The board shall meet at least quarterly. One board meeting shall be held immediately after each regular meeting of members for the purpose of organization, appointment of officers and transaction of other business. [5211]

H. SPECIAL MEETINGS OF THE BOARD OF DIRECTORS may be called by the Chairman or the President or any Vice President or the Secretary of the corporation or by any two(2) directors or by five(5) percent or more of the members. [5211 (a)(1)]

I. NOTICE OF MEETINGS: Notice of the time, date and place of all meetings of the Board of Directors shall be delivered to the directors at least one week in advance by first class mail or by personal delivery, telegram or telephone within at least 48 hours before a special urgent meeting.. [5211 (a)(2)]

J. ACTION WITHOUT A MEETING: Any action which may be taken by the Board of Directors may be taken without a meeting if all directors consent in writing to such action. Such consents shall be filed with the minutes of proceedings of the Board of Directors. [5211 (b)]

K. QUORUM AND TRANSACTION OF BUSINESS: A majority of the authorized number of directors present in person or participating by phone shall constitute a quorum for the transaction of business. Every act done or decision made by a majority of directors present at a meeting duly held at which a quorum is present shall be the act of the Board of Directors. [5211(7),(8)]

L. MEETINGS: The Chairman of the Board shall preside at every meeting of the board, if present. If no chairman is present a chairman chosen by a majority of directors present shall act as chairman. The Secretary of the corporation, or in the absence of the Secretary, any person appointed by the Chairman shall act as secretary of the meeting.

M. COMPENSATION: Directors and members of any committees shall serve without compensation except for reimbursement of expense incurred on behalf of the corporation and subject to prior approval by the Board of Directors. [5235]

N. COMMITTEES: The Board of Directors may create one or more committees each consisting of two or more directors and may include other members of the association. The board shall define the responsibilities and authority of each committee. [5212]

V. ORGANIZATION

A. OFFICERS: The corporation shall have a Chairman of the Board, or a President or both, a Secretary, a Treasurer and such other officers with such titles and duties as the Board of Directors shall determine. All officers shall be chosen and appointed by the Board of Directors and serve at the pleasure of the Board. [5212, 5213]

B. THE CHAIRMAN OF THE BOARD shall exercise such powers and perform such duties as may be assigned by the Board of Directors. The Chairman may sign and execute, in the name of the corporation, any instrument authorized by the Board of Directors. The Chairman shall have all the general powers and duties of management usually vested in the President or Chief executive Officer of a corporation.

C. THE SECRETARY shall keep, or cause to be kept, in a place and form readily available to any director:
1. Minutes of all meetings of the corporation members, Board of Directors and committees of the Board of Directors.
2. Names and addresses of all members.
3. The original or copy of the Articles of Incorporation.
4. These bylaws including any revisions.

D. THE TREASURER shall be responsible for maintaining accurate and correct books and records of moneys of the corporation received and disbursed and for depositing same in the name to the credit of the corporation and shall provide a statement of financial condition of the corporation to the Board of Directors when called upon to do so.

E. CHAPTERS: Members may form Chapters. Each Chapter has its own meetings, procedures and activities, Chapters must establish and maintain a relationship as affiliates of the EAA and agree to abide by the bylaws and Code of Ethics of the Electric Auto Association.

VI. CONTRACTS AND LOANS:

A. CONTRACTS: The Board of Directors may authorize any director, committee of directors or officer of the corporation to enter into any contract or execute and deliver any instrument in the name of and on behalf of the corporation. Without such expressed and recorded authorization no director, committee, officer or other person shall have the power or authority to bind the corporation or to render it liable for any purpose or in any amount. [5141, 5210]

B. LOANS: No loans shall be contracted on behalf of the corporation unless authorized by the Board of Directors.

VII. MEMBERSHIPS:

A. ADMISSION OF MEMBERS: The corporation shall admit as a member anyone who pays the annual membership fee and shall consider each such person a member for one year following receipt by the corporation of each membership fee. Certain institutions, organizations and individuals may be granted complimentary memberships at the discretion of the Board of Directors. Any member may resign at any time by written notice to the Board of Directors. [531 0]

B. CLASS OF MEMBERS: The corporation shall have one class of members and each member shall have one vote on matters to be voted on by the members. [5330]

C. DUES: The Board of Directors may levy upon members such dues, assessments and fees as it may deem appropriate. [5351]

VIII. INSPECTION OF CORPORATE RECORDS:

A. Every director shall have the right to inspect and copy all books, records and documents of the corporation and to inspect the physical properties of the corporation at any reasonable time. Each member shall have the same right of inspection for purposes reasonably related to the business of the association and in the interests of the membership, upon written request stating the purpose, to the Board of Directors. No director or member shall use any record, such as members' names and addresses, for any purpose not in the best interests of the corporation.

IX. MISCELLANEOUS:

A. FISCAL YEAR: The fiscal year of the corporation shall end on the last day of December of each calendar year.

B. ANNUAL REPORT: The Board of Directors shall cause an annual report to be prepared and sent to members, within 120 days after the close of each fiscal year. The report shall include, in appropriate detail: summaries of the corporation, chapter and member activities and corporation income and expenses.

C. BYLAWS: It is the intent of these bylaws to comply with mandatory requirements of the California Nonprofit Corporation Law. The Board of Directors will correct any noncompliance brought to its attention. These bylaws may be adopted, amended, revised or repealed by the Board of Directors or by the members unless the action would materially and adversely affect the rights of the members. [5150]

D. CODE OF ETHICS: The Association will adopt and abide by a Code of Ethics published to the membership as a separate document.

E. AWARDS: The association may grant awards for meritorious service, technical achievement, or other purposes as determined by the Board of Directors.

*Numbers in brackets refer to California Nonprofit Corporation Law.

EVents Calendar

DEC 3-5 1998

1998 North American EV and Infrastructure Conference (NAEVI '98). Phoenix, AZ. Conference focuses on commercialization issues of electric and hybrid electric vehicles in North America. Exhibit and ride and drive will be featured. Contact Pam Turner, EVAA. Phone 650-548-9464. Fax 650-548-9764

For more information, or to add an EVent to this calendar, please call Anna Cornell (510) 685-7580 (10 AM to 4PM, PST only, please!)

1999

JAN 17th -23rd

1999 CITIPOWER SUNRACE '99, in Australia. This 3rd annual 1790 mile open race is for solar & electric vehicles, going from Sydney to Melbourne in 7 days. There are 7 categories for vehicles: Pure Solar, Production EVs, Electric conversions, Pure Solar (Regs. to be finalized, Array 4.5 - 6 meters) & Ultralite Electric. Each host city will welcome you with a BBQ & Breakfast Start and be team & media friendly. You may e-mail organizers at sunrace@netlink com.au OR call John Hoener at 001 1-61-3-9820-9032

EV Cruised

Funky Town

Electric Avenue

Disco didn't die. It just departed to Funky Town.

Located off Missouri 350 and 63rd Street in Kansas City, the new Funky Town has disco ball streetlights, lava lamps, lots of neon and black lights, and all those groovething tunes from the 1970s and 1980s.

Funky Town, in the former General's Inn, is the latest creation of Woody Woodruff, who opened Woody's north of the river in 1987. It's one of the few area dance clubs from that era still operating. He also owns Woody's South in Olathe.

Woodruff, a former stand-up comic, is known for his combination dance clubs and live shows. Eight actors/dancers will put on skits to go with the songs.

At 9 p.m., they'll hook up a giant neon plug and start the Funkolator, transforming the quiet restaurant into a dynamic disco.

During "Burn Rubber," a motorcyclist will drive down a ramp followed by other characters dressed like the Village People. Another stage made of scaffolding is used when "Macho Man" plays.

Soul Train with EV

An electric car will cruise down Electric Avenue, and customers will form a Soul Train-type dance line along the street.

The Fat Cats Air Band features three guys, all weighing more than 250 pounds, playing out of garbage cans.

One hangout off the dance floor features tables made from galvanized washtubs and garbage cans. Another area is filled with 1940s-style kitchen tables and chairs. Murals of city buildings move to the rhythm.

Employees can be easily seen in their green, glow-in-the-dark Afros.

Source Kansas City Star, Mo. Distributed by Knight Ridder/Tribune Business News. With thanks to Bruce EVangel Parmenter, brucedp@yahoo.com

Call / Request for Technical Articles

A new emphasis will soon be placed on technical articles in Current EVents. Anyone who would like to share their design ideas, or experience in hardware are encouraged to submit articles to CE. For those interested, please contact Kurt Bohan at (510) 814-1864 or Clare Bell at (510) 864-9293.

A Call for Letters to the Editor

Read something in CE you would like to comment on? Do you feel something is being left out? Send us a "Letters to the Editor". You can E-mail us, Fax us or use snail mail at the addresses below:

E-mail: eaanews@juno.com
Fax: 510-864-9293
Snail mail:
EAA/Current Events
Hanger 20, Suite 146
2701 Monarch St.
Alameda, CA 94501

News in Brief

compiled by Ruth M. Shipley from information supplied by EIN Publishing. If reprinted, please credit CE and Ruth Shipley.

Kaiser to Install Chargers

Kaiser Permanente recently announced it will install EV charging stations in five of its medical centers in partnership with the Los Angeles Department of Water and Power, the Los Angeles Environmental Affairs Department, and the Mobile Source Air Pollution Reduction Review Committee. In addition, the Kaiser Permanente Woodland Hills Medical Center recently celebrated the opening of its two charging stations with an opportunity to test drive several electric cars, including a Chrysler Epic Minivan, a Toyota RAV4-EV and the General Motors EV1. Other Kaiser Permanente medical centers that will have charging stations installed include the Kaiser Sunset, West Los Angeles, Panorama City and Harbor City locations.
(BUSINESS WIRE: 8/14)

Shell, Daimler Promote Hydrogen Power

Shell recently announced a research deal with a Daimler Benz subsidiary to develop a new breed of hydrogen-powered cars. Shell hopes to utilize DBB Fuel Cell Engines GmbH's new fuel cell technology to convert hydrogen gas into electric power for future EVs. "The result could be a car which has the environmental advantages of fuel cell power plus the convenience of filling up at an existing [gasoline] station," said the two companies in a statement. Shell wants to unite DBB's fuel cells with its own Catalytic Partial Oxidation technology which converts liquid fuels into a hydrogen-rich gas. Shell said it believes that fuel cells can power engines as well as traditional gasoline and diesel with lower emissions and less noise.
(REUTERS: 8/17)

Alternative Vehicle Growth Predicted

According to market analysts Frost and Sullivan, the market for natural gas fuel cell, hybrid, and electric vehicles is set for massive growth over the next five years. The company is forecasting that a European market for alternative vehicles and propulsion system conversions to alternative fuels, which is today worth $618.8 million, will increase 12-fold to $7.94 billion by 2004. The company estimated that EVs would account for 5.9% of the projected increase, while conversion equipment would account for 54.9%, and alternative internal combustion vehicles would comprise 39.2%. However, Frost and Sullivan also warned that many obstacles remain in place, including the lack of refueling infrastructure, high costs of vehicles and in certain countries, higher alternative fuel costs.
(HARTS EUROPEAN FUELS NEWS: 8/5)

Shell Bets on Hydrogen

Speaking at the recent launch of the Zevco hydrogen-powered London blackcab taxi, Chris Fay, chairman and CEO of Shell UK Ltd., said that Shell UK favors the development of hydrogen as a transportation fuel and has decided to fund research into hydrogen-powered vehicle technologies. "Shell Oil is entering the hydrogen supply and distribution business for [transportation] applications," Fay said in a press statement for Zevco. "This signals the emergence of hydrogen from the status of industrial gas to [transportation] fuel and will effectively launch large scale production with its attendant reduced costs." Shell is joined by such automakers as BMW in support of hydrogen as a preferred option for use as an alternative propulsion system.
(HART'S EUROPEAN FUELS NEWS: 8/5)

BWA Provides Drive Chain for Prius

Borg-Warner Automotive (BWA) recently identified a new application for its custom-designed drive chain as part of the engine system for Toyota's first hybrid EV, the Prius. BWA also noted that several other manufacturers are developing HEVs concept cars that incorporate the Borg-Warner Automotive Morse TEC Chain as well. Toyota's HEV engine configuration includes a battery pack that provides power for the electric motor which drives the wheels, and an internal combustion engine that drives a generator to recharge the batteries. The Morse TEC chain on the engine connects the electric motor to the final drive gearing. In addition, the chain helps drive the wheels during acceleration, and drives the motor during deceleration to help recharge the batteries.
(BWA RELEASE: 8/10)

Court Rejects NY EV Plan

A federal appeals court recently rejected New York State's EV mandate. The decision, by a two-judge panel of the U.S. Court of Appeals for the Second Circuit, reverses a lower court decision which upheld the state rule requiring 2% of all vehicles sold beginning last October to be EVs. The ruling still allows New York to require that 10% of all vehicles sold in 2003 be EVs. Administration officials have not decided whether they will appeal the decision. Automobile manufacturers were pleased with the decision, saying it gives them time to fully develop popular electric cars. The industry had argued that the state's deadlines were unrealistic because consumers have so far shown little interest in EVs.
(NEW YORK TIMES: 8/12)

Nissan Leases Altra EV

Nissan recently announced it has leased its first Altra EV in New York to the New York Power Authority (NYPA). The leasing of the Altra EV to NYPA represents the first East Coast evaluation of the lithium ion battery-powered four-passenger compact van. Since its introduction at the 1998 Los Angeles Auto Show earlier this year, more than 15 Altra EVs have begun operating in California and Arizona. Nissan reported the Altra EV has a driving range of 80 to 100 miles per charge in typical use. In addition, the company noted that during the course of the

lease, the Altra EV will undergo a broad range of performance tests from a fleet management perspective with a particular focus on commercial and consumer battery charging solutions.
(NISSAN RELEASE: 8/6)

Ford, Ballard, Daimler-Benz in New Venture

Ford, Daimler-Benz and Ballard Power Systems have unveiled the new name and logotype of a joint enterprise that will develop electric drivetrains for fuel cell-powered vehicles. Ecostar is one of two new ventures announced last April when Ford, Ballard and Daimler formed a global alliance aimed at becoming the world's leading commercial producer of fuel cell-powered electric drivetrains and components for cars, trucks and buses. The new joint venture company will develop advanced electric drive systems, as well as non-automotive applications such as stationary power units. The second joint venture company, DBB Fuel Cell Engines GmbH, is responsible for fuel cell systems. Ford, Ballard and Daimler together have invested more than $700 million in the alliance.
(FORD RELEASE: 8/6)

Argentina Develops Dual-Fuel Vehicle

At the recent 12th World Hydrogen Energy Conference held in Buenos Aires, Argentina, researchers unveiled what is thought to be one of the only hydrogen-powered cars in Latin America. The vehicle was developed by a team headed by conference chairman Juan Carlos Bolcich of the Centro Atomico Bariloche, along with colleagues from the Usina Popular Cooperativa. The duel-fuel vehicle is a converted Renault 9, and includes a 1,600 cubic-centimeter engine. The hydrogen supply is controlled by an electronic assembly that can be bolted on to the engine without having to change cylinder heads. A 35-liter tank contains hydrogen under pressure. The vehicle uses an electrovalve to switch between fuels as needed, and electronic hydrogen controls are shut off when operating on gasoline.
(HYDROGEN AND FUEL CELL LETTER: AUGUST 1998)

Prius Fails U.S. Emissions Goals

Though the Toyota Prius hybrid vehicle has proven in Japan that it can double gas mileage and dramatically reduce emissions over a comparably-sized internal combustion engine, the Prius has not done as well on city and highway tests conducted by the Environmental Protection Agency, according to a recent Autoweek report. While the vehicle practically eliminates carbon dioxide emissions and cuts carbon monoxide, hydrocarbon and nitrogen oxide emissions by one-tenth on the Japanese test cycle, the Prius falls short of meeting ultra-low-emission vehicle and super-ultra-low-emission vehicle standards set by the California Air Resources Board (CARB). Toyota said it plans to add a second catalytic converter to help meet those goals.
(AUTOWEEK: 8/3)

London Adds Hydrogen-Powered Cabs

London began testing its next generation of taxis recently with the release of a hydrogen-powered prototype into the city's famous fleet of black cabs. The hydrogen cabs, built by Zevco, run on technology developed for manned space applications by Zevco subsidiary Elenco. The prototype vehicles are powered through the use of fuel cells that combine oxygen from the air with hydrogen in onboard pressurized tanks. The vehicles cost about 20% more to build than conventional taxis, but because hydrogen is less expensive than diesel, lifetime costs for running the taxis are about 50% lower. Environmentalists have hailed the introduction of the zero-emission cabs, particularly since recent studies show many taxis fail to meet minimum emissions standards.
(FINANCIAL TIMES: 7/30)

Toshiba and UTC Develop Fuel Cell

The Toshiba Corporation will join with U.S.-based United Technologies Corporation (UTC) to develop small fuel cells for EVs. The companies hope to start commercialization by 2003, and the pair have established a joint venture in the U.S. The new company, International Fuel Cell, is 90% held by major aircraft parts manufacturer UTS, with Toshiba holding the remainder. The companies said the Connecticut-based joint venture will develop small, energy-saving fuel cells capable of generating 50 kilowatts by 2000. Officials involved with the joint venture reported that the new fuel cell will be twice as energy efficient as gasoline engines.
(ASIA PULSE: 8/2)

California Closer to 10% Mandate

California is one step closer to a successful market-based launch of zero emission vehicles (ZEVs) in 2003, according to a report recently released by the California Air Resources Board (CARB). This success is due in part to the advancements made in battery technology. In addition, CARB also reported

that zero-emission fuel cell engines are developing ahead of expectations. Of the four most promising battery technologies, nickel metal hydride and sodium nickel chloride could be available in mass quantities by 2003. In 1990, CARB approved a rule that 10% of new vehicles sold in California by 2003 would be ZEVs. Seven major auto manufacturers have agreed to work with the agency to assist California in reaching its goal.
(CARB RELEASE: 7/30)

Alameda to Offer EV Discounts

In an effort to highlight its commitment to clean energy and innovative technologies, the city of Alameda, CA recently announced a program that offers discounts for EV owners. The Alameda Bureau of Electricity said it hopes the EV discounts will encourage economic development in the city. The program reimburses a set dollar amount per month for EV operators who agree to charge their vehicles primarily during off-peak periods. These times usually include the hours between 8 p.m. and 8 a.m., Monday through Friday, and any time on weekends and holidays. The amount drivers are reimbursed depends on the type of vehicle they own, ranging from $9 per month for vehicles ranging from 750 to 1,999 pounds, to $21 for vehicles weighing 5,000 to 8,000 pounds.
(ENERGY SERVICES BULLETIN: AUGUST 1998)

Japan Establishes Technology Consortium

In an effort to promote low-pollution, fuel-efficient vehicles in Japan, the New Energy and Industrial Technology Development Organization (NEDO) has created a consortium similar to the Partnership for a New Generation of Vehicles in the U.S., and the European Union's "Cars of Tomorrow." The new consortium will be entrusted to the Japan Automobile Research Institute, and will consist of government affiliates and automakers. The program will primarily focus on hybrid models which are able to run on both gasoline and electric power with significantly greater fuel efficiency than conventional cars. The main goals of the consortium will be to improve fuel economy, utilize clean energy, and reduce emissions.
(OXY-FUEL NEWS: 7/20)

PolyStor Wins Phase II Contract

The U.S. Advanced Battery Consortium (USABC) has awarded Phase II of a contract to PolyStor Corporation under the Partnership for a New Generation of Vehicles (PNGV). Under Phase I of the project, PolyStor successfully demonstrated the applicability of its proprietary high-power lithium-ion battery technology to meet USABC/PNGV technical goals for HEVs. Now, the company will develop and test 10 Ah lithium-ion cells and deliver 48-volt (12 cell) battery modules with thermal management and electronics. The 10 Ah lithium-ion cells will output more than 1,000 watts per kilogram of power and weigh just 370 grams. The cells are expected to be available in early 1999, at a cost of $0.50 to $1.00 per watt-hour in the short term, decreasing with time and increased production volumes.

Get Published

Write for CE!

By Clare Bell

Current EVents, as the newsletter for the Electric Auto Association, is a unique publication in the electric vehicle field. Since 1967, CE or the Electric Auto Association newsletter has specialized in useful hands-on technical information for EV builders, would-be builders, enthusiasts and advocates. It also became the vehicle for notifying EAA members about upcoming EVents, such as rallies and shows. Founder Walter Laski utilized the newsletter to publish a series of articles on how to build an electric vehicle using relay and battery-tapping speed control before the advent of the modern PWM controller.

Since then, CE has grown in various ways under various editors, adding other facets to its central mission, including coverage of legislative and political events that have affected EVs, EV competitions, notably the Phoenix APS Electrics race, and articles about long distance runs, battery technology, the accomplishments of EV builders such as Ed Rannberg and Bob Schneeveis and more.

At the Crossroads

Now CE stands at a crossroads. After decades of arguing, pushing, demonstrating and agitating, we have begun to see our dream realized in the form of electric vehicles from major manufacturers. The GM EV1, which has been covered in these pages since its birth in 1990, is no longer a willow-the-wisp or a dim possibility on the horizon, but a real car. Toyota is preparing to market the hybrid Prius in the US this fall. The conversions that we use to show the reality and practicality of EVs are numerous, growing, and still the most affordable way of getting an EV. The number of EV drivers is increasing, bringing in people who have not been part of the hobbyist world. EAA has the potential to expand its membership many-fold, in part by generating a publication to serve both the core community of EV builders and drivers and the new "early acceptors" of the commercial EVs such as the Honda EV Plus, the EV1, the EV Plus, the Ford Ranger and others.

The best way CE can serve this growing and increasingly diverse community is by combining what we have done in the past with what we have done recently, making it better. For that we need writers and we are reaching out to you, our readers.

Experience and Details

The most important things are experience and details. We want the blow-by-blow and the nitty-gritty. CE's readers want to sit behind the wheel of a Honda EV Plus as it is being driven from LA up to San Francisco, wrestle with the charging problems in a Jet Escort, take a trip with an EV Rabbit with a range-extending generator trailer on the back, puzzle out how to fit battery racks in an MG Midget and so on.

Feelings

What sort of feelings does an EV generate? Excitement? Elation? What does it feel like to pass the gas-mobiles on the freeway in a converted Porsche 914 or experience the silky smooth push-you-back-in-the-seat acceleration of an EV1? To load the kids in an electric Rabbit or haul garden equipment in a converted S-10? What does it feel like to run out of juice (yes, it does happen, even to the best of us) and how do you cope with it? Has an EV embarrassed you, frustrated you, made you happy, sad, satisfied, delighted or ? What does your mate think of it? Do you take your pets in it? Do you make long journeys or just bop around town?

Doers More than Dreamers

This sort of writing is even better when combined with technical details. CE's core readership are doers even more than dreamers. Put the screwdriver or wrench in the reader's hands, give them the parts list and the address of the supplier lay the components out in front of them, let them crimp a cable, lay out a wire harness, mount a motor. In short, provide enough information so that someone can actually BUILD something that works. Tell how to build battery heaters or install an E-meter, and give them safety tips when working with batteries. Tell them how to test the vehicle and fix it if it breaks.

Infrastructure

CE also wants to know about experiences with the growing EV infrastructure, including the political and legislative decisions that affect it. Has a public charging station been available when you needed it? What do you feel about inductive versus conductive charging? How can we integrate our existing conversions into an infrastructure that is increasingly designed for the commercial EVs and their specific requirements?

Advocacy

CE has been and wants to continue to be a primary weapon in countering misinformation in other media and stating the truth about EVs. If you have data that shows how EV station car use can spare the air, or a rebuttal to a misleading university study, CE is the place to reach people who use and need that sort of information. If you hear about legislation that could either help or hinder EV use, write a heads-up or alert article.

Chapter News and EVents

Tell CE what your local EAA chapter has been up to. Have you exhibited cars at shows? Do you have a member who has come up with some new ideas or built some innovative EVs? Give us some news or a member profile. And don't forget to submit EVents to the calendar.

You Don't Have To Be Hemmingway

For CE, the writing style is less important than content and organization. You don't have to be a brilliant stylist either, although the piece should be coherent. Liberal use of sub-headings helps organize the information or direct the flow of the article. CE's editor and staff can work with the author of a fairly rough-cut piece and help structure and polish it.

Editing

CE, like other publications, reserves the right to edit for accuracy, length and basic English. Since we like to let an author's style show through, we try to minimize the amount of editing. We will often send an edited piece back to the author for review and correction before it goes to layout. This can be done quickly via email.

Computer Stuff

Computer-generated submissions should either be placed on a 3.5 HD IBM PC formatted disk and mailed, or sent via Internet as text (.txt) or Word for Windows (.doc) files. E-mailed submissions should go to either ce96ed@aol.com (Clare Bell) or eaanews@juno.com (Kurt Bohan)

Photos and Art

CE publishes most photos in black and white, though we have done color covers. We prefer hardcopy color or black and white prints, although we have recently had good results with reproducing electronic images (and they reduce the cost of publishing photos). Prints should be at least 3 x 5, though the larger the better for resolution. Images can be sent via the net or put on disk in either JPEG or TIF format. Resolution should be at least 200 dpi and file size no more than 1.44 MB, or what will fit on a HD floppy. We can handle bitmap, though it gives a lower quality.

We can generate line art by re-drawing from a clear sketch or scanning the material in. We can also can accept computer-generated line art in the above formats. Camera-ready hardcopy is also appreciated.

Returns and Copyright

Hardcopy material will not be returned unless accompanied by a request AND a self-addressed stamped envelope.

Copyright will be in CE's name unless an author specifically requests it in their own name. Reprinted material will carry the original copyright and credit the original source.

So... DO IT

It isn't that hard to write for CE and our staff are willing to work with you. By contributing to CE, you help your fellow EV enthusiasts, assist the EV cause and get warm fuzzies by (wow!) actually getting published.

—CB

EAA CHAPTER LISTING

ARIZONA

PHOENIX EAA

Kathy Watson, President (602) 821-0646
1131 East Flint St., Chandler, AZ 85225-5470
Meetings: 4th Saturday/month, 9:00 am
location varies in Phoenix Arizona, contact (602) 250-2131
Homepage: www.primenet.com/~evchdlr/">http://www.primenet.com/~evchdlr/

CALIFORNIA

NATIONAL EAA HEADQUARTERS

June Munro, Membership Secretary
2710 St. Giles Lane, Mountain View, CA. 94040
HomePage at http://www.eaaev.org/
Tel. 1-800-537-2882

EAST BAY EAA

Kurt Bohan, President (510) 814-1864 or (510) 864-9293
E-mail: eaanews@juno.com
Hangar 20, Suite 146 (CalStart Hatchery)
2701 Monarch St., Alameda Point, Alameda, CA 94501
Meetings: 4th Saturday/month, 10:00am (call for Nov-Dec date)
Hangar 20, Room 215, old Alameda Naval Air Station
From Hwy 880, take Broadway turnoff to Webster St.; from Webster, go through the tube to Atlantic, right on Atlantic to the old Alameda Naval Air Station

NORTH BAY EAA

Chuck Hursch, President (415) 927-1046
13 Skylark Dr. #13, Larkspur, CA 94939-1270
Email: gandhi!chuck@uunet.uu.net
Homepage: www.ecoalliance.com/nbeaa/
Meetings in Santa Rosa, CA: Call (415) 927-1046 for time and exact location.

SAN FRANCISCO/PENINSULA EAA

Kip Smith, President (415) 587-7784
Email: kws@merkle.baaqmd.gov
Homepage: www.geocities.com/MotorCity/1759
Meetings: 1st Saturday/month, 10 a.m.
San Bruno Public Library.
701 West Angus St. (at El Camino)
San Bruno, CA

SAN JOSE EAA

Bob Mueller, President (408) 922-6627
Michael Thompson, Contact Person (408) 997-2404
E-mail: m.t.thompson@ieee.org
HomePage:members.aol.com/sjeaa
Meetings: 2nd Saturday/month, 10:00-12:00 AM, Reid Hillview Airport, 2350 Cunningham Ave. San Jose.

SACRAMENTO ELECTRIC VEHICLE ASSOCIATION

Tim Loree, President (916) 962-3044
2428 Wisconsin Dr. Citrus Heights, CA 95610-7432
Meetings: 2nd Saturday/month, 10am - Noon
SMUD, 6301 S Street, Sacramento, CA
HomePage: www.calweb.com/~tonyc/sevahome.html

SAN DIEGO ELECTRIC VEHICLE ASSOCIATION

Scott C. Kennedy, President, (619) 658-4152
1621 San Elijo Ave., Cardiff, CA 92007
Meetings: 4th Tuesday/month, 7pm
San Diego Automotive Museum
2080 Pan American Plaza,
San Diego, CA.

SILICON VALLEY EAA (Founding Chapter)

Will Beckett, President (650) 494-692, fax (650) 852-8384
4189 Baker Ave, Palo Alto, CA 94306
HomePage at http://www.geocities.com/MotorCity/1754/
Meetings: 3rd Saturday/month, 10:00-12:00 am
Hewlett-Packard, Santa Clara facility
5301 Steven Creek Blvd.
Santa Clara, CA
(Lawrence Expressway and Stevens Creek)

COLORADO

DENVER ELECTRIC VEHICLE ASSOCIATION (DEVC)

George Gless, President (303) 442-6566
2940 13th St., Boulder, Co, 80304
Meetnigs: 3rd Saturday/month. Contact George for time and location

MASSACHUSETTS

NEW ENGLAND EAA

Bill Ryan, President (617) 254-5882
340 Market St., Brighton, MA 02135
Meetings: 3rd Saturday (Jan, Mar. Jun, Sept.) 1:00-4:00 PM
Center for Technology Commercialization, 1400 Computer Dr. Westboro, MA
HomePage: norfolk-county.com/users/ws3f/neeahome.htmcounty.com/users/ws3f/neeahome.htm

PIONEER VALLEY

Karen Jones (413) 549-4999, (413) 253-1633
P.O.Box 153 Amherst, MA 01004
Meetings: 3rd Saturday/month (Jan-Nov.), 2pm
Jones Library (Amhurst Rm), Amherst, MA

MISSOURI/KANSAS

MID-AMERICA

Bruce Edgeworth, President (816) 524-4734
101 N.W. Walnut Str., Lee's Summit, MO 64063
HomePage at http://www.geocities.com/MotorCity/Downs/4214/
Meetings: Leewood Public Library, 117th St. & Roe St., Kansas City. Call Bruce for date and time.

NEVADA

LAS VEGAS EAA

William Kuehl, President (702) 645-2132
4504 W. Alexander Rd. North Las Vegas, NV 89030
Meetings: 3rd Thursday 7:00pm (call to verify)
Desert Research Institute
755 E. Flamingo (corner of Swenson)
Las Vegas, NV

NEW MEXICO

ALBUQUERQUE EAA

Neil Wicai, President (505) 899-8420
19 Santa Maria, Corrales, NM 87048
Meetings: 1st Tues/month, 7:00 PM
Shoney's Restaurant, 9700 Montgomery NE, Albuquerque, NM

NORTH CAROLINA

TRIANGLE EAA

Jerry Asher, Contact Person, (919)403-8137
4 Melstone Trun, Durham, NC 27707
Meetings: 2nd Tues 3:00 PM, odd months
Conference Room, IEL Lab, Centennial Campus, NC State University (call Jerry for details)
(Call Jerry Asher for details)
Email teaa@rtpnet.org
HomePage: www.rtpnet.org/~teaa/

TEXAS

HOUSTON EAA

Ken Bancroft, Contact Person, (713) 729-8668
4301 Kingfisher St., Houston, TX
Meetings: 3rd Thursday each month 6:30PM
Citizens National Bank - Activity Center
5217 Cedar St., Bellaire TX (Take Bellaire exit off West 610 Loop go west on Bellaire about 1 mile to Ferris, turn right one block to Cedar, Activity Center on right)

NORTH TEXAS EAA

Paul Schaffer, President (972)-437-1584
430 Ridge Crest, Richardson, TX 75080-2532
Email: pshf@cyberramp.com
Meetings: 3rd Thursday/mo, see www.engr.tcu.edu/nteaa for time and location

VIRGINIA

CENTRAL VIRGINIA EAA

Brian Murphy, President, (804) 717-9443
3218 Ludgate Rd, Chester, VA 23831
Meetings: 3rd Wednesday/month
Meetings: (call Brian for date, time and location or E-mail for info. at: Frydee@aol.com)

WASHINGTON

NORTHERN OLYMPIC PENINSULA ELECTRIC CAR CLUB (NOPEC)

Karl Schreiber (360) 385-3532
11 Kanu Dr. Port Townsend, WA 98368
Meetings: 3rd Saturday/month, 10 AM
Port Towsend High School Shop

SEATTLE EVA

Steven S. Lough, President, (206) 524-1351, Fax (206)526-5348
6021 32nd Ave., N.E., Seattle, WA 98115-7230
Meetings: Contact Steve for time and location
E-Mail: slough@halcyon.com
WWW Site: http://www.halcyon.com/slough/seva.html

CANADA

VANCOUVER ELECTRIC VEHICLE ASSOCIATION

Bill Glazier, Contact (604) 980-5819
3344 Baird Rd. North Vancouver, B.C. Canada V7K 2G7
Meetings: 3rd Sturday/month 7:30 PM
BC Transit Cafeteria

EAA Chapter List

Chapter contacts and meeting locations. Most verified as of 8/20/98. For information about the Electric Auto Association, call 1-800-537-2882

Board of Directors
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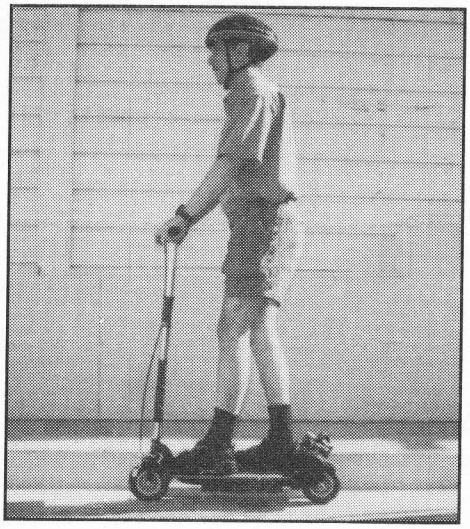
E-mail: BillWed@compuserve.com

FOR SALE - MEMBER WANT ADS -FOR SALE



Folding Go-Ped electric scooter, almost new $300 (half list price), max. speed 14 mph, weight 40 lbs, range 8 mi. legal aboard public transit (no gas). Bob 415-431-8428

For Sale: EV KIT for VW based frame. Motor, controller, battery under carrage, rack, electric parts, etc. for 96/48 volt Bradly. $495. Al Smith, 58 Aruba Bend, Coronado, CA 92118. Tel. (619)575-3830. You pick-up.

Electric bicycles are affordable, dependable, and fun. Adding an electric motor to your bike creates practical transportation for errands and short commutes. Why wait? Get a jump on your dream to 'go electric'. www.electric-bikes.com (408) 262-8975

MEMBER WANT AD RATES

WANT ADS: Print clearly or submit typed copy of your ad with your name, address, and phone number. The EAA is not responsible for the accuracy of ads. Want ads must be received before the 1st of each month and must include payment to run in the next issue of CE.

$10 for the first 35 words. Each additional word, 25 cents. Want ads are available to EAA members for the sale of electric vehicles, equipment and parts only. If you want to run your ad in more than one issue, please specify and include payment for each issue requested.

For corrections or updates, please send a written note or fax to EAA Want Ads at (510) 864-2093. Photographs of your vehicles may be submitted with your ad. If room is available, we run one photo each issue. These photos will not be returned. Send your Member Want Ad request and check payable to:

EAA Want Ads
Hanger 20 Suite 137
2701 Monarch Street, Alameda Point
Alameda, California 94501

Help CE get organized

CE is looking for a

Program Workflow Management Editor

Responsibilities include: tracking workflow, re-contacting possible story contributors, assisting in proofreading, and related duties. Should live in the Bay Area. If you are interested in volunteering for this job please contact Kurt Bohan at 510-814-1864.

Hope to hear from you,
CE staff

Electric Auto Association (EAA)
Membership Application

New Member: ._____ USA: ._____ Note: EAA membership dues are
Renewal: ._____ Canada: ._____ tax deductible in the USA
Other Country: ._____ as allowed by the IRS.

Date: .____/____/_____

Name: ._____ Company: ._____
Street: ._____ Phone: . Hm-_____ Wk-_____
City: ._____ Fax: ._____
State: ._____ Zip:_____ Country: ._____

If a new member, where did you hear about the EAA ?_____
EAA Chapter you attend or support:_____
I need chapter information:_____

Membership / Vehicle Information — Please complete if new or changed

Please identify your primary areas of interest relating to EAA
(Please rank your your choice with a "1" being most important, "2" second, etc.)

1: ._____Hobby / Builder
2: ._____Professional (EVs are a source of income for you)
3: ._____Competition (Rallies, Races, and Records)
4: ._____Environmental and Government Regulations for EVs
5: ._____Social (Rallies, Shows, Dinners, Other)
6: ._____New Technology and Research
7: ._____Promotion and Public Awareness of EVs
8: ._____Student or General Interest
9: ._____Electrathon / Bicycle / Off-road Vehicles
10: ._____Owner / Driver of Electric Commute Vehicle
11: ._____Other: Please Specify:_____

Number of total EVs you have ever owned ?:_____
Number of EVs you now own ?:_____

Please describe any Electric Vehicles you now own or are building: (if more than one, attach information on each)

Vehicle Lic#:_____ State:_____ Country:_____
Vehicle Type:_____ Make/Model:_____ Model Year:_____
Converted Yr:_____ Number of Wheels:_____Motor Type:_____
Controller type:_____ Batteries: No./Type:____/_____ %Completed_____
Pack Voltage:_____ Avg. EV Mi./Week:_____ Avg. EV Trips/Week:_____
Other Features:_____
Comments:_____
_____

Please make your check or money order for appropriate amount (see below), payable to the Electric Auto Association, fasten it to this form and mail it to :

Electric Auto Association
2710 St. Giles Lane
Mountain View, CA. 94040 USA

USA $39 /yr (U.S. Dollars only)
Canada $42 /yr International $45 /yr

Note: All information and statistics in this application are for the exclusive use of the EAA. We never sell or loan our mailing lists.

ver 8/29/97

EAA Store Order Form

Printed materials

CE	Selected Current EVents (specify specific issue)	$3.00 each issue
CEFY	Current EVents - Full year {specify specific year)	$20.00 each year
PB001	Discovered: The Perfect EV Battery	$2.00
FW001	Flywheel Energy Storage	$5.00
BG1997	1997 Buyer's Guide to Electric Vehicles (April 97 CE)	$6.00
BG 1996	1996 Buyer's Guide to Electric Vehicles (Feb. 96 CE)	$5.00
BG1995	1995 Buyer's Guide to Electric Vehicles (Feb. 95 CE)	$4.00
TT001	Team Tucson Land Speed Record Plans	$5.00
IDX001	EAA Current Events Index - 10 Years!	$4.00
XA100	EAA XA-100 Hybrid	$5.00

Other EV items

BS800	Bumper Sticker with 800 number 3.75x15 inch	$3.00
BS002	Bumper Sticker with "the Switch is On", 3.75x15 inch	$3.00
CAP001	100% Cotton Cap, Forest Green with Yellow Ink	$8.00
DC001	Decal - black and red, 3x9 inch, for Window	$3.50
KC001	Key Chain with LED light and "30 Years 1967-1997"	$2.50
MUG002	Thermal Mug	$6.50
MUG003	Porcelain Mug	$5.50
PS001	Polo Shirt w/ embroidered logo select shirt color & size: Teal Green, Forest Green or Navy (s,m,l,xl)	$30.00
SS001	Auto Window Sun Shade with Logo	$8.00
PN001	Ball point writing pen with EAA and 800 number	$1.00
CS001	Current Solutions/Motor Show Video Tape (14 minute runtime)	$15.00
WL001	Window Literature Holder (fits pages 8 5 x 11 inch)	$25.00
PARK01	"EV Parking Only" Sign (18"x12") green icon	$25.00

Electric Auto Association Store Order Form

Send order to:

EAA Store
5820 Herma St.
San Jose, CA 95123-3410

Name _____ Phone _____ _

Address _____ _

City _____ St, _____ Zip _____ _

Item #	Size/Color	Quantity	Item Description	Unit Cost	Amount

Subtotal	
Postage (10% of subtotal, for USA*)	
Handling	$2.00
Total	

* for Canada add 15% or for other foreign destination add 25 % for postage

ELECTRIC AUTO ASSOCIATION

2710St. GilesLane, MountainView, CA94040

• Address Correction Requested •

NON-PROFIT ORGANIZATION U.S. POSTAGE PAID SUNNYVALE CA PERMIT NO. 420

• Time Dated Material - Please Do Not Hold •