Electric Auto Association

CURRENT EVENTS

March-April 2001 Promoting the use of electric vehicles since 1967 Vol. 33 No. 3&4

REVA IS READY

REVA LAUNCH IN NEXT JANUARY (the battery-driven passenger car is to be priced Rs2-2.5 lakh 02/11/2001 India Business Insight Copyright (C) 2001 Silverline Information Systems Pvt. Ltd.; Source: World Reporter (TM) [currency conversions and additional comments by CE staff.]

The Reva, the battery-operated passenger car, is slated for launch in Jan 2002.

Reva Electric Car Company Ltd has manufactured it with financial aid from the Technology Development Board (TDB).

The car is priced Rs2-2.50 lakh [Rs200,000-250,000 = US$4,300-5,400]. It is equipped with battery charging facility making it easier to recharge anywhere and any time.

Even before the country's first and much delayed electric car 'Reva' could hit the city streets, its maker — the Bangalore based Maini group is now charging up plans to roll out special variants on the electric vehicle (EV) platform targeting specific user segments as taxis, resorts and big corporations.

Likely to sport a price tag of under Rs 2 lakh, Reva has been billed as the cheapest car on Indian roads. Being produced under a joint venture between the Mainis and Amerigon of the US, the car will be launched commercially in April, Reva Electric Car Company (RECC) senior vice president Vijay Chandy told The Times of India.

"We will be launching the car initially in Bangalore and in a phased manner roll it out in Chennai, Mysore, Hyderabad and Coimbatore. We are initially targeting the smaller towns and planning to make it a success story there before going national, which is likely to take place in the first quarter of 2002."

The company has already commenced preproduction of the vehicle and at current duty levels, is targeting a price tag of 2-2.5 lakh. "We expect import duties on certain components of EVs to be reduced in the forthcoming budget and so bring down the price to under Rs 2 lakh," Chandy added. The car boasts of a running cost of 40 paise per km [US$0.014/m].

With the Reva project in its final stages of commercial launch, the company is now looking at expanding its product portfolio and introducing more variants on the car. "We will be bringing out special variants targeting the taxi segment and also for transportation within resorts and big complexes."

The Maini group, which controls 67 per cent stake in RECC, has invested Rs 80 crore [Rs800,000,000 = US$17,200,000] to set up a greenfield site for the project. With an installed capacity of 10,000 units per annum, the company expects to breakeven at mere 3,000 units per annum. The company expects to sell 1,500 units in the first year of operations and later ramp up production to 3,000 units in the second year, 10,000 units in the third year and then 12,000 units each in the fourth and fifth years.

The two-door hatchback can carry two adults and two children and achieve a top speed of 65 kmph [46 mph]. One full charge will last for 80 Km [50 miles].

Power is provided by eight 6-volt [48 volt, 200 amp-hr] tubular lead acid batteries specially developed for Reva's power pack and have a life cycle of approximately 40,000 km [25,000 miles] or 3-4 years. 220 volt, 2.2kW On-Board Charger to provide 80 % charge in 3 hours; 100% in 6 hours.

[Website: http://www.revaindia.com/]

Additional information on Page 3.

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PHOTO CREDIT - COVER STORY

REVAINDIA publicity photos demonstration family and business uses.

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From the Chair and Co-Chair:

There have been many changes in the last few months beginning with the election of four new Board members (the current Board totals 9). Roles on the Board have shifted and the transition process because of this is complex. Our main focus for the immediate future is twofold.

First is on CE, (the EAA lifeblood), which will be managed by our Secretary, Ed Thorpe. Under this new organizational structure which you are reading about now, we plan for an aggressive publication schedule considering the number of new players involved in the process for the very first time.

We plan on having a staff of workers, with physical diversity to assist in the creating a backup production strategy. A regular publication schedule is of paramount importance to the Board.

Second is that many new features will be evident in the new issues including (but not limited to), the addition of two column writers that are sure to please the techies in our organization. Feedback and suggestions are always welcomed and encouraged.

Another focus concerns membership. This critical role has changed hands after many years of commendable effort by Anna Cornell, who took this on after it had been done by June Munro almost since the founding of the organization. With membership running about 900 members (having peaked at around 1600), this can be one of the most time-consuming and demanding positions in EAA. Monthly notices are sent out including a final notice for members that have not renewed for two months since their anniversary date has passed. Notices are also sent one month to two weeks prior to membership renewal dates. This causes a constant flow of mail to the membership address, triggering database updates and the sending of the confirmation/membership card.

Please hang on to these cards. We hope to add membership benefits that may require the use of this card. Stay tuned!

Yet another Board focus in the short term is on our organization's operational bylaws. Many of you may have heard that the Silicon Valley Chapter has been suggesting an update to the EAA bylaws. This began with the purpose statements, which are for the most part the original from 1967 and don't reflect changes in the vehicle industry (which now includes using fuel cells as a power source). In this issue you will see the suggested modifications and we encourage our membership input during this review process. The Board has asked a committee to review suggestions for updates to the bylaws headed up by Will Beckett. Will has found that some legal sections of the bylaws are out of date and need some minor language adjustments to conform with current California Law. These will be corrected at the Board level and only affect the administrative functions of the Board. Anyone interested in participating in the updating of the bylaws should contact Will.

Finally a special note to those members that are not living in California. It has long been a problem addressing issues for all our chapters. It is the hope of the Board to now concentrate more on these chapters and their activities. Many special happenings don't receive nearly enough recognition, such as the TEAA (Triangle) Carolina EV Challenge, providing high school students across the southeast with a "hands-on" opportunity to learn about the transportation challenges facing us today. More information about chapters will be profiled in future CEs. In addition, the Board will actively be seeking new Board representatives from all different parts of the country. Telephone conferencing will be used to allow these board members to attend Board meetings remotely. Look to chapter listings for updated contact information. We encourage you all to contact a chapter near you and inquire about upcoming monthly activities in which you might participate and support our cause.

All of the Board members are excited about the coming year and look forward to the new direction the EAA is taking. Our priorities include CEs that are regular, full of interesting and current information, plus expanding our membership thereby demonstrating a high amount of interest in using electricity as a power source for vehicles to reduce pollution and create a safer transport for the mobility of people.

Thank you for your patience and support of the EAA.

Ron Freund, EAA Chairman
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Will Beckett, EAA Vice Chairman
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Cultural Perspective on India and the REVA: The average annual income in India is Rs18,365 [US$395] in Bombay and Rs10,363 [US$223] in Calcutta according to 1998 statistics; see: http://www.mapsofindia.com/maps/india/percapitaincome.htm]

REVA Web Discussion List and Information: http://geocities.com/reva_drivers

how it works

Ultracapacitors deliver jolts of power

Ultracapacitors, capable of storing vast amounts of electrostatic energy, can supplement or even supplant batteries in many applications.

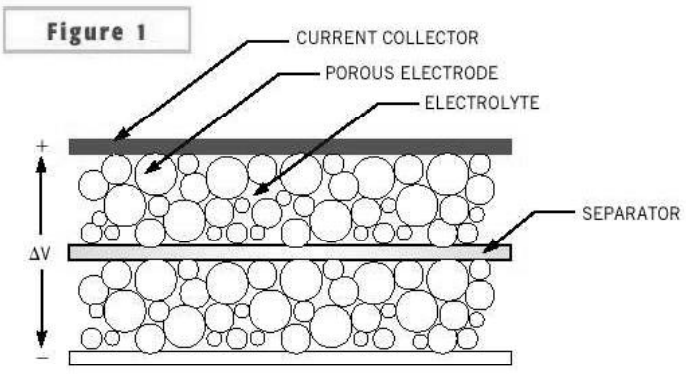
Bill Travis, Senior Technical Editor

A class of passive devices, variously called ultracapacitors, supercapacitors, or electrochemical capacitors, are anything but passive in the wallop of power that they can deliver. They store energy in electrostatic form, unlike batteries, which use electrochemical processes. Ultracapacitors have ratings that can reach thousands of farads (*billions* of microfarads!). They don't approach the volumetric energy density of batteries, but they can deliver much more instantaneous power than a battery can provide. What's more, you can charge an ultracapacitor much faster than you can charge a battery, and the capacitor is amenable to many more charge/discharge cycles than a battery can accommodate without degradation. An ultracapacitor is environmentally safe; it uses no toxic materials, such as the lead and sulfuric acid you find in a lead-acid battery, and it emits no gasses, such as the hydrogen a lead-acid battery emits.

Figure 1 shows the construction details of a double-layer ultracapacitor. The capacitor contains two particulate-carbon electrodes formed on conductive-polymer films. An ionically conductive membrane separates the two electrodes, and a potassium-hydroxide electrolyte permeates the capacitor. The micropores in the carbon particles result in an enormous surface area, yielding extremely high capacitance values that conventional capacitors cannot attain. The ultracapacitor bridges the gap between conventional capacitors and batteries. Though its energy density is only a fraction of that of a battery, it has certain advantages over a battery:

- You can charge and discharge an ultracapacitor almost indefinitely, whereas few batteries can accommodate 1000 cycles.
- You can charge an ultracapacitor instantaneously, whereas fast charging can damage a battery.
- An ultracapacitor can provide high discharge currents, whereas batteries suffer reduced life with frequent high-power pulses.
- An ultracapacitor requires no maintenance and is robust in severe environments.
- An ultracapacitor uses nontoxic and relatively inexpensive materials.

Figure 1



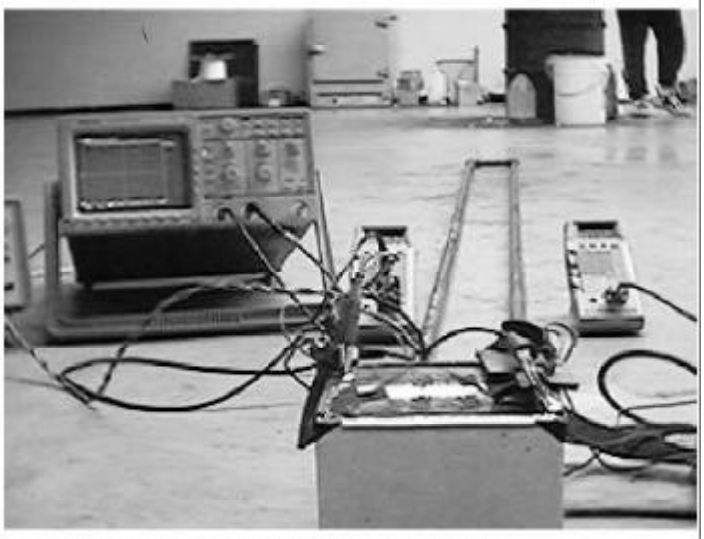
Carbon particles provide a large surface area; hence, an ultracapacitor has high capacitance values.

Figure 2

This hefty ultracapacitor has a rating of 65F, 14V.

Evans Capacitor Co (http://www.evanscap.com/) reveals some details of an ultracapacitor's construction (Reference 1). A MegaCap with a rating of 65F, 14V (65 million µF) contains many thin cells in the form of 0.04x5.75x5.75-in. squares (Figure 2). Because the voltage rating of one cell is only approximately 1V, the MegaCap cells connect in series to attain the 14V rating. The assembly then has the stacks of series-connected cells connected in parallel to attain the capacitance rating. Packaging the cell stacks to form a useful ultracapacitor presents some difficulties. The particulate-carbon electrodes need the application of pressure to provide high conductivity. A pressure of 80 psi equates to a compressive force of approximately 2600 lbs for this cell size. To keep the cells under this force, the MegaCap uses a steel sleeve capped by stiff polymer end plates and an air spring between the cell stacks and the end plates. The final product consists of five 18-cell stacks.

Figure 3



A length of steel pipe serves as a dummy load in the ultracapacitor tests.

The MegaCap has an inherent time constant of 0.6 sec, which indicates that its effective series resistance is 9 mW. To test the MegaCap, Evans configured a dummy load consisting of a 20-ft, 3-in. section of ½-in. steel pipe bent into a large U shape (Figure 3). The connections to the capacitor and switch used large, low-resistance copper cables. With the capacitor removed from the circuit, measurements at 1, 5, and 7A revealed the total resistance of the dummy load was 7.9 mW. Voltage monitored across a 1-mW section of the load provided the current measurement. Evans used a Tektronix (http://www.tektronix.com/) TDS 320 digital oscilloscope to record the capacitor and ammeter voltages during discharges. The scope automatically multiplied the capacitor and ammeter voltages to provide a plot of power dissipated in the load.

The test setup used a sampling rate of 500k samples/sec to observe the first millisecond of the discharge (Figure 4). The spikes appearing before the exponential discharge curve came from switch bounce. These spikes are narrow enough to not appreciably affect the total energy stored in the capacitor. The peak power recorded is 12.5 kW (Figure 4). In the results of a second test, recorded at 100 samples/sec, the power curve shows most of the discharge but doesn't have the resolution to show the initial 12.5-kW peak (Figure 5). The MegaCap exhibited relatively low leakage current. After an initial 24-hour burn-in charge, the measured leakage current was 2 mA at 14V. The device under test stored 6.4 kJ of energy at 14V for a calculated energy density of 2.4J/cm^3 . Evans is developing larger versions of the MegaCap, which will store more than 40 kJ of energy, with energy densities as high as 4J/cm^3 .

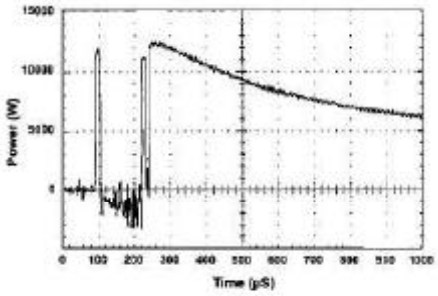


Figure 4 The MegaCap discharge produces a peak power of 12.5 kW in the load.

Some other companies make ultracapacitors with higher capacitance ratings than those from Evans. The PowerCache division of Maxwell Technologies (http://www.electroniccomponents.com/), for example, offers a 2500F, 2.5V unit that measures 6.34x2.44x2.42 in. The capacitor caches 7.8 kJ of energy. Ness (http://www.ness.co.kr/) makes 2.3V ultracapacitors that offer capacitance ratings as high as 3500F. NACC-Mallory (http://www.nacc-mallory.com/) offers the MEC series, with capacitance ratings as high as 2000F. The MEC devices come in asymmetrical and symmetrical versions. The asymmetrical units use a somewhat different electrode configuration from the standard carbon system. You must observe polarity for these units, and you must maintain a certain minimum discharge voltage, as with a battery. The symmetrical units are nonpolarized, and you can discharge them to as low as 0V. Asymmetrical MEC ultracapacitors are available with values reaching 2000F, 12 and with energy-storage capacity as high as 144 kJ. At the other end of the capacitance spectrum is a series of ultracapacitors from AVX Corp (http://www.avxcorp.com/) dubbed BestCap. These small units specify capacitance ratings of 0.06 to 0.2F at 5.5V.

Ultracapacitors find many useful applications. In hybrid gasoline/electric vehicles, for example, they can supplement the battery by providing bursts of instantaneous power. The ultracapacitors readily absorb large amounts of energy from regenerative braking and efficiently release this energy for acceleration. In another application, engine-starting ultracapacitors can also supplement batteries by supplying instantaneous starting power, thus extending the life of the batteries. The devices also fulfill a load-leveling function by supplying bursts of power during peak-energy periods.

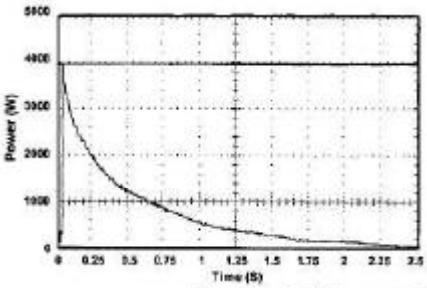


Figure 5 The area under the exponential discharge curve represents a lot of kilojoules of energy.

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REFERENCE

Blakeney, RS, "Performance of a New Line of Large Carbon Double Layer Capacitors," Application Note, Evans Capacitor.

This article ran on page 42 of the March 1, 2001 issue of *EDN*.

Feel Good Cars' Renault Dauphine EV Conversions

Canadian electric car launched at Toronto auto show TORONTO - 02/14/2001 Canada NewsWire [http://www.newswire.ca/ cnw@newswire.ca] A Canadian company is launching a street-legal fully electric four-seater car at the Canadian International Auto Show, opening in Toronto, February 16, 2001.

Feel Good Cars' Dauphine Electric is a restored Renault Dauphine, a car first produced with an electric drivetrain in the 1960s. Feel Good Cars' recycled version is fully electric, unlike the hybrid vehicles now available only in limited numbers. It comes equipped with a state-of-the-art electric motor and fully sealed battery system. Many safety and comfort upgrades will be added to satisfy the demands of today's consumers.

"It's a car for people who are concerned about urban pollution, soaring gas prices and the high maintenance costs associated with traditional gas- powered cars," says Feel Good Cars president Ian Clifford. "We think it will appeal to those who want to drive a unique yet practical vehicle that says something about who they are and what they believe in."

Clifford's company, based in Toronto, has a number of similar eco- friendly projects on the drawing board. Down the road, they plan to release lower-speed electric commuter and delivery vehicles and taxis, and they are even looking at launching a 35-foot electric lake cruiser.

Feel Good Cars is taking orders for the Dauphine Electric at the Toronto Autoshow and will have vehicles on display at their field-level SkyDome exhibit, position A1, next to the Land Rover display.

A special media event is being held at the exhibit from 3:30 to 5:30 p.m., Wednesday, February 14. The Feel Good Cars partners will all be present to speak to the media, as well as a special guest, Jack Gretta. Mr. Gretta sparked Mr. Clifford's interest in electric vehicles when he sold him a vintage Henney Kilowatt electric car several years ago. A retired pilot, Mr. Gretta has been driving electric Dauphines for over 35 years and is a passionate proponent of these vehicles.

The Dauphine Electric accelerates up to 100 kilometers an hour [62 mph], and on a single charge will travel about 80 kilometers [50 miles]. Charging costs are a fraction of what you would pay to fuel a gas-powered car, and the vehicle is equipped with a special regenerative motor braking system that cycles power back into the zero-maintenance batteries while the vehicle is slowing.

Is distance an issue for fully electric vehicles? "Our car isn't a cross-country cruiser, but many drivers don't realize how rarely they drive more than 80 kilometers a day," says Clifford. "For trips that are beyond that range, consumers can rent a conventional vehicle, or use one of the car-sharing services that are becoming more popular."

Clifford suggests that consumers try the Feel Good distance test. "At the beginning of your driving day, zero the trip meter in your car," he says. "At the end of the day, write down the distance you travelled. After a week, if most of your days are less than 80 kilometers [50 miles], you're a good candidate for our electric car."

Dauphine Electrics come with a one-year bumper-to-bumper warranty. For more information on Feel Good Cars and their electric vehicles, visit their web site at www.feelgoodcars.com or call Feel Good Cars at 1-416-535-8395.

/For further information: John Peck or Don Huff, 1-416-487-1012, e-mail jpeck@idirect.com; Photos and media kits are available on request, or on-line at the Feel Good Cars Web site, www.feelgoodcars.com/ 06:00 ET

[Note: Dauphine requires a deposit of $1,000 CDN, made out to: Feel Good Cars "In Trust", to reserve a car. It is estimated that the purchase price of the vehicle shall be between $20,000 and $25,000 CDN but may exceed that amount. In purchasing a Dauphine Electric vehicle, if you live in Ontario you may qualify for a refund of Ontario retail sales tax of up to $1,000 under the provincial "Vehicles Powered by Alternative Fuels Refund Program".]

Wilde Evolutions
Ad

EVA Electric Vehicles of America
Ad

Rick Brown's Dual'in 7

LAS VEGAS NEDRA EV DRAGRACE

The Las Vegas NEDRA Event was a good one and one I will remember. First I would like to thank Richard Furniss for making all the arrangements for the Event and making sure we had power to recharge. It was fun to meet new people too - David Stensland and Dale Glubrecht. I know I met others too. Forgive me if I didn't get your names completely in the hustle and bustle of preparing my car for racing and meeting and greeting the curious gasser drag fans.

I had made a couple of changes for this NEDRA Event. The D'7 received new rear end gears to improve it's launch. Also, I didn't use the dump pack for charging since it's 82 ah battery pack didn't really need much charging between runs. I had my shop charger built to the point where I could use it. Some of you that attended the race probably noticed it. It is a custom-made aluminum box with gages for AC amps in, DC volts and DC amps out. It has one of the Anderson connectors to connect my charge cord to it.

We (my family) arrived at the track at 4:00. We found the NEDRA folks and unloaded the D'7 immediately. After unloading and checking systems, I asked Dave Hawkins if he wanted a ride and we zipped over to the Tech line for inspection. It's always fun to watch the NHRA tech inspectors when they first see my car. Usually a wry smile comes over their faces and they say some thing like, "Oh geez." Or, "An electric, huh." They don't have the slightest clue how to tech my car. Some will look at my kill switch mounted on the back, but most simply sign my ticket and go on to the next car with a smile.

After charging for a while in the special area set up for the electric cars. John Wayland decided to go to the staging lanes for our first run. You've heard the term, "hurry up and wait"? Well, that describes drag racing at a crowded strip. We were finally waved in to the pre-staging area where we could see the light tree. They were using pro-lights where all the yellows go on at once and green immediately. Very quick! John motioned to me to roll my window down and he wanted to be sure I saw how the lights were going. I nodded, but I wasn't really concerned about my reaction time since I wasn't bracket racing and I wanted a clean run so it would count as a NEDRA record.

We were finally waved in. I made a last check of voltage and the bright green flashing LED on my instrument panel that tells me the by-pass contactor is armed. We staged up. The D'7 lined up with the mighty White Zombie. I was certainly an underdog in this race but it's John Wayland driving the Zombie anything can happen! When you stage up, your eyes are glued to the light tree. First stage light second you're in position! READY blink.blink.blink.GO!! John hit it as soon as the first yellow light blinked and red lighted. I waited till the last yellow and stomped hard. I cut a near perfect light at .54. The wide BF Goodrich Drag Radials dug in hard and launched the D'7 down the track. I was watching rpm pretty closely and pressed my foot down on the footswitch to engage the overdrive. 4600 rpm went down to 3600 in an instant. About mid track I noticed that the Zombie hadn't, handily, passed me yet! Could it be?! I press down even harder on the go pedal, just for good measure. When I entered the traps I saw the win light go on in my lane. Yes! I saw John come up beside me, he indeed finished the race and nothing blew-up, but something had to

be wrong.

We went down the return track and I got my time ticket from the timing shack. It was a good run and a new NEDRA record by .05 seconds. It was 15.71 sec., at a touch over 80 mph. They had changed the timing of the lights on us and John reacted to the first yellow instead of the last. He should have rocketed out in front of me too, but the extra power of the Zombie wasn't an advantage on this track. John smoked his tires pretty good then let off a little, stomped down again and smoked them again. His 60' time was over 3 sec, mine was about 2.1sec.

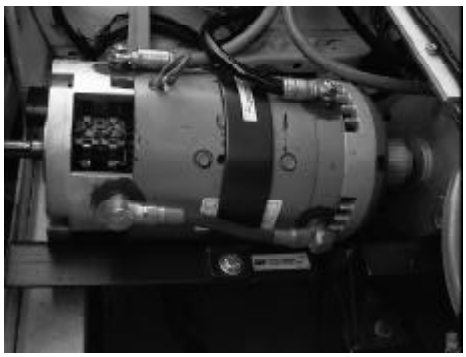
John got his revenge, sort of, on the next run. This time we both launched legal and as would be expected he jumped out ahead and gradually left me behind. But, as usual, <g something went bang(!). At the middle of the slow down track , he let me come up beside him. When I looked over he made a gesture shrugging his shoulders and putting his hands in the air. I didn't understand, but since he was going so slow I decided to beat it down the return track to the timing shack and see what I did. All the way down the return track I kept looking in my rear view mirror for the Zombie. I got my timing slip and decided to turn around and go back up the return track to see if I could find John. As I went up the return track, some of the very fastest supers and pros were coming back down uh ohh. I got up to the end where it turns on to the slow down area and there was John outside the Zombie. He said, "Got a tow rope? " I said , "No. But I can give you a ride hop in!" John thought he had blown the 'Zilla controller under the hood, but it turned out to be a battery, in the car behind him. <g

There is a lot more that went on, some comical, some not so funny. But it was great to get together with the amp heads and the EV listers. We unfortunately were rained out, leaving people wanting more much more. Well there's always Bandimere in May or your local dragstrip!

Rich Brown RichSJ@aol.com
San Jose, CA
Dualin'7 NEDRA multiple record holder

Details Diary - White Zombie Photos by Bruce Parmenter

White Zombie front


Dual inline motors

Rear View


Dump charging port


Under the hood


Interior view


Godzilla controller

Emergency kill switch

Las Vegas Race 2001

Hi, all I want to thank everybody that came and made this a EVent to remember, a few of the racers got in some time runs on Saturday night before the race was called because of a light sprinkle, when your going this fast you don't want wet pavement.

The big excitement was Friday night when the fastest car at the drag strip was an electric, Dennis Berube in Current Eliminator put on a great show, the car sounded like a loose fan belt with the rear tires slipping for more than half the way down the track, if the track was warmer and sticker he would have needed his parachute for sure.

Sunday was the rain day for the race, 11am sunshine everywhere, we were down to four electrics there was Bill Dube with the mega-cycle, Don Crabtree "Father Time" with his cycle, The Silver Bullet was there and broke there own record (check the NEDRA site for official times) and me with the Watts UP EX-7, I raised the bar for the SC/C class by over 1.3 seconds turning in a 16.618 time, JEZZZZZ it was fun. Bill got in some testing his new bike, now its back to the shop for some tweaking before Bandimere, keep your eye on this one, its built to go fast. Father Time was scratching his head trying to figure out how to get just a little more speed out of it. The people with the Silver Bullet was all smiles, the Wilde boys, Don Crabtree son and the driver (can't remember his name) they tried some different things and it worked because they shaved some time off there own record.

For me, it was the first time on a drag strip and I was just a little scared, the other guys gave me a lot of tips on staging the car, then when I got to the front of the staging lane I told the track official it was my first time and he and his partner walked me through it, showing me where the lights were and lining me up on the track, these guys were great. So now I'm staged waiting for the tree to start lighting up, when the light turned green I took off normal (not wanting to brake anything) then about five feet later I hear something like you hear when your driving through gravel so I let off the throttle thinking I broke something, then I realize it is just my tires and that sticky stuff they put on the track for traction <g so I step on the throttle again trying to chase down the Silver Bullet way off in the distance. My second run was much more fun, I just eased in to it and went for a ride, I was up against the Silver Bullet again, and on this last round of the day for the EV's we both broke records.

Many, many thanks to Bruce EVangle Parmenter for all the pictures he put up on a special site to record this NEDRA EVent, also Scott Condos & Apco Equipment for the donation of the generator for charging, and my thanks to the NEDRA guys along with all the fans and racers.

www.lasvegasev.com
Richard Furniss, Las Vegas
"Richard Furniss" <rfurniss@earthlink.net

Photographs by Bruce Parmenter.

IEEE APEC 2001 Conference Report

By Mark E. Hanson, Copyright 2001

The APEC 2001 (Applied Power Electronics Conference) was held Sunday March 4th through Thursday March 8th in California with classes held each day from 8 am to 5:30 pm as well as 110 exhibitors in power electronics components. This was the best international conference at the best cost I've been to.

Energy Efficiency:

With single stage PFC being the holy grail of switchers, several presenters showed some topologies for accomplishing this. All schematics are in volumes 1 and 2 of the proceedings or the CD-ROM I have. With the non-PFC switcher having a power factor of .63, PFC is desired in most new designs. The most promising for small switchers <150W was a single MOSFET switch flyback using a Unitrode (TI) UC3844 presented by Y.S. Lee from Hong Kong. The single fet switch pulsed the charged inductor (flyback) as well as the PFC choke through a diode in discontinuous mode (required for PFC). Stability at full power and low line conditions was somewhat unstable. This is because the PFC front end has to track with a comparator the current (voltage wave across a shunt resistor) and the voltage waveform after the incoming bridge and match the waveforms by PWM a boost converter in discontinuous mode at the same time regulating the output bus to 382 volts.

With a single stage PFC - power supply, add to this voltage and current regulation of the supply and this becomes a bit tricky under all four conditions, i.e.; high - low line and high - low load. Since the flyback topology lends itself to a simpler PFC approach, it is usually chosen for single switch PFC which limits this to <150W. Anything greater is traditionally done in two synchronized stages. EMI is also a problem with flybacks and Power Integrations with their TopSwitch has tackled the problem with frequency dithering. Since a flyback is similar to a boost converter topology, if the bulk cap is removed and heavier secondary caps are used for 60 hertz filtering, pseudo PFC can be had.

Semiconductors:

Bill George - On Semiconductor gave a plenary talk on energy efficiency. Ghost loads (wall warts and remote control sensing circuitry) are the largest waist of electricity in the US. The UL energy star rating seen on new electronic items addresses this problem. These 24-hour quiescent loads are 50W per household or 1.2kwh per day (10W per boob tube) or 1.3 terrawatts in the US. The new PowerTrends controllers for switching supplies have a standby operation that doesn't require a dummy load as used in traditional switchers to maintain a stable loop when the load is disconnected. On Semi, Unitrode(TI) and LinearTech LT1509 and others also have this feature for UL energy star ratings. Power supplies must sense load demands and go into low < .6W leakage standby mode for UL energy star rating. Since switchers are inefficient at light loads they could go into an interval mode and operate in short frequency bursts.

Planar 36V Alternator/Starters:

Planar 36V (42V) alternator/starters built into the flywheel will have the greatest auto efficiency increase by getting rid of belts and pulleys. As all autos move to hybrids with electric assist resulting in smaller gas engines, this will have an overall 30% increase in mileage. With a dual system proposed by Ford 14V & 42V all vehicles will be hybrids by 2010. Presently vehicle systems are 1.5kW and will go to 40kW with propulsion. In order to help fuel economy, electrocam variable valve actuation, direct injection and exhaust after-treatment will be used. DC/DC converters are designed for the 42 - 14V conversion with a peak overvoltage of 58V and a minimum start voltage of 25V with tighter regulation required than present day 14V systems. Load dump protection is required for when the battery looses connection. On-Semi is developing overvoltage clamps for this higher power using a zener, resistor and a MOSFET clamp since present day MOV's are not sufficient.

New Capacitors:

Ian W. Clelland, MLP - Multilayer Polymer by ITW, Lynchburg, VA capacitors are better and cheaper than traditional MLC multilayer ceramic. They are twice as good in ESR as wound jelly-roll caps down to a couple mill-ohms. They won't short and develop a runaway link will open reducing capacitance slightly. They are better for SMT applications than ceramic since the polymer is flexible and won't crack at solder joints. Traditional X7R caps have a 20% reduction in capacitance at 48V whereas polymer caps don't.

Single Stage PFC:

Jindong Zhang with VA Tech, Blacksburg VA Used an interleaved PFC for large >1kW systems to reduce EMI. Twin PFC chokes fets and diodes were used. Interleaved synchronizing of the inputs was required for proper operation. He also developed a 450W forward converter with a single stage front end which is an interesting circuit using one MOSFET switch, two diodes and two chokes communed to the power transformer.

Telecom Converter:

O. Garcia with Alcatel in Raleigh NC designed a telecom converter with 40% cost reduction and 50% less losses (reduced energy consumption) than traditional supplies. With 240vac in the DC buss operates from 260-370V and uses synchronous rectification for efficiency on the 48V telcom and 5V data terminal outputs. A tapped primary is used for different input voltage variations. A copper foil secondary is used for better efficiency. 87% at full load and 64% at low load was measured.

ZVZCS:

Roger Gules from Brazil developed an isolated DC-DC converter using zero voltage switching (phase shift modulation) and zero current switching (resonant mode). His push-pull resonant design achieved 94% efficiency at full load. He used 120kHz for the PFC front end interleaved with a 80 kHz frequency for the main supply. (See his circuit as all others in APEC 2001 Volumes 1 & 2). Lucent also demonstrated a ZVZCS single stage PFC but had no hold up time (typical 20ms) due to no input bulk cap. It operated at 4kW 80 kHz and was a bi-directional DC-DC converter, very strange. This was accomplished (see schematic) with a 3-level ZVZCS using a tapped inductor and snubber.

FET Efficiency:

ST Microelectronics (was SGS Thomson) developed Mdmesh where MOSFET's are designed like MLC multilayer capacitors. They claim an RDSon x input capacitance product resulting in a 30% more efficient operation than Siemens Coolmos or others for switching supplies and class-D amplifiers. Intersil (was Harris) now Fairchild developed a high speed IGBT with a stealth (soft switching) diode to increase efficiency of a 300W 100kHz PFC front end circuit using a standard IRFP450.

Synchronous Switching:

Bob Mammano with Unitrode (TI) had a new push-pull topology with self driven synchronous rectifiers on the secondary. This was almost as efficient as a direct buck converter. (In a buck converter if a narrow duty cycle is required <10% going from a very high to low voltage, then a transformer is needed).

Phase Shift, Full Bridge:

Fred Lee with Virginia Tech in Blacksburg showed a symmetrical half bridge for soft switching. It had better output ripple than a forward converter and could operate at a higher frequency up to 500 kHz (depending on the power level) using phase shift modulation with little or no snubbers. (This is similar to my patent with GE at 1800W phase shift full bridge charger with microprocessor). He said that in a full bridge there is some circulating energy requiring a cap coupled primary or current loop feedback. He used a range switch with a tapped transformer to operate at dual input 120/240 voltages.

Piezoelectric Transformers:

Glenn Skutt with VPT developed a piezoelectric transformer for <100W applications with FACE Inc in Norfolk, VA. Also FerroPerm is another supplier. Alcatel was using a 15W version for notebook computers operating between 380-416 kHz. Input impedance matching is required for proper resonance with usually a choke required in series with the crystal which acts like a cap for a series tank. With ZVS it can be excited on every third cycle if desired but with higher input current ripple. The piezoelectric transformers has no EMI problems and since it is not inductive is small, flat and easier to control without snubbers. They were demonstrated in fluorescent 395kHz electronic ballasts with no EMI at 12W 98% efficiency and excellent isolation. Fred Lee from VA Tech showed the difference between longitudinal and traverse vibration and by creating a custom transformer which combined vibration modes with FACE he was able to eliminate the series inductor required for resonance.

Self Oscillating Switchers:

Sam-ben Yaakov from Israel demonstrated a self oscillating single stage switcher not using an IC at 256W for a high pressure mercury lamp. It didn't have the over-current, voltage and temperature protection typical with IC controlled switchers.

Planar Magnetics:

Artesyn Technologies, Conor Quinn showed point of load converters using their high frequency, low profile transformers. Some use multilayer circuit boards for the windings similar to Saft battery chargers. Then only the ferrite is clamped around the board with no assembly labor. Usually high frequency to 500 kHz is used to minimize windings with a multilayer board. If the board house isn't familiar with this type of design interlayer shorts and quality control problems can result. He noted that horizontal E core leakage inductance is 10 times better than planar transformers and a toroidal is even 10 times better than that. Interleaving windings in planar transformers minimizes leakage inductance. All power to and from leads were plated next to each other to cancel out EMI inductance radiation (using the right-hand inductance rule).

EDUCATION:

DONDERO HS STUDENTS BUILD EVS

The Manufacturing and Engineering Technology Program at Dondero High School is electric — a blast, even.

That's because students build cars and robots in an environment that provides real-life working conditions and allows them to teach themselves. "This is a blast, especially because I love doing hands-on stuff. In here, there's a whole lot of hands-on work," said James Dixon, a senior.

More than 125 students from all grade levels participate in the state-funded program, said Chuck Gosdzinski, the school-to-career department chairman and instructor of the program.

The primary engineering project of the year is to design and build a fully working electric car for competition purposes, Gosdzinski said. The electric car must be able to run for a full hour on an oval track.

"It's a kid-based project, from the design to the procurement of materials to enlisting family members, friends and sometimes manufacturers to work on the car," he said. "The way I teach is facilitator-based, with the kids teaching themselves. I'm there when they get stuck, and I help them find the resources. They do most of the work themselves."

This spring, the car will enter two electric car competitions: The Electrathon and the National Electric Car Association's electric car tests.

The students are also building a robot, an automated machine to be entered in the Oakland County Competitive Robotics Association event.
(THE DETROIT NEWS: 03/12)

GM STARTS RE-LEASING 1ST-GENERATION EV1S

General Motors announced it has completed the engineering and remanufacture of its first-generation EV1 electric cars and will begin re-leasing them, but says it already has enough customers for the 200 it will make available and doesn't plan to offer any more.

GM said it is fulfilling its pledge to begin offering them in the first quarter of 2001; the first deliveries are expected this month. The original "Gen I" EV1 Lessees who indicated they would like to participate in the "Second Lease Program" (including individuals, fleets, and partners) will be receiving the majority of the vehicles.

GM claims it will receive no credits from the California Air Resources Board toward its zero-emission vehicle requirements, and that it has invested more in each EV1 rebuild "than the complete cost of many new midsize cars."

Some of the remaining Gen I vehicles will be used in further development of "EVs, Gen III propulsion systems, traction drive and the engineering of other advanced transportation endeavors," GM said, adding that it is continuing its work on "various technologies including EVs, hybrids, and fuel cells." (3/9/01)

GM/EV1 LAW SUIT AGAINST CARB

General Motors Corp. is suing to overturn California's misguided requirement that automakers sell electric cars to consumers who don't want them. The state is demanding that zero-emission vehicles — meaning some form of electric car — make up at least 10 percent of California's new car fleet by 2003. That figure jumps to 16 percent by 2018. GM is suing in state court to block enforcement and instead requires California to explore lower cost alternatives for improving air quality. It doesn't seem too much to ask.

California's law could have far-reaching effects on the national auto market. Three Northeastern states, Massachusetts, New York and Vermont, are poised to follow Sacramento's example.

GM attorneys argue that the state, in attempting to curb greenhouse gas emissions and increase fuel economy, is violating the U.S. Constitution by usurping the federal government's regulatory authority. The lawsuit also contends the regulations are unconstitutional because they interfere with interstate commerce. Remarkable progress in auto technology has been achieved in the decade since California first imposed the electric car mandate. Hybrid vehicles that employ both an electric battery and conventional engine are available, and power-producing fuel-cell research is yielding measurable results. Ironically, the electric vehicle mandate will only divert research and development dollars from these more promising alternatives.

Having spent $1 billion on electric vehicle development without much to show for it, GM has obviously wised up and is tired of negotiating with California. As its lawsuit states: "(N)either the industry nor the government can dictate what consumers in their own judgment and self-interest prefer and are willing to pay for."
(THE DETROIT NEWS: 03/21)

AUTOMAKERS PLAN TO FIGHT EV REQUIREMENTS

Leading American and Japanese car manufacturers are gearing up in advance of 2003 state regulations requiring zero-emissions quotas, reports the Boston Globe. Clean air requirements in Massachusetts will require a percentage of each manufacturer's sales to be zero emissions vehicles (ZEVs) beginning in 2003. Similar regulations in California were originally enacted for 1998 compliance, but the deadline was postponed to 2003, and the ZEV quota was recently reduced to 2 percent of fleet. Still, manufacturers are huddling now with regulators to negotiate compromises, because most of them have nothing to offer in connection with the zero-emissions requirement, which currently would mean battery-powered electric vehicles.

Some hope they can bank up credits by increasing the sales of electric-gas hybrids and super efficient gas engines that receive partial compliance credits in advance of the deadlines, easing the transition. Manufacturers argue that electric vehicles could cost $7,500 to $20,000 more per unit than their gasoline-powered counterparts, and consumers won't buy them. Other states are poised to take up similar regulations; so, if car makers can't work out a compromise, fines of up to $5,000 per vehicle could be levied, costing hundreds of millions.
(BOSTON:4/11)

ZEV PROGRAM FACES NEW DANGER IN CALIFORNIA?

California's zero-emission vehicle (ZEV) program may be facing a new threat from proposed legislation that could make it easier for automakers to satisfy their ZEV requirements by buying emissions-reducing vehicles or equipment instead of offering ZEVs, according to the California Electric Transportation Coalition. On April 16, the Assembly Transportation Committee is scheduled to hear and vote on Assembly Bill 1390 (Firebaugh, D-50th District).

This legislation may be amended to include "flexible performance requirements" that could allow automakers to "buy out" all or part of their ZEV production requirements by purchasing specified vehicles or equipment and placing them in low-income communities or communities of color. Examples could include low-emission buses or diesel particulate traps, or incentive programs to encourage the scrapping of older, higher-polluting vehicles. Opponents of the bill are asking citizens to contact Assembly Transportation Committee members to voice their concerns about the potential weakening of the ZEV production requirements.
(SACRAMENTO: 4/13)

OVONIC BATTERY FILES A LAWSUIT AGAINST MATSUSHITA BATTERY

Alternative energy firm Energy Conversion Devices Inc.'s unit Ovonic Battery Co. Inc. had filed suit against Matsushita Battery Industrial Co. Ltd., Toyota Motor Corp., Panasonic EV Energy Co. Ltd. and other related entities for patent infringement.

The suit charges that Matsushita's hybrid electric vehicle batteries, battery components and battery systems infringe on Ovonic's patents. MBI and Panasonic EV supply batteries used in the Toyota Prius gasoline-electric hybrid car sold by Toyota

in the United States.

Ovonic also ended a 1992 agreement which licensed MBI under patents held by Energy Conversion and Ovonic Battery for the manufacture and sale of small consumer batteries. Matsushita Battery breached that agreement by failing to pay royalties to Ovonic Battery, Energy Conversion alleged.

Ovonic Battery said it seeks damages for the royalties, and also to enjoin the importation of all Panasonic products that contain batteries using its patented technology.
(REUTERS ENGLISH NEWS SERVICE: 03/06)

DYNASTY MOTORCARS BRINGS NEW EV TO ROSE BOWL

Dynasty Motorcars will sponsor a "drive and ride" event to introduce their new 'Dynasty it' electric vehicle to California drivers. In a company release, Manager of Government and Industry Relations Graham Hill announced the event, which is slated for 3:00pm at Brookside Park, located at the intersection of Arroyo and Seca immediately south of the famous Pasadena Rose Bowl. The new model is a Neighborhood Electric Vehicle (NEV), a class of compact, extremely light, electrically-propelled short range vehicles with a top speed of 25mph. They are designed for short local hops, and help cut down on traffic snarls, tailpipe emissions and parking congestion. Unlike many NEVs, the Dynasty is a fully-enclosed four-door vehicle featuring a number of standard safety features. With an increasing emphasis placed on clean transportation, NEVs offer many positive aspects to urban drivers seeking non-polluting, convenient and reliable local mobility.
(3/20)

FLORIDA DESIGNER SEEKS PARTNER TO MAKE UNIVERSITY-DESIGNED ELECTRIC CAR

That's how Sarasota design innovator Piero Rivolta would like automakers to view his company's plans for an electric-powered city car that looks more like a sturdy sport utility vehicle than a battery-driven cart.

Rivolta, whose boatmaking business churns out a custom 38-foot vessel from Port Manatee every month, hopes a large manufacturer will latch onto the idea and mass-produce the vehicle, designed by engineers at the University of South Florida in Tampa. Electric vehicles resembling golf carts, but made for low-speed street driving, are nothing new. Big automakers also are moving toward hybrid gas- and electric-driven cars. But Rivolta sees this design as sturdier and sportier than existing electric models, easy to manufacture, and still affordable, probably selling for less than $10,000. "It's a real car; that's what may distinguish it from some of the others," said Richard Storm, a spokesman for Rivolta Group of Sarasota. "It's not a modified golf cart. It's not a hybrid."

The Iso Isigo, based on a Rivolta gas-powered car, meets the federal government's definition of a neighborhood electric vehicle, which travels at a maximum of 25 mph. It is billed as being ideal for urban and neighborhood driving, and it has all the standard safety features of a car, but not amenities that require much power, such as air conditioning. At average speeds, the car travels 35 to 40 miles before the battery needs to be recharged. The vehicle contains a recharger, and the owner would plug it into a power source for about six hours at a time.

Rivolta is trying to sell the idea to a variety of large auto manufacturers, but Storm wouldn't name any of them. He also said governments in Australia, New Zealand, India and Malaysia expressed interest in the car, and it got good reviews at the Electrical Vehicle Symposium in Montreal.

Engineers at USF started working on the car several years ago as a joint initiative of Rivolta and the Florida High-Tech Corridor Council. The company pitched in two-thirds of the $150,000 research and development project, and the council paid one-third. Students in USF's electrical engineering department participated.

Goals of the corridor initiative include helping educate the region's work force and building the number of high-tech jobs along Interstate 4 from Tampa Bay to the Space Coast. The car is meant to be used in crowded cities where combustion engines cause too much pollution, as well as in neighborhoods. Similar electric cars are now used in some island communities, including Anna Maria.
(KNIGHT-RIDDER TRIBUNE: 03/09)

AMERICAN AIRLINES SWITCHES TO ELECTRIC GSE FLEET

American Airlines says it has become the first airline in the United States to fully replace its fossil fuel-powered Ground Service Equipment (GSE) fleet with electric vehicles at a local airport within a serious air-quality non-attainment area. The airline said the replacement of its diesel-powered vehicles at El Paso International Airport is part of its "commitment to maintaining a healthy environment for the communities it serves. This commitment includes a long-term plan to replace 80 percent of its fossil fuel GSE fleet throughout the United States with electric vehicles over the next decade, at a cost of $400 million."

Starting in 1996, the airline began giving priority to re-equipping stations in cities with severe air-quality issues. El Paso received top priority due to the "Serious" non-attainment designation it received from the U.S. Environmental Protection Agency. In addition to reduced vehicle exhaust levels, the electric GSE fleet will reduce fossil fuel usage and noise emissions. American also implemented a series of innovative new bat-

tery-charging techniques that have helped the airline.
(3/16)

E-WHEEL: A 75KW, 100 HP MOTOR IN A CAR WHEEL

A new propulsion system for battery, hybrid or fuel cell powered vehicles has just been announced in Detroit. Canadian company TM4 unveiled its new E-Wheel, which has a powerful electric motor and control unit built into a car wheel. Power output is said to be 75 kilowatts, that's more than 100 horsepower. That kind of power not only puts the electric car into direct competition with the internal combustion engine, it also frees the space taken up by conventional drive systems.

The TM4 E-Wheel is developed from Michelin's PAX tyre-monitoring and run-flat wheel - about to be launched in France. A prototype four-wheel-drive electric Chrysler Intrepid is currently being used by TM4 as a rolling laboratory and there are plans to have a roadworthy prototype built with a partner as soon as possible.

The E-Wheel means the same car can be rear-wheel, front-wheel or four-wheel drive - only the power and control cabling needs to be changed. Power can be limited electronically, so again the same units can be used on family cars and out-and-out sports cars. Imagine having 400 electric horses under the control of your right foot, with full torque (pulling power) available from zero rpm. Acceleration would be phenomenal, quicker than most of today's conventionally powered supercars.
(WORLD REPORTER: 03/23)

LOS ANGELES ZEV DRIVERS PARK FREE AT CITY METERS

Drivers of electric cars will soon get a perk for not contributing to Los Angeles' pollution problem: free parking at city meters. Beginning April 2, motorists who drive zero-emission vehicles will no longer have to feed meters throughout Los Angeles. But drivers will still have to abide by posted time limits, such as two-hour parking.

"It's these types of things we've been talking to different counties and cities about," said Rich Varenchik, spokesman for the California Air Resources Board. "What can you do to give [drivers of such cars] a boost? The more we have on the streets in the hands of consumers, the better our air will be."

City meter readers will be able to tell if a car qualifies for free parking by looking for a state-issued decal that enables certain clean-air vehicles to travel in carpool lanes without the mandatory number of passengers. "We thought this would be an easy way for traffic officers to see who qualifies," said David Gershwin, spokesman for Los Angeles City Councilman Alex Padilla, who suggested the program. Zero-emission cars, essentially battery-electric vehicles, and "super ultra-low emission vehicles," which run on such alternative fuel as compressed natural gas, are the only ones that can park for free. Vehicles that use gasoline will not qualify.

It is unknown how much meter money the city will lose with this program, Gershwin said. After a year of the pilot program, officials will determine the level of participation and how much revenue was lost in deciding whether to continue the effort. City officials estimate there are 1,200 alternative-fuel vehicles in Southern California.
(LOS ANGELES TIMES: 2/23)

FREE EV PARKING COMING TO DOWNTOWN SAN JOSE, CA

This two-year pilot program approved by the San Jose City Council will offer drivers of zero- and low-emission vehicles free parking at city garages and parking meters starting in July. The city also will install more public electrical charging and compressed natural gas stations and aggressively expand its fleet of more than 100 clean-fuel airport shuttles, street sweepers and other vehicles.
(SAN FRANCISCO CHRONICLE: 4/18)

POSTAL SERVICE TRIES ELECTRIC VEHICLES TO DELIVER MAIL

A new electric postal vehicle has a battery pack instead of a fuel tank, which means no tailpipe emissions and no trips to the gas station. It also tracks better through the snow because it's heavier than the gas-powered version.

Postal carriers who have tested the prototypes making curbside deliveries in California say they also like one other feature of the quiet electric vehicle: "The dogs don't hear it," said Lynn Leone, delivery supervisor at the Fountain Valley Post Office in Orange County. "The old Jeep; they knew as soon as you were in the neighborhood." These electric vehicles, or EVs, are assembled in Rome, N.Y., in a building where Air Force personnel once worked on cruise missiles.

The partners in this venture include Ford Motor Co., which markets an electric version of its Ranger compact pickup truck and provides the rolling chassis with the steering wheel on the right side. Ford joined with Baker Equipment Engineering of Richmond, Va., in 1999 to win a $24 million contract to build electric postal trucks. Baker/Ford is now putting Grumman bodies - the familiar white boxes with the blue eagle logo - on the Ford chassis.

The U.S. Postal Service is paying about $23,000 per electric truck, a price comparable to the vehicle's gas-powered counterpart. But that price is heavily subsidized with incentives from New York, California and the U.S. Department of Energy. Without the subsidies, the postal EVs would cost up to twice as much. The mission for Baker/Ford is to prove that mass-produced electric vehicles, with savings on fuel and maintenance, can cost no more than gas-powered trucks over the course of their life cycle.

The postal truck is considered an ideal application of electric power because its route is less than 25 miles per day, it makes frequent starts and stops, and it can return each evening to the same location to have its battery recharged. The Postal Service has long supported new technologies to improve the delivery of mail, from railroads to trucks to airplanes. The first electric mail vehicle was tested in Buffalo, N.Y., in 1899 as an alternative to the horse and buggy.

The trucks being assembled in Rome look very similar to the gas-powered versions that make up the bulk of the Postal Service fleet. A large sliding door on the right side gives the letter carrier access to roadside mailboxes. A metal tray to the driver's left holds

sorted material. A sliding overhead door opens in the rear to allow loading of up to 1,250 pounds of cargo.

At the end of the workday the vehicles are plugged into a charging station, and a timer switches on the current overnight, when electric rates are lowest. Even in California, where the electricity supply can't meet peak demands in some areas, the power required for the Evs is readily available in off-peak hours.
(STAR-TRIBUNE NEWSPAPER: 03/01)

OFFICE BUILDING TENANTS IN PORTLAND, ORE. TO PROMOTE 'GREENER' COMMUTING

Management of the 200 Market Building has presented its 2,000 tenants with an environmentally-friendly electric car for use in running errands or traveling to meetings during the day, free of charge.

This "Tenant Convenience Car" program is one of the first of its kind in the nation and is a good example of creative solutions to transportation concerns. "I'm pleased that many of our tenants ride their bikes, walk or take mass transportation to work, but I understand that some days it's just not possible to go without a car," said John W. Russell, president of Russell Development, general partner of the 200 Market Building, and a member of the Oregon Transportation Commission. "Our Tenant Convenience Car program should allow the best of both worlds — no need to drive to-and-from work, but a car is available when you need it. And what is even better is that this is an electric vehicle, so it isn't damaging to the environment."

This transportation idea was conceived by Russell, out of his commitment to seeking environmentally-friendly solutions to Portland's transportation issues.

The 200 Market Building has purchased a Corbin Motors (www.corbinmotors.com) Sparrow, an electric, zero emissions, one-person commute vehicle. There are only 150 Sparrows currently on the road, with hundreds more ordered. Manufactured in California, the cars have caught the attention of a variety of consumers, including Apple Computer's Steve Wozniak, who regularly commutes to work in his blue Sparrow.

"This initiative is the first of its kind in Portland, and probably the nation," said Portland City Commissioner Charlie Hales. "I applaud Russell Development and the tenants that take advantage of this car, and encourage other management companies to consider implementing similar programs."
(BUSINESS WIRE FEATURES: 02/27)

GEORGIA POWER'S EV EMPLOYEE LEASING PROGRAM MILESTONE

Georgia Power's electric vehicle employee leasing program has set a milestone with more than one million commute miles.

Since its inception in December 1998, the employee vehicle leasing program began with eight electric vehicles and today has more than 140 electric vehicles in the program. The program is designed for Southern Company and Georgia Power employees living and working in the metro Atlanta area to commute to and from work by electric GM EV1s and Ford Rangers. The vehicles are also used for business-related meetings. Charging stations are available for employees to charge their vehicles at work, in their home garages, as well as at several malls in the metro Atlanta area.

"Our employees have really embraced this program," said Don Still, Georgia Power's electric transportation manager. "The majority of employees in the program began receiving their vehicles in December 1999 through January 2000, so this is a great accomplishment for the commute program," Still added.

An incentive enjoyed by employees other than the quiet ride and no visits to the gasoline station, is the use of the high occupancy vehicle (HOV) lanes. Because electric vehicles are alternative fueled vehicles, employees are allowed to ride in the HOV lanes with just one occupant in the vehicle, resulting in shorter commute times.
(PR Newswire: 02/12)

HYBRID DRIVERS WANT AZ BILL TO USE HOV LANES

Hybrid drivers in Arizona are frustrated that they can't drive in the HOV lanes reserved for car pools, motorcycles and alternative-fuel vehicles, including the controversial conversions that can run on gasoline or an alternative fuel such as compressed natural gas. The Honda and Toyota hybrid cars get 50 to 70 miles per gallon and are rated as ultra low emission or super low emission vehicles by the federal government.

A bill now before the Arizona state Senate (SB1429) would allow drivers of the hybrids to use HOV lanes without a second passenger. It is sponsored by Sen. Jay Blanchard, D-Gilbert, who was swept into office by public furor over a runaway subsidy program for alternative-fuel vehicles orchestrated by his election opponent, former House Speaker Jeff Groscost.

The alternative fuels subsidy program stood to cost Arizona $680 million before lawmakers went into a special session to rein it in. The state hopes those changes will cut the costs to about $200 million. Unlike the alt-fuels mess, Blanchard said this proposal creates an incentive for people to buy vehicles that are environmentally friendly without costing the state a dime.

Four states - California, Virginia, Georgia and Hawaii - allow single driver electric vehicles in HOV lanes, but Arizona could be the first to allow hybrids. HOV lanes were created as an incentive for car pooling in hope of reducing the number of cars on the road. That goal remains largely unrecognized, but encouraging people who won't give up their cars to use hybrid vehicles could help with two other goals: reducing air pollution and gasoline consumption.

Should Blanchard's bill eventually become law, it is unlikely to flood the state's HOV lanes anytime soon. Less than 10,000 hybrid vehicles have been sold in the United States, according to the Electric Vehicle Association of the Americas.
(ASSOCIATED PRESS NEWSWIRES: 02/17)

Here is a partial list of current EV-related books to enlighten and educate on the background and pratical implementations of EVs.

OVERVIEWS:

THE LEADING EDGE : Aerodynamic Design of Ultra-Streamlined Land Vehicles
Automotive Design
Goro Tamai 1999 $35.96A

TRENDS 2000 : How To Prepare For And Profit From The Changes Of The 21st Century
Future Trends
Gerald Celente 1998 $11.99A

THE FUTURE AIN'T WHAT IT USED TO BE
Future Trends
Mary Meehan 1998 $19.25A

CLICKING : 17 Trends That Drive Your Business — And Your Life
Future Trends
Faith Popcorn 1998 $11.30A

THE INNOVATOR'S DILEMMA
Techology overview
Clayton Christensen 1997 $19.25A

EV UNDERSTANDING:

DESIGNING TRANSPORTATION FUELS FOR A CLEANER ENVIRONMENT
Electric Vehicles
John Reynolds 1999 $69.95A

BUILDING THE E-MOTIVE INDUSTRY
Essays and Conversations About Strategies for Creating an Electric Vehicle Industry
Scott Cronk 1995 $29.00A

DESIGN INNOVATIONS IN ELECTRIC AND HYBRID ELECTRIC VEHICLES
Electric Vehicles
Bradford Bates 1995 $49.00A

ENGINES OF TOMORROW
How the World's Best Companies Are Using Research Labs to Win the Future
Robert Buderi $22.00A

BICYCLE TRANSPORTATION : A Handbook for Cycling Transportation Engineers
Bicycles
John Forester 1994 $30.00A

HISTORY:

FORWARD DRIVE : The Race to Build the Car of the Future
The story of how Solectria got started
Jim Motavalli 1999 $20.00A

CHARGING AHEAD
The history and innovation of Electric Cars
Joe Sherman 1998 $17.50A

FUTURE DRIVE : Electric Vehicles And Sustainable Transportation
Dan Sperlin 1995 $19.95A

TAKING CHARGE: THE ELECTRIC AUTO IN AMERICA
Comprehensive history of EV, 225 pgs. w/ photos
M. Schiffer 1994 $25.00K

GUIDE TO EVS:

THE NEW ELECTRIC VEHICLES: A Clean & Quiet Revolution
Conversions, solar cars, boats, planes, 272 pgs., 465 photos
Michael Hackleman 1996 $25.00K/A

1996 WORLDWIDE EV DIRECTORY
Complete resource book & directory, 80 pgs. w/illus.
Philip Terpstra 1996 $14.50K

1995 BUYER'S GUIDE TO ELECTRIC VEHICLES
Up-to-date info on EVs, performance, associations, 32 pgs.
P. Terpstra 1995 $3.50K

1994 BUYER'S GUIDE TO ELECTRIC VEHICLES
Up-to-date info on EVs, performance, associations, 32 pgs.
P. Terpstra 1994 $3.00K

GUIDE TO ELECTRIC AUTO CONVERSION
Practical conversion resource, 76 pgs. w/ illus.
Bill Williams 1981 $23.00K

BATTERIES:

U.S. BATTERY EVALUATION REPORT
Demonstrates 550 cycles & 19,754 mi. w/ lead-acid batteries, 18 pgs.
B. Williams 1991 $7.95K

BATTERY BOOK ONE
Everything you wanted to know about lead-acid batteries, 72 pgs. w/illus.
Curtis Instruments 1981 $9.00K

FUEL CELLS:

POWERING THE FUTURE
The Ballard Fuel Cell and the Race to Change the World
Tom Koppel 1999 $19.57A

HYDROGEN FUEL FOR SURFACE TRANSPORTATION
Hydrogen
SAE 1996 $89.00A

FUEL CELLS: A HANDBOOK
Fuel Cells
R.P. Engleman 1995 $75.00A

BATTERIES AND FUEL CELLS FOR STATIONARY AND ELECTRIC VEHICLES
Hydrogen
Electrochemical Society 1993 $43.00A

HARNESSING HYDROGEN : The Key To Sustainable Transportation
Hydrogen
James Cannon 1995 $30.00A

HOW-TO RESOURCES:

AFFORDABLE ECOTRANSPORTATION SOURCEBOOK
How to build light, inexpensive vehicles, 28 pgs.
Big Island EVA 1994 $6.00K

BUILD YOUR OWN ELECTRIC VEHICLE
Complete textbook, covers every subject, 310 pgs. w/illus.
Bob Brant 1994
$20.00K / $17.95A

CONVERT IT! (3RD ed.)
Takes you through conversion process step-by-step, 128 pgs. w/illus.
Michael Brown 1993
$28.50K / $24.95A

REGENERATIVE BRAKING WITH DC SERIES MOTORS
Practical info for implementing regen braking, 67 pgs. w/illus.
G. Jackson 1997 $15.00K

BUILD YOUR OWN EXPANDED-SCALE VOLTMETER
Your best battery voltage monitor, 7 pgs. w/illus.
K. Koch 1989 $2.50K

BUILD YOUR OWN TEMPERATURE METER
Monitor battery/motor/controller temperature, 8 pgs. w/illus.
K. Koch 1989 $2.50K

RESTORING VACUUM TO POWER BRAKES IN AN ELECTRIC CAR CONVERSION
Restore for safety, 6 pgs. w/illus.
K. Koch 1989 $2.50K

ELECTRIC HEATING FOR YOUR ELECTRIC CAR
Shows electric floor heater conversion, 9 pgs. w/illus
K. Koch 1989 $2.50K

VIDEOS:

"1994 TOUR DE SOL" video
Coverage of NESEA road rally; Many converted EVs; Interviews; Components
D. Mueller 1996 $18.50K

"A QUIET REVOLUTION" video
Complete conversion of GMC S15 pickup truck by EcoElectric, 70 min.
Avalon Video 1993 $37.00K

Note: all pricing based on two sources:

A = Amazon Books.
http://www.amazon.com.

K = KTA Services. 944 West 21st Street, Upland, Ca. 91784 USA
Phone: 1-909-949-7916

Please verify for current pricing and availability before ordering. Some of these books may also be found in your local community or college library.

REQUEST FOR BOOK REVIEW AND ARTICLES

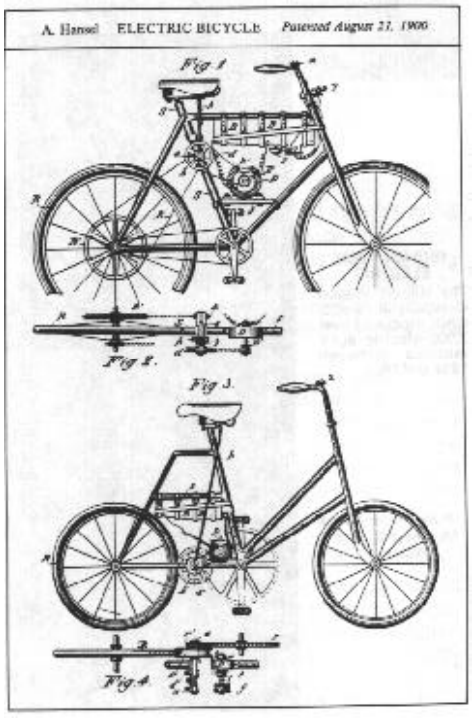
Request for members to read and submit book reviews on any EV related books, to assist others with understanding the value of these resources.

Also, if you come across additional books that is EV-related, please let us know.

Send any submissions for reviews, information or even articles to:

CE Submissions
2 Smith Ct.
Alameda, CA 94502-7786 USA

or email to:
EAA-contact@excite.com



From THE COMPLETE BOOK OF ELECTRIC VEHICLES,
by Sheldon R. Shacket
provided by Terry Wilson

THE ELECTRIC BICYCLE

Conceived as early as 1895, electric bicycles were well ahead of their time. The design of the battery and the use of motor as an integrated propulsion system were in many respects similar to today's electric bicycle. However, despite the advanced nature of their design, the weight of the motors, batteries, and bicycle frames limited their use.

Among the numerous patents issued for electric bicycles prior to the turn of the century, one incorporated a motor within the hub of the front wheel. This innovative design configuration did not reappear until almost eighty years later.

The present popularity of the electric bicycle can be attributed to advances in technology resulting in improved efficiency using compact, lightweight motor and battery designs.

Diagram from early electric bicycle patent.

True location of eMOTORS?

I stopped by Feb 27 to the site posted on EVL for eMOTORS. The announcement of a grand opening is premature. I have been to the Kinko's copy center several times, traffic congestion is always difficult and parking almost impossible as 2nd Street is 6 lanes one way east and Grand Ave exit off Hwy 101 is 4 lines one way going N. I did get a spot in the parking lot then looked and asked directions. There was a white Corbin Sparrow on display on the sidewalk corner but no showroom I could find. No one uses that sidewalk and you would have to be crazy to walk across that intersection. By asking several people going to other offices in the parking lot finally some said try the kiosk, a glass building obviously empty about 3' X 7', probably for a parking attendant at an earlier time. Then Oscar riding a pedal bike, not electric, showed up. He was the sole eMOTOR person there and a friendly company representative.

I asked where the EV showroom was. He pointed to the garden that served as the traffic divider to keep those looking for a parking spot going in one direction. Oscar said that garden will be roofed over and several EVs will be on display there. I saw no possible location for future repair facilities.

I asked Oscar if the boss was around that I would like to ask if eMOTORS would try to help the North SF Bay EAA Chapter get more Avcon charging stations in Marin County as there is only one now at the COSTCO in Novato 10 miles north. I also brought a collection of EV magazines and newsletter that I though eMOTORS might have an interest for possible advertising.

Oscar dialed up Andrew Carver, President, and handed the cell phone to me. Carver asked if I was interested in buying and EV? I responded I had be driving EVs for the last 29 years and had a leased Ford Ranger Electric at the moment but I wanted to share my ideas with him. He cut me off quickly saying he was seeing patients all day and for me to send him a letter with my questions! I think Dr. Carver (surgeon?) is premature in announcing an EV store opening. The website http://emotorsonline.com lists 2 more showrooms in San Francisco to sell and rent Corbin Sparrows, Iaccoca ebikes and NEV, Currie scooters, Prius, etc.

If you are looking for EV cars or bikes north of the Golden Gate Bridge in Marin County I think for immediate information you should go 5 blocks away where parking is a little easier at It's Electric which has a large showroom with Solectria Force, Sparrow and bikes for sale. Check them out 10 a.m. to early evening at 540 Irwin Street, San Rafael. 415-456-7211. They have been in business for 2 years or more now. We have had several North SF Bay EAA Chapter meetings at this location.

Bob Wing, Media Correspondent, EV

April 3 update: I went by It's Electric on Irwin Street in San Rafael, Calif and the doors are locked, no sign on the door, all EVs are gone, furniture moved out leaving just some clean up to make the store ready to rent. The big store sign over the entry still stands.

It's Electric was the Bay Area distributor for Solectria Cars.

Review of the Electric Auto Association Charter

Over the next 4 pages (pg 22-25) you will find the official EAA Bylaws and Code of Ethics. These documents haven't been revised nor updated in over 7 years. The Board has formed a committee, chaired by Will Becket, to review, receive comments from the Membership and affect changes to:

1. Bring these legal documents up to current standards, to comply with Corporate Law and regulations which have changed.

2. Update our Mission Statement and commitment to influence development and acceptance of EVs and to extend our coverage to include vehicles other than automobiles and possibly the inclusion of Fuel Cells and Hybrid technologies.

Please take some time to read/review these pages and provide comments back to Will (e-mail: willbeckett@email.com).

Thank you for your participation.

CE Topics to Povide Coverage

In a better effort to cover the many facits of EVs and provide a more balanced coverage of East Coast/Midwest/West Coast activities, the CE endeavors to expand coverage in these areas:

1. Editorial (perspective from the Editor and/or CE staff)

2. National EAA news - Description of focus of EAA and Chapters; Mission Statement.

3. Local EAA Chapters - Listing for contacts, locations and meeting schedules; Calendar of events; possible rotating focus on what's happening in various parts of the country and world.

4. Related EV Groups and Resources - List of other EV groups (like EV1 User Group, etc); List of websites and resources available online; Location of discussion lists both general and manufacturer specific.

5. Education - Description of what is happening at grade school and college levels to education and promote EV acceptance, usage and development; special School features.

6. Industry - News and press releases for specific EV developments; Reviews of new vehicles and products; Lawsuites and recalls.

7. Legislation - CARB resolution; East Coast legistation; Tax and other financial incentives; Diamond Lane, free charging stations and other benifits.

8. Technology - Battery developments; Infastructure planning.

9. Manufacturers - Who's producing what and availability; Benifits and limitations.

10. Conversions - How to find out what's been converted (EValbum); Resources to convert yourself or hire; Benifits and limitations of conversion.

11. Performance - Speed envelope; Range envelope.

Kaylor Energy Products
Ad

General REsale
Ad

CORPORATION PURPOSES:
To act as a source of information for the membership, other organizations and the public, on developments in electric automobile technology worldwide.
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.
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. To publish newsletters, information packages, and other materials designed to promote the cause of electric vehicles.

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

MEETINGS AND VOTING RIGHTS

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 (a), (c)]

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

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(e), 5512]

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]

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]

ACTION BY WRITTEN BALLOT WITHOUT A MEETING: Any action, including election of directors, which may be taken at a meeting of members maybe 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)]

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 if a meeting is not held.. [5610]

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]

BOARD OF DIRECTORS:

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)]

NUMBER OF DIRECTORS: The authorized number of directors of the corporation shall be an odd number not less than three(s) 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 an/or minimum number of directors may be only changed by approval of the members. [5151]

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]

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]

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]

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)]

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]

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)]

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)]

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 consent shall be filed with the minutes of proceedings of the Board of Directors. [5211(b)]

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)]

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.

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]

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]

ORGANIZATION

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]

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.

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

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.

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.

CONTRACTS AND LOANS:

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]

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

MEMBERSHIPS:

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. [5310]

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]

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

INSPECTION OF CORPORATE RECORDS:
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.

MISCELLANEOUS:

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

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.

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]

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

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.

Effective 1/15/94

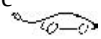
Election Results

At the end of 2000 there were 4 Board of Directors positions open. We had a healthy participation of 2 incumbents, 1 write-in (Jerry) and 7 new candidates and the membership response was substantial. Over 1/3 of the members voted, resulting in 319 valid ballots received. The votes were distributed as follows:

Candidate	#Votes	%Votes	Status
Will Beckett	238	74%	Win
Ron Freund	215	67%	Win
Roy Kaylor	123	39%	
Bruce Parmenter	249	78%	Win
Willian Shafer	44	14%	
Bill Smith	47	15%	
Jack Swartz	69	22%	
Terry Wilson	221	69%	Win
Tong Zhou	42	13%	
Jerry Asher	3	1%	

Thank you all for participating. We have a critical year ahead, with important changes in California and the East Coast. Continue to fight and education efforts to promote EVs as viable and practical for automotive transportation.

National EAA Election Committee



Board of Directors 2001

Chairman
Ron Freund
rfreund@hpchs.cup.hp.com

Vice-Chairman
EAA Membership
Will Beckett
willbeckett@email.com
1-650-494-6922

Secretary
EAA Publications
Ed Thorpe
EAA-contact@excite.com
1-510-864-0662

Treasurer
EAA Awards
Stan Skokan
1-650-366-0643
1020 Parkwood Wy
Redwood City, CA 94061-3691

EAA Historian
Terry Wilson
eaa.historian@n2.com
1-408-446-9357

Web, EAA Technology
Bruce Parmenter
brucedp@iname.com

Ed Holsinger
evmuseum@webtv.com
1-510-849-4973

EAA Chapter Relations
Anna Cornell
ebeaa@juno.com
1-925-685-7580

Cars for *Clean Air*
Kurt Bohan
eaanews@aol.com

EAA Board contact:
e-mail: EAA-contact@excite.com
phone: 1-510-864-0662

EAA Membership contact:
e-mail: EAAmembership@email.com
phone: 1-650-494-6922

Electric Auto Association Code of Ethics

1. The Electric Auto Association will conduct itself in a professional mariner in all public and private actions; respecting the rights and beliefs of all parties.

2. The Electric Auto Association will make every effort to ensure the information provided to its members and the public is true, reliable and accurate and will not willfully misrepresent any material fact when disseminating that information.

3. Gathering and disseminating information about products and policies is one of the primary functions of the Association. Under no circumstances will a member of the EAA violate any law to obtain information nor distribute information by an illegal means.

4. The EAA will respect the confidentiality and intellectual property rights of all members of the EAA as well as member and non-member business. The Association will not willingly release, reproduce or distribute restricted information provided to the EAA under non-disclosure without the consent of the owner.

5. The EAA will inform members and the public of developments and availability of products and services related to electric vehicles, but will not endorse any product or service.

6. The Association's name should not be used or implied in the promotion of any product or service.

7. All officers and board members will use the resources of the Association to achieve the Association's goals to the best of their ability; personal gain shall not be a consideration in conducting the Association's business.

8. Any officer or member of the Board of Directors of the EAA who has a potential conflict of interest between EAA activity and other activities or relationships, shall 1) inform the membership that elects them of the potential conflict; and 2) abstain from participating in balloting or other determination of Association business related to the potential conflict.

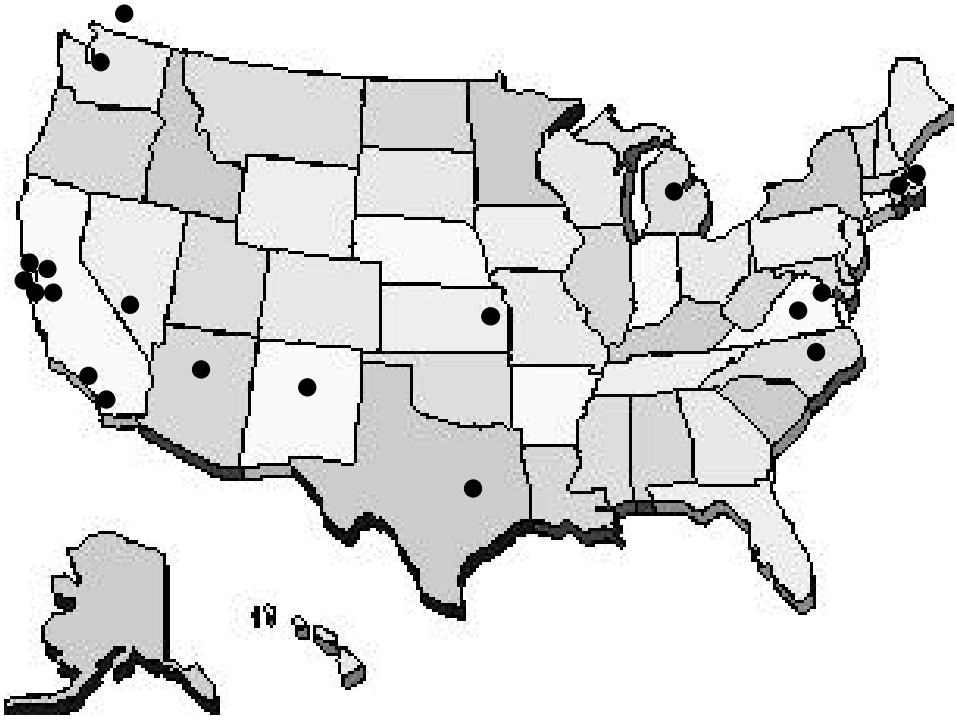
9. All members have a responsibility to report unlawful or unethical conduct associated with any Electric Auto Association activity to the officers or the Board of Directors of the Association.

10. The EAA is open to all individuals regardless of sex, age or ethnic background, discrimination or harassment by or toward any member will not be tolerated.

Effective 1/15/94

NATIONAL EAA HEADQUARTERS
Web Site: http://www.eaaev.org/
Contact: EAA-contact@excite.com
Phone: 1-510-864-0662
Mailing: 2 Smith Ct, Alameda, CA 94502-7786, USA

Chapter Count: 20



CANADA

VANCOUVER ELECTRIC VEHICLE ASSOCIATION
Web Site: http://www.veva.bc.ca/
Contact: Haakon MacCullum, 1-604-878-9500, hmaccallum@hotmail.com
Mailings: P.O. Box 3456, 349 W. Georgia St., Vancouver, BC V6B3Y4, Canada
Meetings: 3rd Wednesday/month 7:30 pm
Location: BC Transit Center cafeteria, off of Kitchener between Boundary and Gilmore, Burnaby, B.C.

UNITED STATES

ARIZONA

PHOENIX EAA
Web Site: http://geocities.com/phoenix_eaa/
Contact: Roy Thompson, Chapter President, 1-480-991-5075, dv8bug@aol.com
Contact: Sam DiMarco, 1-480-948-0719, voltek_2000@yahoo.com
Mailing: EAA Phoenix Chapter, PO Box 6465, Scottsdale, AZ 85258, USA
Meetings: 4th Saturday/month, 9:00 am
Location: Varies, see Web Site for details.

CALIFORNIA

EAST (SF) BAY EAA
Web Site: http://geocities.com/ebeaa/ http://www.geocities.com/MotorCity/1756/
Contact: Ed Thorpe, Chapter President, 1-510-864-0662, EAA-contact@excite.com
Mailing: 2 Smith Ct., Alameda, CA 94502-7786, USA
Meetings: 4th Saturday/month, 10:00 am (call for Nov/Dec).
Location: Alameda First Baptist Church, 1515 Santa Clara Ave, Alameda, CA

LOS ANGELES EAA
Contact: Irv Weiss, Chapter President, 1-818-841-5994
Mailing: 2034 North Brighton, Burbank, CA 91504, USA
Meetings: 1st Saturday, 10:00 am
Location: CA Tech, Winnet Lounge, Pasadena, CA

NORTH BAY EAA
Web Site: http://www.geocities.com/MotorCity/1757/
Contact: Chuck Hursch, 1-415-927-1046, chursch@yahoo.com
Mailing: 13 Skylark Dr., #13, Larkspur, CA 94939, USA
Meetings: 3rd Saturday/month 10 am
Location: Call for meeting details.

SAN FRANCISCO PENINSULA EAA
Web Site: http://www.geocities.com/MotorCity/1759/
Contact: Tony Kabage, Chapter President, 1-650-992-1834
Mailing: 356 East Moore Ave., Daly City, CA 94015-2039, USA
Meetings: 1st Saturday/month, 10 am
Location: San Bruno Public Library (downstairs), 701 West Angus St., San Bruno, CA

SAN DIEGO ELECTRIC VEHICLE ASSOCIATION
Web Site: http://home.att.net/~NCSDCA/EVAoSD/
Contact: Chris Jones, Chapter President, 1-619-6030
Mailing: 315 South Coast Highway 101, Suite U44, Encinitas, CA 92024, USA
Meetings: 4th Tuesday/month, 7:00 pm (except Dec.)
Location: San Diego Automotive Museum, NE door, 2nd flr conference, 2080 Pan American Plaza, San Diego, CA

SAN JOSE EAA
Web Site: http://geocities.com/sjeaa/
Contact: Mike Thompson, Chapter President, m.t.thompson@ieee.org
Contact: Roy Paulson, 1-408-269-7937
Mailing: 1592 Jacob Ave. San Jose, CA 95118, USA
Meetings: 2nd Saturday/month, 10:00 am (call to confirm)
Location: Reid-Hillview Airport, 2350 Cunningham Ave., San Jose, CA

SILICON VALLEY EAA
Web Site: http://eaasv.org/
Contact: Will Beckett, Chapter President, 1-650-494-6922, Will Beckett@email.com
Mailing: 4189 Baker Ave., Palo Alto, CA 94306, USA
Meetings: 3rd Saturday/month, 10:00 am
Location: Hewlett-Packard Co, Corporate World Headquarters, Lobby A Auditorium, 3000 Hanover St., Palo Alto, CA

KANSAS / MISSOURI
MID AMERICA EAA
Web Site: http://maeaa.org
Contact: Mike Chancey, 1-816-822-8079, evtinker@hotmail.com
Contact: Don Buckshot, Chapter President
Mailing: 1700 E. 80th St., Kansas City, MO 64131, USA
Meetings: Call 1-877-377-0833 for current meeting info.

MASSACHUSETTS
NEW ENGLAND EAA
Web Site: http://people.ne.mediaone.net/bmatheny/home.htm
Contact: Tony Ascrizzi, Chapter President, 1-508-799-5650, tonyascrizzi@juno.com
Mailing: 34 Paine Street, Worcester, MA 01605, USA
Meetings: 2nd Saturday/month, 2 pm
Location: Call or email for meeting location.

PIONEER VALLEY EAA
Web Site: http://www.geocities.com/pveaa/
Contact: Karen Jones, Chapter President, k-jones@juno.com
Contact: Emlen Jones, Chapter Vice President, 1-413-549-6522
Mailing: P.O. Box 153, Amherst, MA 01004 USA
Meetings: 3rd Saturday/month, 2 pm (Jan-Nov)
Location: Call or email for meeting location.

MICHIGAN
DETROIT EAA
Web Site: http://geocities.com/detroit_eaa/
Contact: Lawrence Rose, larryrose11@yahoo.com
Mailing: 4301 King Fischer, Detroit, MI 77035, USA
Meetings: Email for meeting details.
Location: in Ferndale, MI.

NEVADA
LAS VEGAS EVA
Web Site: http://www.geocities.com/lveva/
Contact: William Kuehl, Chapter President, 1-702-645-2132, bill2k2000@yahoo.com
Mailing: 4504 W. Alexander Rd., N. Las Vegas, NV 89030, USA
Meetings: Call 1-702-642-4000 for time and location.

NEW MEXICO
ALBUQUERQUE EAA
Web Site: http://abqev.org/
Email: info@abqev.org
Contact: Neil Wicai, Chapter President, 1-505-899-7660, neilwicai@home.com
*Mailing:*19 Santa Maria, Corrales, NM 87048, USA
Meetings: 1st Tuesday/month, 7:00 pm
Location: Shoney's Restaurant, 6810 Menaul NE, Albuquerque, NM

NORTH CAROLINA
TRIANGLE EAA
Web Site: http://www.rtpnet.org/~teaa/
Contact: Ken Dulaney, Chapter President, 1-919-461-1241, teaa@rtpnet.org
Mailing: 202 Whitehall Way, Cary, NC 27511, USA
Meetings: 3rd Tuesday/month, 5:30 pm
Location: Varies, call for details.

TEXAS
HOUSTON EAA
Web Site: http://www.dataline.net/hceaa/
Contact: Dale Brooks, Chapter President, 1-713-218-6785,brooksdale@usa.net
Mailing: 8541 Hatton St, Houston, TX 77025, USA
Meetings: 3rd Thursday/month, 6:30 pm
Location: The Citizen Environmental Center, 2nd flr, rm 280, 3015 Richmond Houston, Texas

VIRGINIA
VIRGINIA ELECTRIC VEHICLE ASSOCIATION
Contact: Ernest Moore, Chapter President, 1-804-271-6411
Contact: Bob Oldham, 1-804-864-1455, bobtheham@igc.org
Mailing: 12276 Welling Hall Rd, Doswell, VA 23047, USA
Meetings: 3rd Wednesday/month, Call for details.
Location: Richmond Technical Center, Westwood Ave., Richmond, VA

WASHINGTON
SEATTLE ELECTRIC VEHICLE ASSOCIATION
Web Site: http://www.halcyon.com/slough/seva.html
Contact: Steven Lough, 1-206-524-1351, slough@halcyon.com
Mailing: 6021 32nd Ave. NE, Seattle, WA. 98115-7230, USA
Meetings: Call for details.

WASHINGTON D.C.
ELECTRIC VEHICLE ASSOCIATION OF WASHINGTON DC
Web Site: http://www.evadc.org
Contact: David Goldstein, Chapter President, goldie.ev1@juno.com
Meetings: 2nd or 3rd Tuesday/month, 7 pm
Location: National Institute of Health (NIH), Building 31-C, 6th Floor, Bethesda, MD.
Note: Please call Charlie Garlow 1-202-564-1088 to confirm attendence.

Listing updated, verified and current as of 4/15/01.

Additional EV related groups, such as EV1 Users Group and regional Electric enthusiasts can be found on various websites. We encourage groups to become affiliated with the EAA by complying with Chapter Bylaws and maintain active membership in the National EAA.

For a copy of the EAA Chapter Handbook, please send your request via the Membership address. Later this year we hope to post this information on our web site to assist new Chapters with getting started and to provide updated documentation to current officers within the active Chapters.

April 16 - 19

Beijing International PSE on Electric Vehicles, Clean Cars Technology, Beijing, China
Conference on electric and alternative fuel vehicle technologies with emphasis on automotive technology in China.
Contact: Ms. Yun Liu
Phone: +86-10-68321889 *Fax:* +86-10-68344994
E-mail: gcchb@bj.col.com.cn

April 17 - 19

National Station/Shared Car Conference, Atlanta, Georgia, USA
First annual station car conference, hosted by Clean Earth Action, will be held in downtown.
WebSite: http://www.cleanearthaction.com/2001conf.shtml

April 21 - 25

Forum 2001 - Solar Energy: The Power to Choose, Washington, D.C., USA
Participants of The American Solar Energy Society will gather for the largest and most comprehensive solar event of the new millennium.
Website: http://www.solarenergyforum.org or http;//www.prsea.org

April 22 - 24

Small Fuel Cells 2001, Washington, D.C., USA
Conference dedicated to small fuel cells and battery technologies for portable power applications
Contact: Knowledge Foundation
Phone: 1-617-232-7400 *Fax:* 1-617-232-9171
E-mail: custserv@knowledgefoundation.com

April 27 - 28

Carolina EV Challenge, Raleigh, North Carolina, USA
Sixth annual Triangle Electric Auto Association (TEAA) sponsored event - the largest conversion electric vehicle event in the Southeastern US's history.
Contact: Ralph Goodwin
Phone: 1-519-546-6551
Website: http://www.evchallenge.org

May 2 - 5

Canadian Electric Vehicle Conference 2001, Kelowna, BC, Canada
Annual conference of the Canadian EVAC.
Contact: Tom Lewison, EVAC
Phone: 1-613-723-3127 *Fax:* 1-613-723-8275
E-mail: evac@evac.ca
Website: http://www.evac.ca

May 13-16

National Clean Cities Conference and Expo, Philadelphia Convention Center, Philadelphia, Pennsylvania, USA
Seventh annual meeting focusing on alternative fuel issues, transportation policy initiatives, and technology innovations to ease smog and improve air quality in urban areas. Hosted by the U.S. Department of Energy and the Greater Philadelphia Clean Cities Program.
Contact: NREL Conference Services, 1617 Cole Boulevard, MS 1623, Golden, CO 80401-3393
Phone: 1-800-224-8437
Website: http://ccities.doe.gov/conference.shtml

May 15 - 16

Grid-Connected Hybrids Conference, Davis, CA, USA
A conference at the Institute of Transportation at U of Calif, Davis. In 2003 the new California mandate permits up to 50% of ZEV requirement can be met with grid-connected, plug-in hybrids have all-electric range <20 miles.
Web Site: http://its.ucdavis.edu/events/

May 16-18

F-Cells Week 2001, Palm Springs, California, USA
A conference on the challenges facing the commercialization of fuel cells for automotive and stationary applications.
Contact: F-Cells Week 2001
Phone: 1-800-822-8684 or 1-973-256-0211
Fax: 1-973-256-0205
E-mail: fcells2001@iqpc.co.uk
Web Site: http://www.f-cellsnetwork.com

May 19-26

NESEA Tour de Sol, Boston, Massachusetts, USA
Thirteenth annual championship of electric and green vehicles will travel from Waterbury, Connecticut to Boston, Massachusetts over seven days, with festivals along the way in Albany, NY and Pittsfield, Greenfield, and Worcester, MA. Over 50 vehicles will compete and many more will be on display.
Contact: Nancy Hazard, NESEA
Phone: 413/774-6051 *Fax:* 413/774-6053
E-mail: nhazard@nesea.org
Web Site: http://www.nesea.org

June 2

Tanforan Friendship Rally, San Bruno, California, USA
San Francisco Peninsula EAA annual EVent for displaying EVs and educating the public.
Contact: Tonyh Kabage
Phone: 1-650-992-1834

June 2

Boyertown Historic Electric Vehicle Weekend, Boyertown, Pennsylvannia, USA
First annual EV Weekend sponsored by the Eastern Electric Vehicle Club of PA (EEVC).
Contact: Perry Oliver
E-mail: perryo@Cinnaminson.com

June 4 - 5

Electric: The Smart Solution, San Diego, California, USA
EPRI national conference focusing on new technologies in non-road electric vehicles.
Contact: Laura Ramos, EPRI
Phone: 650/855-7919
E-Mail: lramos@epri.org
Web Site: http://www.epri.com

June 4 - 7

ITS 2001, Miami Beach, Florida
Eleventh annual ITS America meeting and expo. EXHIBIT OPPORTUNITIES AVAILABLE
Contact: ITS America
Phone: 202/484-4847 *Fax:* 202/484-3483
Web Site: http://www.itsa.org

June 10 - 13

EnV2001, Southfield, Michigan
Annual conference and expo focusing on technology and global standardization of environmental vehicles and alternative fuels.
Contact: ESD
Phone: 1-800-659-2559
Web Site: http://www.esd.org

June 12 - 13

Vehicle Systems Integration In the Wired World, Brighton, England
International conference will focus on the technical research and engineering challenges facing the automotive product development sector from the current market drivers for the industry.
Contact: Corrine Paine, Ricardo
Fax: +44-(0)1926-614977
Web Site: http://www.ricardo.com/conference

June 17 - 20

Canadian Hydrogen Conference, Victoria, B.C., Canada
Eleventh annual conference will present the latest advances and issues in the science, technology, business and policy associated with the emerging hydrogen economy.

CARS AND PARTS FOR SALE

Sources for Existing EVs for Sale:

(West Coast)
Silicon Valley Chapter EAA
http://home.pacbell.net/beckettw/forsale.htm#owned

Innevations
http://www.innevations.com/used-evs.html

Eco-Motion Electric Cars
http://www.halcyon.com/slough/contributions.html

Used EV Brokers
Electric Vehicles Inc. 650-964-3974 (San Francisco area patrons Only)

(South-West)
Arcata Electric Car
http://www.tidepool.com/~ecar/list.html

(Mid-West)
EV Tradin' Post
http://members.nbci.com/evalbum/geobook.html

(East Coast)
EVA/DC
http://www.evadc.org/forsale.html

Triangle EAA
http://www.rtpnet.org/~teaa/forsale.html

1980 Dodge Jet 007 Omni Hatchback Electric Car.

2 door, 4 passenger with fold-down rear seat. 120V with 20 Trojan batteries, 4-speed, PMC Controller, Invicta tires. White with blue interior. All original gauges work for electric indicators. $3,500. 1-415-388-0838

Contact: Canadian Hydrogen Council
Phone: 1-250-721-6295 *Fax:* 1-250-721-6323
E-mail: cha2001@iesvic.uvic.ca
Web Site: http://iesvic.uvic.ca/cha

June 20 - 22

Engine Expo 2001, Stuttgart, Germany
An international exhibition and conference dedicated to engine design, engine components, and engine manufacturing
Contact: Engine Expo 2001
Phone: +44 (0) 1306 743744 *Fax:* +44 (0) 1306 877411
E-mail: expo@ukintpress.com

June 23

East Coast NEDRA Drag Race, Mason-Dixon Dragway, Hagerstown, Maryland, USA
EVA/DC is organizing the Power of DC, an electric drag race which will be held at the Mason Dixon Dragway outside of Washington D.C.
Contact: Greg Pokorny
E-mail: grepok@bigfoot.com
WebSite: http://www.evadc.org/pdc/index.html

June 24 - 28

Air and Waste Management Conference, Orlando, Florida
Annual conference on environmental issues and solutions.
Contact: AWMA
Web Site: http://www.awma.org

July 15-25

American Solar Challenge, Chicago, Illinois to Los Angeles, California, USA
Teams from around the world will participate in this 2300 mile solar car race from Chicago to Los Angeles.
Website: http://formulasun.org/asc/

August 6 - 10

2001 Management Briefing Seminars, Traverse City, Michigan, USA
Annual management briefings on automotive industry and transportation issues sponsored by Environmental Research Institute of Michigan Center for Professional Development, University of Michigan College of Engineering
Contact: ERIM
Phone: 1-734-662-1287 x946 *Fax:* 1-734-662-5736
Website: http://www.erim.org

August 25

EBEAA EV Rally, Walnut Creek, California, USA
Fifth Annual EBEAA Annual Rally for distance and performance.
Phone: 1-925-685-7580

September 9 - 14

Hypothesis IV, Stralsund, Germany
Conference on theoretical and engineering solutions on hydrogen power. It will cover all aspects of technology developments and commercialization of hydrogen and fuel cells.
Contact: Fachhochschule Stralsund University
Phone: +49-3831-456-811/456-703 *Fax:* +49-3831-456-687
E-mail: hypothesis@fh-stralsund.de
Website: http://www.hypothesis.de

September 15

SVEAA Chapter Rally, Stanford, California, USA
Annual Silicon Valley EAA Rally, from 10 am to 4 pm, at the Stanford University Campus.
E-mail: Will Beckett@email.com

October 1 - 4

SAE Automotive and Transportation Technology Congress and Expo (formerly ISATA), Barcelona, Spain
Conference to explore issues, products and ideas vital to the automotive and transportation technology industry.
Contact: ATT staff
Phone: +44-1372-720620 *Fax:* +44-1372-720101
E-mail: enquiries@attce.com
Web Site: http://www.attce.com

October 20 - 24

EVS-18, Berlin, Germany.
Eighteenth annual EVS, hosted by EVAA.
Contact: EVAA
Phone: 1-415-249-2690 *Fax:* 1-415-249-2699
E-mail: ev@evaa.org
Web Site: http://evs18.tu-berlin.de/

Electric Auto Association (EAA) Membership Application Form

Print and fill out this form, attach a check or money order in US funds only for $39 ($42 Canada) ($45 International) payable to 'Electric Auto Association'. You can fold this form as indicated and mail it with your payment enclosed. Do Not use staples. Use tape to attach your payment, and seal the form before you mail it.

New Member: ___ Renewal: ___ Country origin: _____ Date: _____

Name & *email: _____

Home & Work phone # _____

Street, City, State & ZIP: _____

Referred by:

I support the _____ EAA Chapter (*optional)

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

The Electric Auto Association www.eaaev.org

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

The Electric Auto Association (EAA) is a non-profit organization (eaaev.org 501c3) for the promotion of Electric Vehicle use in and by the public. Your membership is Tax Deductible and you will receive the informative monthly EAA publication, "Current EVents". All information and statistics in this application are for the exclusive use of the EAA and is not sold or given to any other organization or company. From your membership dues, a percentage goes to the EAA Chapter you support for public Electric Vehicle promotion activities like EVents, Rallies, Shows, and EV rides.

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

Return address

_____

_____

_____

1st Class Postage Here

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

EAA Merchandise

The **Electric Auto Association** (EAA) is a nonprofit organization for the promotion of public awareness of Electric Vehicle use as a viable transportation option. All minor sales proceeds are used to cover the costs of our nonprofit efforts in this cause. Please show your support with your purchases for better, cleaner, quieter, and lower maintenance transportation.

Product	Description	Comments	Item#	Price
Licence Plate Holder	Black plastic frame, white lettering on visible green.	Allow 6 weeks.	LICPH1	$ 10.00
Licence Plate Holder	For motorcycles. Black or chrome metal.		LICPH2	$ 14.00
Embroidered Patch	White, Sew-On.	Allow 3 weeks.	PATCH1	$ 6.50
Embroidered Patch	Green, Sew-On.		PATCH2	$ 6.50
Embrodered Hat	Adjustable fit.		CAP002	$ 9.50
"Electric Vehicle Parking Only" Sign	Metal sign, reflective white background with dark green lettering. Wall or pole mounting.	Like public no-parking sign quality.	PARK01	$ 25.00
EAA Key Chain	With LED light and "30 years 1967-1997".		KEY01	$ 2.50
Coffee Mug	Ceramic.		MUG03	$ 5.50
Insulated Car Coffee Mug	Plastic.		MUG02	$ 6.50
Embroidered Polo Shirt	Size: S,M,L,XL,XXL. Color: Forest, Teal, or Navy.	Allow 10 weeks.	SHIRT01	$ 30.00
EAA Jacket	Size: S,M,L,XL,XXL. Color: Blue or Black.	Allow 10 weeks.	JACKE1	$ 59.00
EAA Wind Breaker	Size: S,M,L,XL,XXL. Color: Blue or Black.	Allow 10 weeks.	WBREK1	$ 49.00
EAA Sweat Shirt	Size: S,M,L,XL,XXL. Color: Blue or Black.	Allow 10 weeks.	SWEAT1	$ 39.00
EAA ball-point pen	EAA ball-point pen with EAA.	Sold individually.	PEN01	$ 1.00
Car Window Shade	EAA Car Window Shade.		SS001	$ 8.00
Bumper Sticker #1	EAA Bumper Sticker.	Size: 10.5" x 3.75"	BS800	$ 2.00
Bumper Sticker #2	EAA Bumper Sticker "The Switch is on".	Size: 15" x 3.75"	BS002	$ 2.00
Decal	EAA Decal (The Switch is on).		DECAL	$ 1.00
	— EV Buyers Guides —			
2000	Electrifying Times Preview 2002.	Not available.	BG2000	NA
1999	Electrifying Times	Not available.	BG1999	NA
1998	Electrifying Times Preview 2000.		BG1998	$ 5.95
1997	1997 EV Buyers Guide.		BG1997	$ 5.95
1996	1996 EV Buyers Guide.		BG1996	$ 5.95
1995	1995 EV Buyers Guide.		BG1995	$ 5.95
	— Literature —			
Convert-It	EV conversion Book		CONV01	$ 24.95
KTA Catalog	Electric Vehicle Kits & Component Parts		CATAL1	$ 5.00
Window Literature Holder	Light plastic.		WL002	$ 15.00
	— Special —			
AVCON to 14-50 Electrical Adapter Kit	Sheet metal box, 14-50 outlet (2 hots and a ground, no neutral), for 220 VAC chargers only.	Allow 6+ weeks delivery after payment deposited. Some assembly required.	ADAPT1	$200.00
EAA Membership	Fill out Membership for on opposite page	Include form w/ order.	EAAM01	$ 39.00
Shipping	US =10% / CANADA =15%, OTHER = 20% of the sub-total.	*Orders are restricted to the US, Mexico and Canada*	Subtotal Shipping	$_____ $_____
			Handling	$ 2.00
			TOTAL	$_____

To order, include your name, phone number, mailing/shipping address and payment by check or money order. Please specify quantity for each item and size/color for clothing.

Send orders to:

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

KTA Services
Ad

ELECTRIC AUTO ASSOCIATION
2 Smith Ct, Alameda, CA 94502-7786

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420