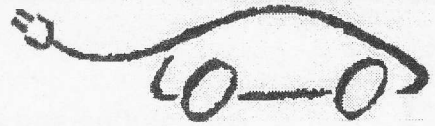


CURRENT EVENTS



April '96

Promoting the use of electric vehicles since 1967

Vol 28 No. 4

EVS WILL HELP

Air Pollution and Health

By Ruth M. Shipley

From Philadelphia to Seattle, Sao Paulo to Barcelona, Copenhagen to Beijing, researchers are continuing to document the health effects of air pollution.

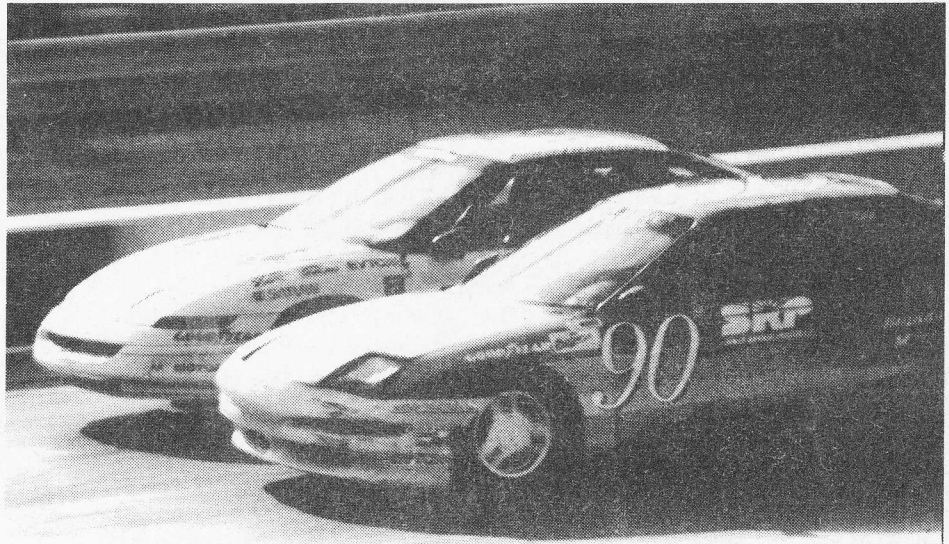
Scientists have known about the link between air pollution and health since 1952, when a deadly smog in Britain killed 4,000 people.

What's different now is that many parts of the world are dotted with pollution monitoring equipment that can document the levels of every specific pollutant down to the microgram. And researchers can use hospital databases that contain data on admissions and mortality rates.

One of the best studies to date was the Harvard Six Cities Study, which was published in 1993. This study followed more than 8,000 people in six US cities over a 14- to 16-year period. The death rate from lung and heart disease were 26% higher in the most heavily-polluted city than the rate in the least-polluted city.

Mortality rates were most strongly associated with small particulate matter and the association held up even after the scientists adjusted the data for other factors that affect the heart and lungs such as smoking, diabetes, obesity, and occupational hazards.

And researchers at UCLA caused quite a stir in 1994 when they released the results of a study of three Southern California communities which revealed that air pollution can affect lung function as severely as smoking.



Unfortunately, the strong epidemiological link between air pollution and illness and death cannot always be confirmed by laboratory research exposing individual people to specific air pollutants. For example, 69 million Americans live in areas where ozone concentrations exceed the National Ambient Air Quality Standards and epidemiologic studies have revealed increased emergency room visits and hospitalizations in people with asthma when ozone levels are high.

Yet when researchers expose people with asthma to ozone in a laboratory, they can't always document changes in pulmonary function.

But even though biologists can't always determine exactly how pollutants damage lung tissue, the evidence linking air pollution to increased death rates has been documented in so many parts of the

world that most researchers believe the association is clear.

Here is a brief summary of what we know about the effects of specific pollutants:

Ozone

Exposure to ozone impairs lung function in exercising adults and can cause coughing and chest pain. It causes an inflammatory response in the upper and lower airway and has been linked to increased emergency room visits and hospitalizations in people with asthma.

Many people adapt to chronic ozone exposure, but researchers agree that chronic ozone exposure can damage the peripheral airways, causing obstructive lung disease.

continued on page 4

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- 6** **Second Annual SF Bay Electric Auto Rally.** Time to grin and BEAR it! Registration form included.
- 9** **EV Technology in the UK.** From the AVT-100E to Nelco Motors.
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- 16** **Tech Tips.** Bob Batson tells us the right way to tighten connections on battery posts.

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The deadline for articles is the 25th of each month for the next issue of CE. Articles received after this date will be retained for future issues of CE.

Contact Clare Bell, Managing Editor for further information. If you would like to submit an article for CE, the preferred format is on a floppy disk, along with a printed copy of the article. Include camera-ready photos or graphics in TIFF or EPS. Please specify PC or MAC and identify software and version number.

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EAA Membership

2710 St. Giles Lane
Mountain View, CA 94040

PHOTO CREDIT - PAGE 1

Tom Sneva in #90 Ford Probe and David Swan in #15 Saturn battle for lead. Electric cars such as these Phoenix APS Super Stock racers can substantially reduce air pollution. (See pg 10 for story.)

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LETTERS TO THE EDITOR

Several Internet EV Discussion List posts appeared in response to Scott Cornell's Battery Test Data article.

Date: Wed, 06 Mar 1996 21:29:20 -0700

From: Bob Jackson <bobj@HPBS669.BOI.HP.COM>

Good Day...

I took the Battery discharge numbers from the March '96 Current EVents and beat on them a bit....

Battery	min@100amp/lb	min@100amp/\$
5SHP	.46	.24
1450	.37	.24
Horizon	.61	.08 (assume \$400)
Optima	.47	.22
Genesis(1)	.47	.12
Genesis(2)	.55	.14
27-EV	.45	.52
T125	.59	.55
2300	.54	.76

Comments: Optima's are as good as 5SHP's and are sealed. 6v are the best value (by far). I hope the Horizon numbers are wrong.

Date: Thu, 07 Mar 1996 09:23:55 -0800 (PST)

From: Charlie Panek <charlier@LSID.HP.COM>
Everett, Washington

I did about the same thing with the data. (BTW a great big THANK YOU to Clare, et. al. for supporting and publishing this. I hope we see more of this sort of thing in CE in the future!)

I too was a bit disappointed about where the Horizon landed, but I think it's important to observe what happened with the data on the Genesis battery, when he used two of them instead of one. The energy density number increases by 17%! If he had used 2 Horizons in parallel as well, I'm sure that it would have done better by as least as much. If you compare the Horizon with a wet cell of similar weight (The Eveready) you'll see that it's about 33% better in terms of energy density, (based on mins at 100A), even higher when you consider that the Horizon held it's output voltage about .7 V higher than the Eveready for the entire length of the discharge. This is consistent with Horizon's claim of about 40% better energy density.

Probably a fairer (albeit more costly) test would have been to test equal weights of each kind of battery with the same current. That is to say, to test 500 lbs of each kind of battery, all discharging at 100 amps. We all know that a battery can deliver more total energy at lower discharge currents. Well, conversely

more pounds of battery can deliver more total energy for a given total discharge current. It's obvious when 2 batteries are connected in parallel, like the Genesis, that each is now supporting only half the current it was before. When comparing a 87 lb 5SHP with a 53 lb Eveready, a similar effect is at work: the 5SHP could be almost thought of as 2 smaller batteries in parallel, probably about 87/53 times the plate area of the Eveready, etc.

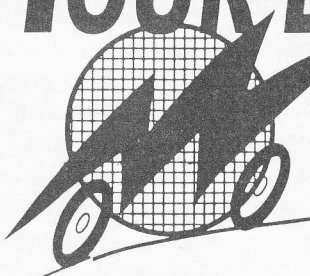
The battery that really impressed me was the Optima! It did better than the much heavier 5SHP on a per-pound basis when being asked to deliver the same current. And it's only slightly more expensive (per pound). Imagine how it would have compared if he'd tested two Optimas in parallel!

Thanks for your comments (and your enthusiasm) about the battery test article. CE will be continuing to publish battery evaluations and comparisons, since the information is directly useful to EAA members who have EVs or are building/planning them. Kudos should go to Tech Editor Scott Cornell for doing all the work. I'll be passing your comments on to him for his response, but in the meanwhile, here is mine.

continued on page 20

An invitation to join NESEA's eighth annual

AMERICAN TOUR DE SOL



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Air Pollution

Continued from pg 1

Animal studies reveal that ozone can damage the immune response to infectious organisms but no one has been able to document an increase in death from lung infections in those chronically exposed to ozone.

Carbon monoxide

There is evidence that exposure to elevated levels of carbon monoxide can increase episodes of angina and hospitalization rates in people with coronary artery disease and the mechanism in this case is fairly clear. Carbon monoxide attaches to hemoglobin, the principle carrier of oxygen in the blood. A decrease in the supply of oxygen to the heart can lead to chest pain during exercise. A recent study in seven US cities found that increased CO levels were associated with increased hospital admissions for congestive heart failure.

NOX

Oxides of nitrogen don't seem to affect healthy adults adversely but some studies have found increased lung irritability in people with asthma during NOX exposure. Children also appear to be more susceptible to its effects. More than 60% of NOX is deposited in peripheral areas of the lung and NOX has caused emphysema-like changes in mice. Animal studies also reveal that NOX impairs the ability of the immune system to fight bacterial infections.

SOX

Researchers have been unable to document laboratory evidence of lung dysfunction in healthy adults following exposure to aerosolized acidic sulfates. However, adolescents with asthma do experience functional impairment following SOX exposure. There is evidence of abnormal clearance of secretions in the small airways even in healthy people when exposed to acidic sulfates.

Particulates

In the 1990s, more and more researchers are focusing on the link between small particulate matter and lung disease.

Douglas Dockery of Harvard's School of Public Health has documented much of the evidence linking particulate matter to lung disease. The principle investigator of the Harvard Six Cities Study, his research has also linked small particulate matter to increased death rates in elderly people in Sao Paulo, Brazil and increased hospitalizations in Beijing.

Dockery and a colleague, C. Arden Pope, summarized much of the research on the health effects of small particulate matter in the Annual Review of Public Health in 1994.

They surveyed US studies from Philadelphia to Utah Valley and from Detroit to Birmingham, Alabama. Most of the studies found an increase in total mortality from 1% to 1.6% for each 10 microgram per cubic meter increase in particulate matter smaller than 10 microns. The death rates from respiratory disease were more than 3% per 10 microgram/m³ increase.

Although these increases in mortality may seem small, keep in mind that a 10 microgram/m³ increase is also very small. In many communities, total particulate matter exceeds 50, 100 and even 150 micrograms/m³. And death rates would be magnified accordingly.

Other researchers have shown that an increase in small particulate matter is associated with grade school absences, childhood hospitalizations for respiratory disease and increased use of asthma medications.

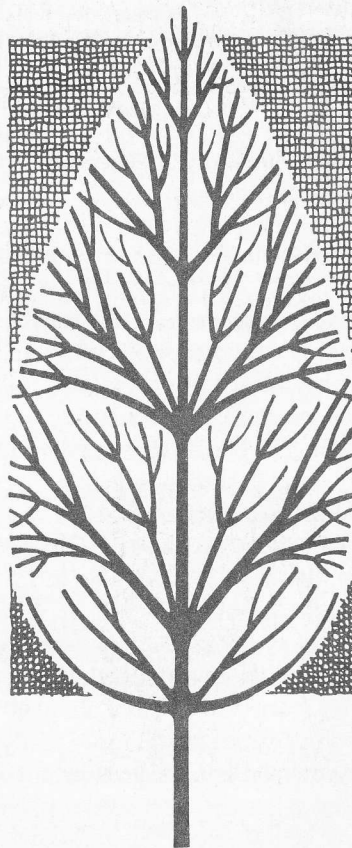
Pope found that hospitalizations for respiratory disease in children fell 50% in Utah Valley in the winter of 1986-87 when small particulate concentrations dropped substantially following a strike at the local steel mill.

And even though scientists agree that small particles can be carried deep into the lungs, laboratory research has yet to confirm exactly how they affect the lungs.

Scientists may have a living laboratory in which to study the effects of air pollution now that the federal 55 mph speed limit has been abolished. Many observers believe that increased highway speeds will result in increased pollution — so much so that many communities will be hard pressed to meet air quality standards.

Will the predicted increase in traffic fatalities be matched by an increase in illness and death from air pollution? If so, it will strengthen the association. —RMS

Ruth M. Shipley can be reached on the Internet at [73043.60@compuserve.com](mailto:<73043.60@compuserve.com>)



Electric Destructo-Derby?

For those perverted souls who are into electric destruction derby, there was no shortage of fender-bashing outside the high school races. In Saturday's Stock/Super Stock heat or sprint race, Wilde Evolution's #7 Taurus beat Tom Sneva into the first turn, but lost it in a 180 spinout that brought both cars together nose to nose. Sneva's Probe came away with only some battle scars on its left front bumper, but the collision put Rod Wilde out of the heat race. A post-race pit inspection revealed the cause; a bent rear suspension arm causing toe-out in the tire. This condition kept the Taurus' tail from sticking during hard cornering and braking.

Some quick in-the-pit fixing and panel-beating got the Taurus back into competition for Sunday's enduro. Kudos to Wilde Evolutions for good teamwork.

And a good word to Tom Sneva, whose Probe bravely shrugged off the Taurus' love-tap on the snoot. Veteran Indy driver Sneva went on to place fourth overall, despite some possible wheel interference problems that might have been caused by the encounter.

On a collision-avoidance note: Little Guy Racing's Garry Jackson practiced his automotive ballet by pirouetting his #44 Geo Metro not once but twice during the enduro run. Despite the dancing act, Jackson managed to recover well enough to take away second place. When asked about his maneuver, the veteran competitor Poway CA responded, "I wanted to earn the team some extra prize money, so I'm practicing my stunt driving. We had just changed the tires and it got a little slick out there."

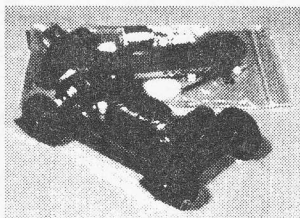
After the first spinout, which happened at the blind corner just past the first (Winston Tower) turn, Jackson kept his head, got his car quickly off the track out of the way of the oncoming field (who weren't able to see him). He then launched back in. Good and gutsy driving, Gary. —CB

As EVs become market ready, will your market be ready for EVs?

EV Media, in association with EV industry leaders, has developed the following communication tools to help your community become EV ready:

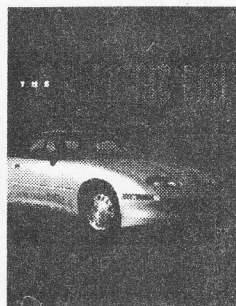
Electric Car

Full-color, 16-page booklet. Technical, environmental, economic and infrastructure issues introduced. For students in grades 6-12 and adults. Community Discussion Leader's Guide available. \$2.95 + \$1.50 S&H (quantity discounts available).



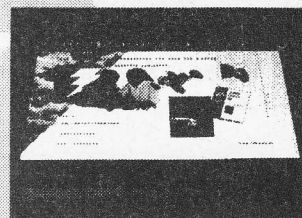
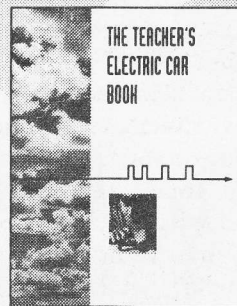
The Electric Flyer model kit

Includes a 5.5" aluminum chassis, chrome axles, 1.5" wheels, electric motor, battery holder, three nylon gears (which can be configured in seven ratios), and misc. washers and fasteners. Kit includes *Electric Car* booklet and 8-page, illustrated assembly guide. \$18.95 + \$5.00 S&H.



The Teacher's Electric Car Book

128-pages. Everything a teacher needs to conduct a unit on electric vehicles: background information on urban air pollution, batteries, infrastructure, etc. Provides directions for building model EVs, lap counters, controllers, inductive chargers, rechargeable batteries, and much more. \$12.95 + \$5.00 S&H.



Electric Vehicle Classroom Kit.

The materials and suggestions a teacher needs for a super, hands-on unit on electric vehicles: 35 *Electric Car* color booklets, 5 *Electric Flyer* model kits, and 1 *Teacher's Electric Vehicle Book*. \$125.00 (a \$148.95 value) + \$12.50 S&H.

(California residents, please add appropriate sales tax)

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2nd Annual San Francisco Bay Electric Auto Rally

by Peter Barnes and Henry Deaton, SF-Peninsula Chapter

The San Francisco-Peninsula Chapter of EAA is an early splinter from the Charter EAA organization which formed further south on the San Francisco Peninsula. We have about 60 members and meet monthly, usually to hear a scheduled speaker. Our group is noted for being more social than technical, but mostly we like to talk EVs at

parades, county fairs and other local EV events.

Last year the SF-Peninsula Chapter of EAA organized and sponsored a different rally concept; a scenic drive and fund raising effort for the American Lung Association (ALA) in support of their National Clean Air Month (May) awareness efforts. The linkage between electric vehicles and clean air was obvious and the Lung Association was enthusiastic.

Over 25 vehicles entered and most drove across the 3 major bridges on the 45 mile route. SF BEAR raised over \$6000 for ALA from participants including AAA, the local electric utility, and the Bank of America.

We also garnered endorsements from many community organizations and city governments. The clean air theme, support of charity, and scenic drive aspects of this rally make it unique. We think the connection of electric vehicle events to Clean Air Month activities is one that could become a focus for EAA members and chapters through out the US. Doing our part we announce:

The 2nd Annual San Francisco Bay Electric Auto Rally (SF BEAR), and Clean Air Fair Saturday May 4, 1996, Crissy Field, San Francisco, California.

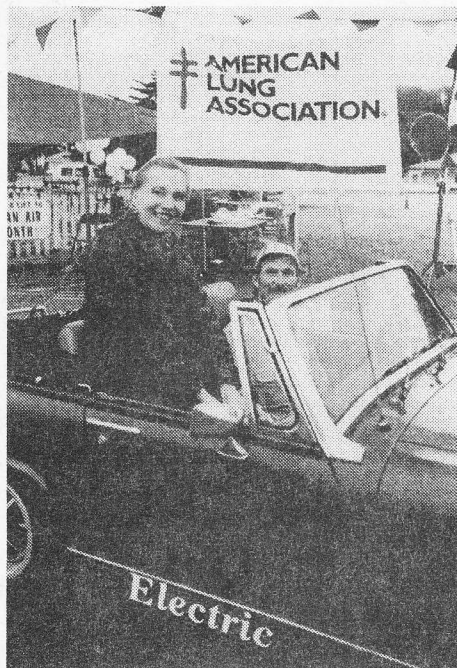
American Lung Association

The American Lung Association's major role is to educate the youth and adult public along with health professionals regarding hazards to breathing. The Association serves as an information and educational resource for occupational and environmental health of the air for people living and working in metropolitan areas throughout the US. Special target areas include promotion of public transportation, ridesharing, and, in California, vigorous support of the ZEV initiative. The demonstrated air quality improvements that are sure to come with the advent and use of electric vehicles makes ALA a logical national partner to EAA in the promotion of EVs as personal transportation.

This year we will continue to publicize electric vehicles and provide a venue for other organizations working to improve air quality and the public health in the SF Bay Area. We have selected a high visibility site at Crissy Field on the waterfront in the San Francisco Presidio for the staging area for the SF BEAR and for Fair booths and EV displays. The Clean Air Fair will involve displays of electric vehicles and is open to organizations promoting clean air technologies, programs or policies. All participants will pay a small entry fee to help offset the costs of SF BEAR and the Fair.

The planned SF BEAR route is a repeat of last year's successful 2-3 hr scenic drive circling the central SF Bay with the route crossing the Golden Gate, Richmond-San Rafael, and Bay Bridges. We plan to include stops at popular vistas and at city centers along the route to provide photo opportunities and to symbolically deliver clean air.

A shorter route (less than 20mi) is planned over the Golden Gate Bridge



Dave Coale and the Bay Area Action MG (top) and Otmar Ebbenhoech's S10 (bottom) at 1st Annual SF BEAR in 1995.

SF Bear and Fair Participant Form

Name _____
 Address _____
 City _____ State _____ Zip _____
 Phone - Day (____) _____ Evening (____) _____ e-mail _____

I/We would like space/table to display Clean Air literature or technology
 Contact Event for space needs and costs

___ I will be driving an electric vehicle: (Provide info. below)

Vehicle registration fee \$20 (\$25 after April 15th)

___ I would like to bring an electric vehicle to display

Vehicle registration fee \$10 (\$12 after April 15th)

Total Enclosed (make check payable to EAA)

\$ _____

ELECTRIC VEHICLE INFORMATION

Owner/Driver _____

Ins. Co. _____

Make of vehicle _____ Year _____

Lisc. _____

Outstanding & interesting features _____

I will need to charge my vehicle overnight in San Francisco:

Fri. 5/3 _____ Sat. 5/4 _____

I will need a "topping" charge before _____/after _____ the rally.

Note: A signed waiver will be requested from all rally participants at check-in.

Return Registration material to:

SF BEAR
 SF-Peninsula Chapter of the EAA
 P.O. Box 420712
 San Francisco, California 94142-0712



ELECTRIC AUTO ASSOCIATION

and within San Francisco for distance-challenged vehicles.

The SF BEAR Event is open to all EV owners and drivers. Participation by either driving and displays EV's is encouraged. All participants will pay a small entry fee to help offset the Event costs and are encouraged (not required as last year) to obtain sponsorships as donations to ALA for their vehicles. In addition, all rally participants will be asked to allow major donors to ALA's Clean Air Month fund raising efforts to be recognized on their vehicles.

Participants will be recognized for:

- ☐ Participation
- ☐ Display and promotion of EVs and Clean Air strategies
- ☐ Completion of the rally and delivery of clean air
- ☐ Obtaining sponsorship for ALA

To enter the Rally, vehicles must be street-legal in California and drivers must be licensed and insured. 110 volt charging will be available at the Presidio before and after the rally.

To enter the Fair, individuals and organizations must focus on displays that promote Clean Air technologies and policies with application to the Bay Area.

For SF BEAR and Fair information or to volunteer to help us with the Event, write us at the address below or contact Chapter President, Henry Deaton, (415) 861-5624 : hdeaton@surf.com

See the SF BEAR and Fair participant registration form at left

All participants are encouraged to obtain donations for the American Lung Association in support of ALA's effort to promote clean air. Vehicle entries should also be willing to have corporate sponsorship of ALA to be recognized by association with your vehicle.

Lithium-ion batteries for EVs

by Bill Yerkes

Sony has developed a lithium-ion rechargeable battery for EV applications with a high energy density of 100 W-h/kg and a high power density of 300 W/kg. The lithium-ion battery technology was announced by Sony in 1990. These batteries have high energy density, high operating voltage, long life, and the absence of a memory effect. This has caused them to become popular for camcorders, personal computers, and other such products. Now Sony is looking at the electric vehicle market.

The new lithium-ion battery is a module of eight cell batteries connected in series. The cell diameter is 67 mm and cell length is 410 mm. The cathode material is made of lithium cobaltite (LiCoO₂) and the anode material is composed of nongraphitizing carbon. Its gravimetric energy density is three times greater than lead/acid batteries and 1.5 to 2 times greater than nickel-type batteries. When compared by weight, the lithium-ion batteries offer 1.5 to 3 times more driving distance. Because the battery has a higher power density of 300 W / kg, it provides the large current necessary for driving uphill or at high speeds in EVs.

The battery has a long life of 1200 cycles, an approximate 10% self-discharge rate, and a high charge density efficiency of 95%. It can be operated from -20 C to +80 C. Full charge can be obtained in 2.5 hours, a 50% charge in 30 minutes, and an 80% charge can be attained in one hour. The battery has a built-in cell controller. Battery voltage, current, and other data regarding each cell in the module are transmitted to a controller in the vehicle to maintain an optimum operating environment. The eight-cell package can yield 28.8 volts, and 100 A-h, with a mass of 29 kg. The overall dimensions are 290 mm in width, 150 mm in height, and 440 mm in depth.

California-style Emission Standards for British Columbia

In November 1995, the province of British Columbia, Canada unveiled new regulations requiring vehicles to be California-certified low emission type. BC's five point regulatory program includes the following:

- * Starting in 1998, all new vehicles sold in British Columbia must meet United States federal emissions standards.

- * Effective in 2001, all new vehicles sold in this province are required to meet the more stringent California low emission standard.

- * Targets have been established for the proportion of zero-emission and ultra-low emission vehicles to be sold in BC starting in 1998. A Cleaner Technology Vehicles (CTV) Committee has been established to ensure these targets are met.

- * By February 15, 1996, all automobile manufacturers must provide the Minister of Environment, Land and Parks with their proposed actions to further reduce harmful emissions from vehicles offered for sale in the years 1997-2000. As a result of these proposals, further measures to reduce air pollution will be announced before March 1, 1996.

- * Beginning in 1997, BC will mandate improved warranty coverage for emission-control equipment. Auto manufacturers selling vehicles in BC must offer warranties that cover emission-related components for up to eight years or 120,000 kilometers.

(from a letter from BC Minister Moe Shihota to V. Warren Bourgeois in reply to a query about emission standards for British Columbia. With thanks to the Vancouver Electric Vehicle Association newsletter, Feb. 1996.

The above information was supplied by Sony to Dan Holt, Editor-in-Chief of SAE's Automotive Engineering Magazine. It was printed in the December 1995 issue in Dan's "Focus on Electronics" column, page 12, and copied to the EV Discussion List, with credit given. Dan Holt, Editor-in-Chief, Automotive Engineering "Focus On Electronics - New for '95, page 12 Automotive Engineering, December, 1995.

This same information and additional details are published in the California Air Resources Board Battery Review document from December 1995. — BY

(Received Sun, 28 Jan 1996 19:48:30 -0800 from the Internet EV Discussion List. Posted by "J.W.Bill Yerkes" <billy@NWLINK.COM>.)



Celebrate EARTH DAY '96

EV Technology in the UK

Paul Compton of the UK recently visited me and brought with him some information about recent EV doings in that country.

Alternative Vehicles Technology, of Somerset, produces the AVT-100E, a purpose-designed ground-up built commuter electric. Using on running gear from the British Rover Metro/100, this practical 4-seater is ideal for local driving. A regenerative-braking controller plus the low drag, and low frontal area makes the AVT a highly efficient EV. The body is made of lightweight composite panels attached to a strong yet light tubular chassis which incorporates reinforcement for accident protection and improved occupant safety. Battery location and fully independent suspension ensure excellent road holding and handling. Range is given as 60+ miles with a top speed of 80 mph. It comes in hatch-back, van, or pickup versions.

has also developed a kit for converting the BL Metro Mk1 or 2. This conversion offers the most cost-effective introduction to electric motoring, plus the opportunity to recycle a Metro into a practical, clean and fun urban runabout. AVT also offers a unique design and build service and can supply complete converted vehicles or a comprehensive range of conversion parts for a wide range of existing gas or diesel cars.

Nelco is a recognized British name in brushed DC motors, and, although it is difficult to get them, especially in the larger sizes, they outperform other

motors in terms of power to weight.

Despite constant predictions of the imminent demise of brushed DC motors, they are still being built in greater numbers each year. Many are small in size, but their volume still exceeds that of all AC types put together. Now new motor and drive developments from Nelco appear to give an additional lease on life to the DC brushed motor.

Nelco has expanded the speed range at which these motors run most efficiently. Nelco's new Gemini Nexus traction motors maintain their power and efficiency over a speed range greater than 4:1 by using dual-wound motor armatures combined with electronic field weakening. The two separate armature windings are each fed by end-plate commutators.

Brushed DC motors can usually run efficiently only over a narrow speed range since their speed is mainly limited by the back emf (voltage produced by the motor acting simultaneously as a generator). Nelco's new motors achieve high torque at low speeds by connecting the two armatures in series. Back emf voltage is reduced by chopping the current to the stator field windings, allowing an increase in speed.



The composite-bodied AVT-100 uses regenerative braking. Top speed is 80 mph, range is 60 miles.

For greater speeds, full field strength is re-established, but the electronic drive reconnects the armatures in parallel. Top speed is attained by weakening the stator field again.

By relating stator current chopping and armature switching to speed signals derived from a toothed wheel and magnetic sensors, Nelco technical director Arthur Copus says that it is possible to attain a flat power and efficiency characteristic from just over 1,000 RPM to 5,000 RPM.

Power to weight ratio of these motors is presently around 600 W/kgm. Energy range of production units is expected to be 20 KW, 40kW and 80 KW, but may be extended downwards to 10kW and up to 150 kW.

Access: Alternative Vehicles Technology (AVT)
Blue Lias House, Station Road, Halch Beachamp,
Somerset, TA36SQ. Tel/Fax 01823 480196

Access: Nelco Electric - Arthur Copus, 0252-721233



Hey what's this?

*A Milk Delivery truck in Maidenhead, U.K.
72V and approx. 20 miles/day.*

Port Townsend Takes Phoenix

by Clare Bell

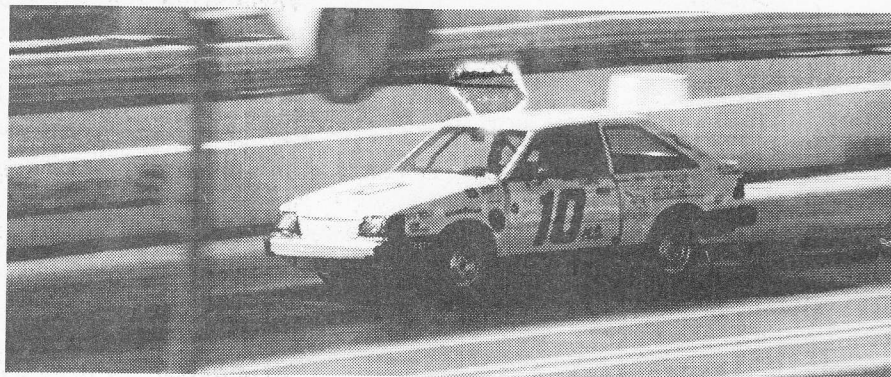
EVTC determined the overall High School winner by a point-scored combination of car performance, design and presentation. Teams that did well in the various performance evaluations showed up well in the heat and enduro races. Car #77, a 1993 Ford Probe from Port Townsend, WA, peeled off a 14.05 sec fast time in the acceleration competition and then won the High School Feature. This was #77's second victory, having taken the same event last year. Driven by Chip Hanauer, #77 led in all laps and won by a 18.47 margin. Hanauer also turned the fastest lap (1:17:072). During a post-race interview, he said that he was proud of the Port Townsend High School kids. "They did a great job, not just today but year round. I am totally behind this as "hands on" education." Jokingly, he added, "I used to be a teacher, but it was too dangerous so I became a professional hydroplane driver!"

Shadow Mountain's midnight-blue 914 Porsche, car #19, aced the braking and handling run with a 37.32 run time through the course. Veteran Porsche pilot Randy Salo was at the wheel for the Phoenix AZ high school. Shadow Mountain's baby also got the most distance for its amps, going 48 laps on 11.28 kW. #19, wearing a borrowed a lexan rear window from WE'RE-IT's #13, also did well in the final race, taking second. After the finish, Salo said, "We have been in this program for over four years. This is our second car. We have done really well every year and plan to keep coming back."

Gloucester High School of Gloucester, VA took second in the range event and the design competition with their 1983 Mercury Lynx, car #62. Driven by Paul DeBolt, the Lynx, seasoned by a win last year at an EVTC race in Richmond, took third. DeBolt exclaimed, "After a win last year at Richmond — then coming out here and finishing third, well it is just great!"



Gloucester's Lynx during performance testing.



Northhampton East's Escort on track.

Best oral presentation went to Central Shenandoah, with Port Townsend showing up again in the the top five. First in the design competition went to Northhampton East for their little gem of a Geo Metro, car # 10A, running on Electrosorce Horizon advanced lead-acids. Port Townsend also did well design-wise, taking third. Placing well in so many categories gave Port Townsend the much-coveted first overall in the High School Competition.

Sixteen cars ran in the High School A Heat race, with Northhampton East cars taking the top two slots; Keith Edwards in an '85 Ford Escort followed by Eric Ryan in a '89 Geo Metro. The second batch of sixteen ran the B heat with Bill Markley of Tucson High School in first with his '87 300 Coupe and Sahurita

High School in second with a '76 Triumph TR-7.

A flood of high school cars on track in the combined grid led to fender scraping and paint trading among the jostling mob. Few entries escaped without war wounds. A number of drivers came in wide-eyed from a jolt of adrenaline caused by an intimate encounter or a near-miss.

In the end, however, the race upheld EVTC President Don Karner's vision of what the competition is all about. "The whole basis of this program is education... The students work all year putting together their cars, then they have the excitement of... running wheel to wheel against other high schools."



More EcoElectric News ! !

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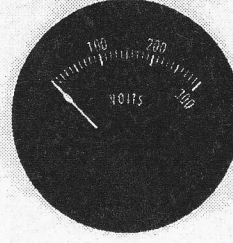
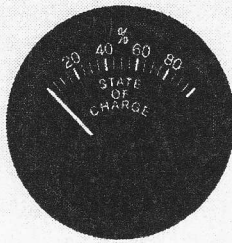
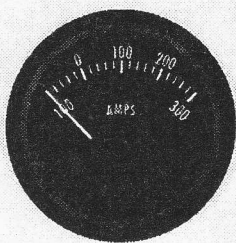
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1996 Phoenix - Tougher and Tighter

by Clare Bell

A 1.1 mile rattlesnake of a road course at Firebird plus more cars at higher race speeds combined to make this year's 1996 APS Phoenix Electrics one of the wildest ever. Not all the thrills came from fender-banging, however. The performance of this year's entries gained deserved cheers from the spectators.

This Year's Hot Stuff

For Street and Super Stock, the hot setup was two motors and high battery capacity. There were two flavors of this strategy—high tech and expensive versus homebrew and low-budget.

For Super Stock, as expected, the winning entry chose the former. Tandem motors belt-coupled to the transaxle gave AeroVironment's '96 Saturn enough acceleration to win Saturday's heat race.

Ovonic NiMH batteries

A high-capacity Ovonic nickel-metal hydride pack plus David Swan's steady and cool-headed driving gave the AeroVironment team the enduro feature. The real winners, Swan said later, were AeroVironment's "superb team" of electric vehicle professionals and the "outstanding storage capacity" of the GM Ovonic NiMH batteries. "Without the...energy storage optimization modifications accomplished by AeroVironment personnel and the excellent performance characteristics of the Ovonic batteries, I couldn't have done as well." He added that the car ended the race with leftover energy. Swan also credited "outstanding support" from Dr. John Dunning of Delphi-E and Jim Mathis of EV Power.

Swan was surprised to finish a full three laps ahead of the Salt River Project Ford Probe, car #90. He commented, "We thought Sneva would give us more competition than he did."

What lies behind the twin-motor design trend? Two small motors can pack more power per pound than a single large one when used in an efficient

design.

They can also spin up faster, since their

smaller armatures have less mass and thus less rotational inertia. As vehicles become more powerful and traction control gets better, motor-spin-up time starts to limit how fast a car can launch from standstill or shoot out of a corner.

In Street Stock, where throwing money at an entry isn't necessarily the best strategy, Cloud/Gabriel Racing chose to go economy class with car #40. Their Dodge Colt twin-motor terror chain-sawed its way to the top in both the Street Stock heat (sprint) and enduro races. Though the Colt, with its direct chain drive to individual front wheels, had virtually no coasting ability, its battery capacity more than made up for any energy loss caused by an inability to free-wheel. With a high (3200 lb) GVW and stripped down to 1100 lbs, the Colt was able to load enough Optima red-tops in its belly to charge around the track without stopping.

In both divisions, the "just git out there and run" philosophy won out over track-side fast-charging. Though #90 Probe had the best qualifying time (0:59.614, yielding an average lap speed of 66.427 mph) and fastest lap speed, it couldn't make up for time lost during recharge stops, even with the high-powered Norvik unit shoving amps into the Probe's Optimas.

Another fast qualifier was Mary Ann Chapman in the WE'RE-IT Porsche #13, pulling a 1:11.208. This was the best of the stock class and better than several of the supers. #13 went on to take an official second in the Stock heat. In light of its qualifying time, the car should have done better. This was no fault of the equipment or driver, but in part a strategy error that resulted from a misunderstanding about what entry was in what

**For Street and Super Stock,
the hot setup was two motors.**

class (which led to some debate about the race results).

University Spec and Formula E

Fresh from completing his IndyCar rookie test at Phoenix International Raceway, Billy Roe of Chandler, AZ jumped over to Firebird and drove the Brawner Motorsports Exide EX-11 to a win in the Formula racing division. The University Spec cars and Formula Lightnings ran together but placed in separate classes. Roe, in the Brawner EX-11, ran what was essentially a demo race, since the EX-11 outclasses the two others in the Formula Division. Nevertheless, his run was impressive, hitting 120 mph along the front stretch of Firebird.

Roe plans to compete in Indy Car Racing and intends to run the Indy 500 in May. Maybe someday he'll drive an electric in the Indy. Well, he'll have the experience.

His competitors, Embury Riddle University's March Indy Lite and Carl Hayden High School's '92 Formula Lightning deserve recognition for just being in the field against such a powerhouse.

University Spec class cars with lead-acid packs were scheduled for three pit stops. Arizona State University, running on nickel-cadmium cells, only needed one. Internet EV Discussion List member Shannon Cash enthused, "My favorite class is the Formula Lightning...if you want to see some engineering, enthusiasm, dedication and team spirit...they have it all!!"

University Spec Class driver Craig Taylor in Ohio U's AC Propulsion-equipped '94 Formula Lightning not only won his class but dared to challenge Roe's EX-11 for the lead during laps 9-10 and 18-19. Taylor and Car #3 also fin-

ished second overall. Third overall and second in University Spec was Richard Harrison from the University of Oklahoma, Car # 31. Arizona State U's nicads pushed car #9's driver, Paul Sweeney to third.

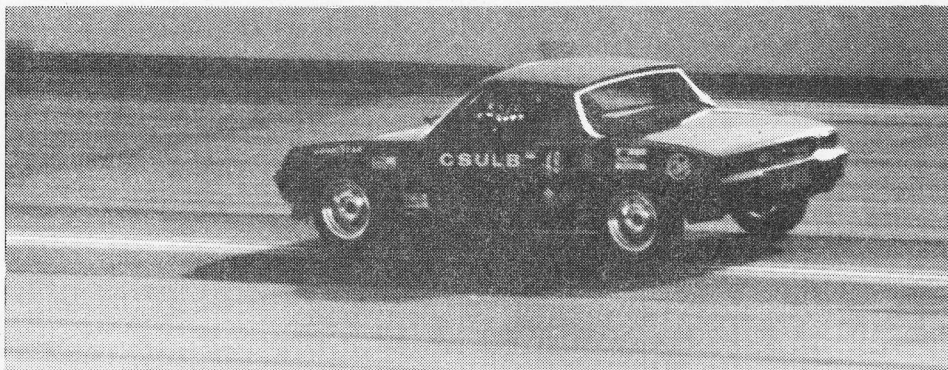
Equipment-wise, the thing to have for U Spec and Formula E was the AC Propulsion (Cocconi) drivetrain. Both first and second-placing University spec class cars ran ACP's 150 kW 3-phase motor/controller package. With fresh 28-31 fresh Optima red-tops as amp sources, these drivetrains could lay 220 HP down on the pavement. The teams were able to push the systems to 170 kW, far beyond their normal rated output.

AC Propulsion powered a winner in the DOE hybrid electric class, University of Idaho's Shawn Riffe in car # 27. The high efficiency of the 134 HP AC-100 drive coupled with careful energy management strategy enabled Riffe to "blast past the competition" and take the finish.

The #90 Probe, which fought so valiantly against Swan's Saturn, also had an AC propulsion system, which put it on the pole both days and set the fast lap in Stock and Super Stock.

With AC Propulsion taking so many of the top places in classes across the board, it was a shame that Alan Cocconi couldn't have been in the grandstands, or better yet, up on the winner's podium. Alas, he and his CRX were outside the track, having been ejected by security for one burnout too many in the parking lot. He was, however, forgiving enough to thank EVTC and APS in an ACP press release for sponsoring and organizing the race.

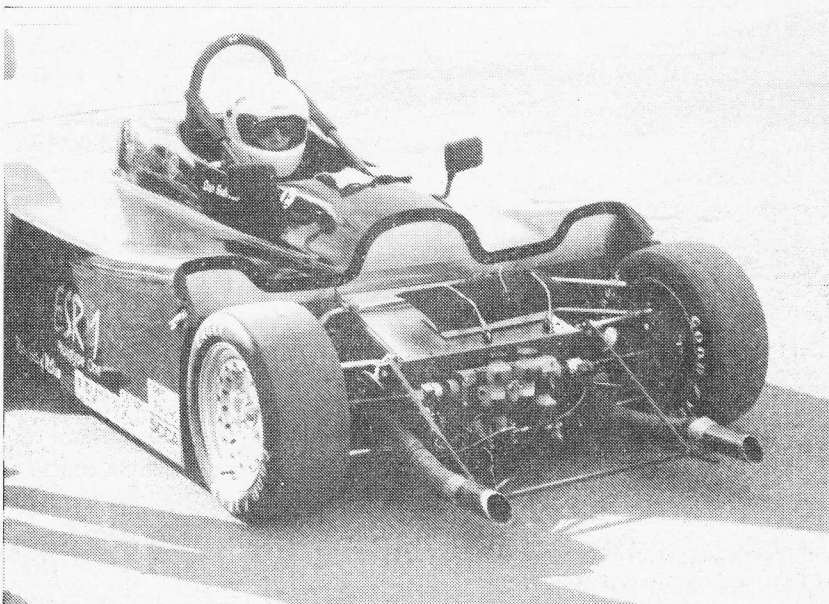
— CB



Cal State Long Beach — dogged by misfortune and a battery terminal meltdown.



Jesse James' moment of glory — #84 leads the Street Stock pack.



Dan Sullivan did a 66 mph average demo lap in the ESR-1.

Da Friday Night Drags

by Clare Bell

It was a Wilde night down at the Firebird Strip. Roderick Wilde in his arrest-me-red RX-7 blasted past a specially prepped and geared SunnySide-Up Impact EV-1. The Wilde man's velocity at the end of the quarter-mile was 85 plus against SunnySide's respectable 80. The start was even more spectacular, with the RX-7 electric drag-mobile launched a good half-way down the strip before SunnySide got very far past the line. The EV-1 accelerated to a fast clip, but all she got were Wilde's tail-lights.

As the times flashed up, the cheer that broke from the crowd could probably have been heard from Phoenix to Wilde's

The 510 held together and fired Wayland down the track like Wiley E. Coyote riding an Acme mail-order missile.

hometown of Jerome AZ. The cheering became a chant, "DEE CEE, DEE CEE!". AC proponents looked slightly sour, but they quickly realized that (most of it) was all in fun. The Wilde guy, when he came back to the start line, was glowing and going a mile a minute. "Where's his off switch?" quipped John Wayland of E-car as Wilde exceeded the word-per-minute limit as rapidly as his Impact-eater munched SunnySide-Up. But the egg was on GM's chops as they took their baby back to the cold pit.

Here's to the boisterous and beaming Mr. Wilde, who has long deserved to stand amid the uniquely noisy adulation given by electric drag race fans.

Fry, Die or Win

King of the Electric Burnout went to E-Car's John Wayland in his suicide sled of a Datsun. The tire-smoking burn lasted more than a minute, covering the track and spectators with billowing haze and eude combustion de Goodyear. The white 510 managed to break every controller that touched it, so Wayland hung his butt out by using only a couple of BIG contactors. "Fry, die or win," he grinned nervously before takeoff. Despite predictions of a trashed tranny, mangled motors or deformed driveshafts, the 510 held together and fired Wayland down the track like Wiley E. Coyote riding an Acme mail-order missile. Wayland had wheelspin on each upshift — the fans could hear the tire chirps clear down at the Winston Tower. Likewise the triumphant (or totally panicked?) whoop from the driver. John



King of the Electric Burnout. John Wayland's 510 Datsun.
photo credit Paul Compton

thanks his overworked guardian angel and Kilovac contactors.

Friday Night Drag Competition Results

Place	Car	Team	Time (sec)
High School			
1	77	Pt. Townsend HS	21.34
2	05	Window Rock H	23.22
3	3	Agua Fria HS	24.24
Race			
1		Ohio State U	15.28
Kart			
1		Japan EV Club	15.39
2		Ed Rannberg	16.59
3		Electro Mech Racing	18.54
144v-P1			
1	91	Current Technology pickup	21.87
2	84	Sunbelt Battery Ghia	22.70
3	74	Pontiac Fiero	23.66
288v-P2			
1	80	Street Wires	17.10
2	31	Shelby Motor Cars	17.71
3	15	AeroVironment	22.64
Over-P3			
1	13	Wilde EVolutions	14.70
2	Impact	General Motors	16.95
3	27	Univ. of Idaho	18.55

Flashes from tortured motors lit the night as other entries, including some incredibly fast English and Japanese go-karts imperiled their driver's derrieres by propelling them to 80 mph while riding scant inches above the ground. That is courting road rash in a big way, fellows! Using a double set of rear wheels to get power to the pavement, the Japanese kart was so torque-y and the young Japanese driver so hyper that the kart nearly launched into the assembled throng. Luckily Ken Koch of KTA Services got the kart stopped before it could inflict any mayhem. Wearing a kamikaze headdress in support of the Nippon team, Koch kept the situation under control. Quick thinking, Ken.

The Americans didn't leave all the fireworks to the foreigners. Ed Rannberg's go-kart fireballed a motor, sending up cometary shower of brushes and other bits. Other motors backfired loudly as they arced under the strain, mixing sharp cracks with the raucous cheering.

Hero of the moment went to the outlaw James as #84 Karmann Ghia dusted not only Kitty Rodden's aquamarine 914, but the next two challengers that came after. Jesse, riding high amidst the hoots of encouragement, claimed that #84's miraculous runs were powered by generous helpings of General Chu's chicken plus some high-octane hot and sour soup. For a moment it looked as though there might be Wilde - James drag face-off, but 84 abruptly remembered that it was electric, not methane-powered, and withdrew itself from any more participation in such activities (translation, it finked out on him). Though it was good while it lasted, hey Jesse? —CB

First Weekend with a New EV

By Henry Deaton, San Francisco/Peninsula Chapter

Late Friday we picked up our new EV, a 1987 Ford Escort Wagon converted in 1992 by Solar Electric Car. Saturday morning, feeling lucky, we drove it to Alameda for the East Bay EAA chapter meeting. 32.8 miles round trip and it was still indicating about 80% on the state of charge meter when we got home. After driving CitiCars (which we still love) for the last eight months, it's nice to be in an EV that can handle the highways.

All-in-all it's a very nice conversion, but we're still figuring out a few things. The oddest thing is that the solar panels (four big ones on the roof, two on the hood), are currently wired to only charge part of the battery pack. The four panels on the roof charge eight out of ten of the 6-volt batteries in the back, and the two solar panels on the hood are connected to either two or four of the eight batteries in the front pack. The solar panels are pretty cool, but why would you have a system that is guaranteed to unbalance your battery pack?

Otherwise the car is very, very nice. Only 79,500+ miles, nice body and interior, and like I said earlier, a very clean conversion. The batteries (T125s) are about a year old, but haven't been cycled much recently. We're getting pretty good power out of them now, but I think they'll do better after they've been used a little bit.

Today we took my son home to Richmond, just across the Bay from SF. It was 18.9 miles each way, mostly freeway. I generally left the Escort in 3rd, which is good for 55 to 60 miles per hour, a little less going up over the overpasses. We couldn't resist getting an opportunity charge at his mom's house (45 minutes). In retrospect we should have made the round trip without charging just so we'd get a better idea of the car's range. I'm hoping for at least 40 to 50 miles at about 50 to 55 mph. My new job is exactly 41.1 miles from home, and, as soon as I can get them to put in a charging station, the new Escort's taking a trip to San Jose.

Just a few observations that were news to me. After being on the EV list for 9 months, and being involved in the EAA for about a year, I thought I knew a couple of things about EVs. Here is what surprised me the most. While I knew that you get the best range by using as low a gear as possible, I didn't realize that occasionally you get better acceleration by upshifting.

As far as the solar panels go, I'll probably rewire them in parallel, then feed the 12 volt output into a 200 Watt inverter, rectify it, and use the output to charge the whole pack. It's a 108 volt system, so a regular 115 volt inverter should be just about right. I don't have any specs on the solar panels, but an educated guess is that I'll get about a 1.5 amp charge from them.—HD

Tightening Battery Posts is Critical

by Bob Batson

We just received a call from one of our customers regarding corrosion around the battery post. We thought this advice might help others.

Be extremely careful when tightening the battery connections. Usually, this is assumed to be a routine task and minimal direction is provided. It is a critical task. Done incorrectly, batteries can be damaged and their life shortened.

There are many different battery connections, (automotive post, universal post, L post, etc).

On automotive posts and L posts the bolt is offset from the center of the lead post. This means that you can apply a torque that will break the seal between the polyethylene battery case and the lead post. This seal is there for difference in thermal expansion between the two materials. Breaking this seal allows acid to rise and corrode the lug, etc.

We prefer the universal post, where the post allows the bolt to go through the center of the post. The advantage is that you are not applying torque offset from the center of the post and therefore, less likely to break the seal.

If you have any questions, contact your EV dealer. Remember he has years of experience working with many different designs.

Bob Batson (EVAmerica@aol.com) Electric Vehicles of America, Inc. (EVA) Tel# 508-897-9393, Fax# 508-897-6740 48 Acton Street, Maynard, MA 01754 USA

GENERAL GUIDELINES

1. Do not use a ratchet.
2. Use two wrenches where necessary.
3. Do not overtighten. Tighten until the lug is snug against the post, then tighten another 1/2 turn.
4. Inspect and retighten after a few battery charge cycles. The lead post may relax. Inspect monthly when you add distilled water to the batteries.
5. Pay attention. You do not want to damage the post.

British Electric Karts

England has long been the source of high-tech, high performance race chassies built by such firms as Lola and Penske. Now the UK has done it again in the area of karting. Electro Mech Racing of Gloucester has introduced electric karts that meet or exceed the performance of gas-driven karts. Intended to eliminate the hazard of gasoline fumes and exhaust on indoor karting tracks, these EV karts have proved to be faster around corners, since they don't need the centrifugal clutch that keeps a gas engine from stalling.

Electro Mech Racing was formed to meet the growing needs of the karting industry through the investment of skills and technology by its founders, Robert Lindsay — owner of the Gloucester Karting Centre — and Morgan Nicholas — owner of Electro Mech Repairs in Dursley. Morgan Nicholas and his team at Electro Mech built their first electric kart and raced it in a seven-mile international competition organized by BBC Television's "Top Gear" at Mallory Park. Racing at speeds up to 100 mph, the Electro Mech kart came in first in the British National events and fourth overall from an international lineup.

Electro Mech offers both competition karts (24 kW peak power, 48 volts at 500 A, 90-100 mph) and rental karts (13.2 kW peak power, 48 volts at 275 A, 40-50 mph). Batteries are gel-filled lead-acid and karts are rapid-charged. For karting centers, Electro Mech has a continuous race system consisting of 12 kart chassies, 20 rapid-chargers and 20 set of batteries.

These karts are well-made and professionally finished. They will probably become popular in Europe — Electro Mech has a signed order for 1500 from Holland.

Access: Electro Mech Racing Unit 5, Madleaze Tranding Estate, Bristol Road, Gloucester. Tel: 01452 311211 / 0831 699028 / 0585 492949. Fax: 01452 330911

Q: Should I Use An AC Or A DC Motor?

To compare AC and DC motors, you must compare whole systems. A typical DC car runs on 96-144V at 4,000-6,500 rpm. In contrast, an AC motor is a low-torque/high-rpm device, and runs as high as 14,000 rpm. Rpm depends on voltage, and $hp = (rpm \times torque)/5252$. To get enough hp, the AC motor needs higher voltage (often over 300V) so it can use its high rpm capability.

Bulk. This high voltage pack needs more room than a lower DC pack. Also, the control system for an AC motor is much bigger, because it is much more complex. It must invert the DC input

from the batteries into AC output, and control all three phases of current in a synchronized fashion.

Cost. AC and DC motors may be close in price, but the AC controller will cost 3 or 4 times as much as a DC controller. The higher-voltage battery pack will also add to the cost.

Transmission vs. Direct Drive. AC systems are often direct drive, while a DC system needs a transmission. The AC rpm band is so high, however, that it must be geared down to be usable. In effect, the AC system uses a one-speed transmission. The weight saved

is offset by the extra batteries.

Efficiency. Overall, AC systems are slightly more efficient. However, due to the added cost and bulk, they are not practical for most people doing a home shop conversion.

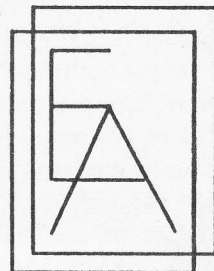
Send your questions to Mike Brown's EV Q&A, POB 1113, Felton, CA 95018 or fax (408) 429-1907. Include address for reply. Mike Brown has 28 years of professional automotive experience, & 17 years of professional conversion experience. His book, "Convert It", is available for \$30.00 postpaid in the U.S. & Canada.

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News in Brief

By Ruth Shipley

News in Brief is compiled by Ruth M. Shipley from information supplied by Environmental Information Networks. If reprinted, please credit CE and Ruth Shipley.

Ovonic Charges Forward

A fundamental leap in rechargeable battery technology has been made by Energy Conversion Devices, Inc. (ECD), its subsidiary Ovonic Battery Company, Inc. and its licensee Gold Peak Battery International Limited (GP Batteries). Using the latest Ovonic technology, the companies have achieved an energy density of more than 95 Wh/kg in advanced nickel metal hydride (NiMH) consumer batteries. "Our present achievement of 95 Wh/kg will increase the range of a purpose-built electric vehicle from the already demonstrated 245 miles to over 315 miles on a single charge," said Stanford Ovshinsky, inventor of Ovonic NiMH batteries, president and CEO of ECD and chairman and CEO of Ovonic. "We expect to continuously improve performance to the 120-150 Wh/kg level." (PRNEWswire: 1/17)

EVs Go to School

School children and their parents will now have an opportunity to learn about EVs, thanks to a recently-initiated program developed by EV Media of Santa Monica, CA. The program consists of learning materials and a hands-on model building kit that will be made available free of cost to all schools that request it. The aim of the program is to reach parents, who may soon be in the market for an EV, as well as children at or near the driving age. The learning package includes a teacher's guide and rechargeable, table-top EV model kit. EV Media, which began developing the kit in 1994, received input from industry leaders including Southern California Edison, Florida Power and Virginia Power. For additional information regarding the EV school program contact Burks at 310-394-3890.

(EV MEDIA RELEASE: 1/23)

Solectria to Market EVs in Japan

Sanoh Industrial Co., Ltd., a major global supplier of automotive components based in Japan, soon will begin to market Solectria Corp.'s Force electric sedan, E-10 electric pickup truck and EV components to customers throughout Japan. The arrangement is part of an exclusive sales agreement recently signed between the two companies, according to Solectria. Sanoh has exclusive rights to market Ovonic NiMH batteries to the Japanese market. The batteries have been used in Solectria's Force NiMH sedan, which is capable of traveling more than 100 miles on a single charge. The Force is the only NiMH-powered EV currently on the market. For more information, contact Karl Thidemann at 508-658-2231, or e-mail www.solectria.com.

(SOLECTRIA RELEASE: 1/29)

Cities to Host EV Workshops in 1996

Despite a recent rollback in the introduction of EVs to California, EV advocates continue to push for public education on the benefits of the vehicles. For this reason, the Electric Transportation Coalition, a national nonprofit group dedicated to promoting electric transportation, will sponsor a series of public EV workshops in cities across the United States during 1996. The industry- and government-sponsored workshops will be held in 10 cities: Los Angeles and Sacramento, CA, Atlanta, Phoenix, Washington, DC, Boston, New York City, Richmond, VA, Detroit, and Fort Lauderdale, FL. The purpose of the workshops will be to educate the public on the needs for a national EV infrastructure. For additional information about specific workshop dates, contact the coalition at 202-508-5995.

(GLEAM/EV NEWS: JANUARY 1996)

Saturn Dealers Prepare for EV1

The 25 Saturn dealerships in Los Angeles, San Diego, Phoenix and Tucson that have been chosen to sell GM's EV1 are planning to pamper buyers as no car owner has ever been pampered. "We will do everything we can to create and nurture enthusiasm among our owners," said Joe Kennedy, Saturn's vice president of sales. GM believes the first buyers will be male entrepreneurs, executives or professionals who are interested in technology. Saturn dealers plan to coddle EV1 customers with sales and service perks, like a lease option that will expire at about the same time as the car's lead-acid batteries need to be replaced. Customers also will get a 24-hour roadside assistance plan and batteries will be replaced free of charge. Saturn was chosen to market the EV1 because car buyers trust the division, which is critical when asking consumers to buy new technology. (AUTOMOTIVE NEWS: 2/5)

SF Station Cars to Continue

The San Francisco Bay Area Station Car Demonstration Program will continue despite the decision by the California Air Resources Board (CARB) proposal to drop the 1998 ZEV mandate. In fact, plans have already begun to expand the demonstration far beyond the 40 EVs that have been part of an initial demonstration that began in October in San Francisco. Station cars are small electric passenger cars driven to and from mass transit stations by transit riders. San Francisco commuters pick up the cars at Bay Area Rapid Transit (BART) train stations. Florida Power & Light has launched a similar program in Florida. "We look to 1996 to be a good year for developing the station car concept," said the Association's Executive Director, Martin Bernard.

(UTILITY FLEET MANAGEMENT: 2/96)

CARB Releases ZEV Compromise

The California Air Resources Board (CARB) and the administration of Governor Pete Wilson have disclosed the details of a proposal to replace the state's ZEV mandate. CARB will drop the 1998 2% mandate but automakers have agreed to provide 3,750 demonstration EVs between 1998 and 2000. They must also submit reports on EV production capacity, the size of their investment and the features of specific models. The reports will not be available to the public. In 2003, the voluntary arrangement would become mandatory, when 10% of California cars offered for sale by the seven major auto manufacturers would have to be exhaust-free. Auto executives have endorsed the voluntary arrangements, calling them a good-faith effort to prove the industry is serious about electric cars.

(LA TIMES: 2/9)

Battery Rental Program in France

A new initiative aimed at supporting the use of EVs in France will enable EV drivers to rent batteries in order to avoid the large initial expense of purchasing one. Under the Battery Service plan, EV owners will be able to rent a battery and receive other benefits of a customer service package that will include recharging, upkeep and maintenance. The monthly cost to participants will total about \$100. In addition to helping potential EV buyers overcome the large initial cost of a battery purchase, the Battery Service plan will also ensure that batteries will be recovered and recycled at the end of their useful life. PSA Peugeot Citroen will oversee battery sales and distribution, while Saft will work with Peugeot and Citroen to provide battery upkeep and maintenance services.

(ELECTRIC VEHICLE PROGRESS: 2/1)

Honda Will Use Ballard Fuel Cell

Japan's Honda Research and Development Company has awarded a \$1.5 million contract to Ballard Power Systems, Inc. (Vancouver, Canada) for the use of Ballard's fuel cells and related equipment in its EV program. The Canadian company is a world leader in the development of proton exchange membrane fuel cell power system technology. The Ballard Fuel Cell converts natural gas, methanol or hydrogen into electricity. Many leading international companies, including Daimler-Benz, General Motors and Hitachi, are currently using Ballard fuel cell technology in the development of EVs and other zero-emission applications. For additional information call Paul Lancaster of Ballard Power Systems, 604-986-9367.

(BALLARD RELEASE: 2/13)

GM Will Lease EV1

General Motors Corp. has decided that it will not sell the EV1, but will lease it instead. "There are so many new things in this car that when it comes to the finance side, we wanted to keep things simple," said Don Young, EV program manager for GM's Saturn unit, which will market the cars. "We wanted the driver to feel as little risk as possible." EV1 drivers will be treated as members of an exclusive club, insulated from the problem of worrying about resale values, according to the automaker. The car will be priced around \$30,000, with a monthly lease payment of between \$450 and \$600. But GM officials said that as technology improves, the price will fall. The

ELECTRIC VEHICLES ONLINE TODAY Month-in-Review

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drivers also will be supplied with chargers, leased from and installed by Edison EV.

(WALL STREET JOURNAL: 2/15)

Big Money Derailed ZEV Mandate

The California Public Interest Research Group (CalPIRG) estimates that oil companies and automakers spent about \$14 million on lobbying, campaign contributions, and print and radio advertisements to derail California's ZEV mandate. Another \$10 million went to produce television ads. CalPIRG Executive Director Ed Maschke compared these enormous sums to the less than \$50,000 that EV supporters spent — to no avail — trying to convince the public that the regulation was reasonable and necessary. (GREEN CAR JOURNAL: 2/96)

Letters to the Editor

Continued from page 3

The Optima does have an impressive capacity and is great as a high-current racing battery. Since Scott didn't test for cycle life (cost and time would have been prohibitive) we can't say how long it would give that sort of performance. Some commercial EVs have been using double strings of Optimas and Genesis to lessen the current load on these smaller batteries. This has had somewhat mixed success.

The Horizon that Scott tested was the 12N85, which is the smaller 85-ampour battery. Electrosources also makes the 12N95, which I used in my Porsche for the Phoenix race. When properly charged and conditioned, these batteries do seem to deliver higher energy density. —CB

Electric Snowmobiles?

Dear Editor,

I would like to know if anyone knows of any plans to design, develop or produce electric snowmobiles.

Recent articles indicate that snowmobiles are a major contributor to air and noise pollution at our National Parks. In West Yellowstone, the outfitting town for snowmobilers, a thick blue haze over the entrance to the park has left rangers coughing and suffering from nausea. In addition, the noise level of 35 mph snowmobiles is 74 decibels.

It would seem that the relatively moderate range and speed requirements of snowmobiles could be met by EVs. However, I understand that weight may be a concern. Keeping in mind that there are 1.4 million snowmobiles registered in the US, this may prove to be a very interesting niche for EVs.

Sincerely, Morris Altschuler, 311 Lorraine Drive, Rockville, MD 20852 (301) 770-5591 (home), (202) 260-9752 (office)

Weight may be a problem in an EV snowmobiles; also the power output requirements. Snowmobile engines have a very high power to weight ratio (they are light enough to be used in aircraft). However as the energy density and power to weight ratio of electric drivetrains increases, EV snowmobiles start looking more attractive. Local-use ones might well be practical now and would help get rid of the blue haze over the national park.

Anyone out there know about EV snowmobiles? —CB

DATSALECTRIC? Dats Good!

Dear Editor,

Here in Connecticut, the land of steady habits, we are also building EVs. Most of us treat EVs as a hobby. Expensive, but nevertheless, a hobby. I have built and/or owned just about every kind of car that runs. By 1980, the emissions tests, cost of gas maintenance, taxes and the EPA has become a major pain.

Last year I started my EV and it is almost finished. I picked up a 1980 Datsun 280 ZX two-seater with five on the floor. It is stripped down to 1900 lbs. Finished, it will come to its rated curb weight of 3200 (I hope). This car has independent suspension on all four corners and disc brakes. Aluminum wheels, power steering, power windows and a glass sunroof. Painted Polo White, it came out nice.

Electrically it runs a 9 inch motor coupled directly to the transmission (no clutch) with all the stuff to make it turn. I don't have the batteries yet, but I intend to run 120 volts. Four 12 volters will take the place of the 21-gallon gas tank in the back and six under the hood. The power brakes run from a Gates vacuum pump and the power steering pump is run from the main motor.

I haven't made up my mind yet about the batteries. I would like to use gel cells to get away from the acid mess, but I have not located a charger. A regular charger will "cook" the batteries by overcharge at the end of the cycle and blow the sealing valves. I can live with the reduced range per charge, but not early battery replacement.

Yours truly, Harland Coffin, 265 Burnsford Ave. Bridgeport, Conn, 06606

P.S. The name of my car is DATSALECTRIC.

Good for you! I'm always glad to see another EV go on the road. The Datsun Z-cars seem to make good conversions — several have been built by high school racing teams and have done well in competitions.

For some folks, EVs are a hobby; for others they are commuter workhorses. It depends on how you build your vehicle and how you use it. Battery monitoring and charge control systems may be part of the solution for gel cells or sealed lead-acids. As for the "answer", there may not be a single one, but many bright people, are working on battery technology. —CB

Events Calendar

By Anna Cornell

1996

April 10-14

California Alternative Fuel Vehicle Partnership will be having a fleet operators' forum at the Los Angeles Convention Center. The public is invited to visit the alternative fuel vehicle exhibits at ECO EXPO 1996 on April 13-14. Contact Jerry Ribnick at (800) 427-3976.

April 11-14

The Electra Challenge is a high school electric vehicle competition to be held in conjunction with the 1996 auto fair at Charlotte Motor Speedway in Charlotte, N.C. Contact Bob Kosack at (803) 325-2865.

April 25-27

The EV Grand Prix is a high school electric vehicle competition to be held at the Richmond International Raceway in Richmond, VA. Contact Cindy Dickerson at (804) 775-5624 or EVTC at (602) 256-2599.

April 27

Advanced Technology Boat Race (Solar, Electric, Human Powered) in Canberra Australia. Contact Australian Science Festival at (06) 205 0588 int. (616) 205-0588.

May 4

San Francisco Bay Area Electric Auto Rally (SF BEAR) will be held at Crissy Field. Charging will be available there. Benefits the American Lung Association. Contact Henry Deaton at (415) 861-5624 (note - date was wrong in March '96 CE)

May 5

The Snellville Days Festival is looking for OLD electric vehicles to display along with their 4th annual Orphan Vehicle Show and Swap. Contact Rick Kamen at (404) 288-8222.

May 10-1

The 8th Annual Tour De Sol rally runs from New York City to Washington DC with pit stops and free displays along the way.

Contact Northeast Sustainable Energy Association at (413) 774-6051 or fax (413) 774-6053.

May 25-June 9

Ener Run IV - A rally from Hardy, AK to St. Louis, MO. Contact SportsPro at (510) 856-5624 or 510-856-3877.

Jun. 10-16

1996 Future Car Challenge, contact Argonne National Lab, 9700 S. Cass. Ave. Bldg 362, Argonne, IL 60439. Tel. 708-252-8677, fax. 708-252-3443

Jun. 20-23

Solar Splash (Electric Boat Regatta), Milwaukee, WA. Advanced Energy Competitions, 602-773-0230

June 27-29

Cleveland Electric Formula Classic - Open-wheeled ABB University spec (Formula Lighting) vehicle series in Cleveland OH. Contact EVTC at (602) 256-2599

July 4

Chevrolet Pike's Peak Auto Hill Climb in Manitou Springs, CO. Call (719) 685-4400.

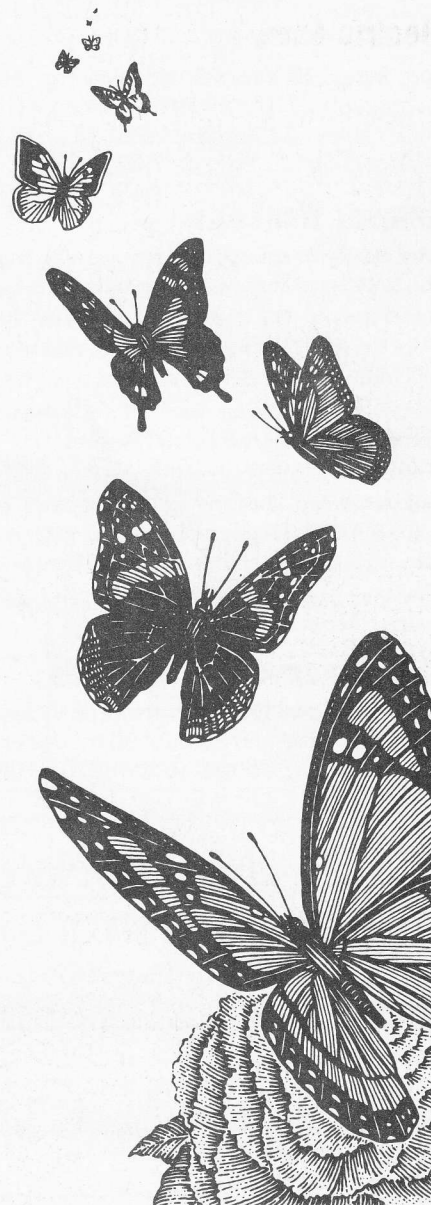
August 5-13

Sun Sprint of the Rockies - Aspen, CO to Moab UT. Call (907) 872-3882.

Sept. 20-26

Beijing International EV Exhibition, Beijing, China 86-10-5013764

Please CALL calendar items to Anna Cornell at 510 685-7580 (during day hours if possible - thanks!)



EV Want Ads

For Sale

For Sale: Electrathon motor and controllers. More wins than other motor. Also ideal for motorscooters and lighter go-carts. 24 volt, 1 HP continuous, 3 Hp peak. \$260 each. Call, FAX or write for fact sheet. 624 S. Archer St., Anaheim, CA 92804. (714) 956-3016. (S. California)

For Sale: '81 JET Electrica. 12K miles, 20 HP/96 Volt, factory air, gas heat, 220V charger, Curtis controller. Excellent condition. \$8900/obo. (301) 587-6841. (Maryland)

For Sale: '84 Ford Escort. 5 speed, 120 Volt system, 9" Advanced DC motor, Curtis PMC controller, on-board charger, new Delco deep cycle batteries. About 40 mile range, tow bar and lights. Very clean. \$7500 (510) 447-5369. (N. California)

For Sale: '84 Electric Escort. 2400 miles, PMC controller, On-board K&W charger, 1300 miles on 120V Trojan 55H(P)'s. Runs great, photos, extras. Make offer. Call (205) 650-3225 or CLNAIR@AOL.COM. (Alabama)

For Sale: 20-Years-Shop-Moving Sale. 1976 2-passenger ELCAR - \$1000; Tachograph - \$100; 17 HP Street Legal Engine/Generator/Trailer - \$500/\$300/\$500; Box of EV cables - \$100; 48 V Lester Charger \$100; Towbar, Jet Dealer Parts; etc. Call Erv at (310) 593-8612 - days. (S. California)

Member Want Ads

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

\$7 for the first 25 words. Each additional word, 25 cents. Want Ads are available to EAA members for the sale of electric vehicles, equipment and parts only.

Please see advertising rates for commercial products or information below on the NEW! Commercial Want Ads listed below.

If you want to run your ad in more than one issue, please specify and include payment for each issue requested. For corrections or updates, please send a written note or fax to EAA Want Ads @ 408.374.8750. Photographs of your vehicles may be submitted with your ad. If room is available, we run one photo each issue. These photos will not be returned.

Send your Member Want Ad request and check made payable to: EAA Want Ads, 18297 Baylor Avenue, Saratoga, CA 95070.

NEW! Commercial Want Ads

For Sale: Good Quality Amateur Video of Phoenix '96. March 1-3 Race, 70 minutes plus solar home and EV info. 30 minutes VHS. \$12.95 (incl. shipping). Send your request to Solar Electric Control Systems, 7042 Vista Lane, Fincastle, VA 24090.

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3 ads	\$300 ea
12 ads	\$250 ea

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1 ad	\$200 ea
3 ads	\$150 ea
12 ads	\$100 ea

1/4 page 3.50" x 4.50"

1 ad	\$100 ea
3 ads	\$100 ea
12 ads	\$75 ea

1/8 page 2.0" x 3.5"

1 ad	\$100 ea
3 ads	\$75 ea
12 ads	\$50 ea

Ads may be placed for 1, 3 or 12 months. Camera-ready copy for each ad must be submitted along with payment. Ads may be submitted on diskette in TIF or EPS format on the PC or MAC. For 12 ads, an invoice will be billed quarterly. A minimum of 3 ads need to be prepaid per quarter.

Ad Deadline

The Deadline for camera-ready copy is the **1st of the month**. Copy received after the 1st will be run in the next issue. Ads will be placed in the priority received. Prepaid ads will receive 1st priority.

Advertising Manager

Susan Hollis, Advertising Manager
Office: (408) 374-8605
FAX (408) 374-8750

Address

Make check payable to EAA. Camera-ready copy and payment for the ad should be sent to:

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18297 Baylor Avenue
Saratoga, CA 95070

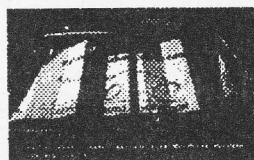
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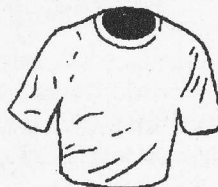
EAA Reprints Order Form



100% Cotton Cap Forest Green "Charging into the Future" EAA Logo
CAP001.....\$6.50



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T-Shirt with EAA Logo
TS001\$14.50



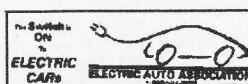
Porcelain Mug with "The Switch is on" and EAA Logo
MUG001\$5.00



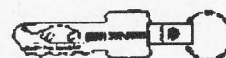
Window decal "The Switch is on to Electric Cars" Black and Red printing 3 x 9 inches
DC001.....\$3.00



Bumper sticker 3.75 x 15 inches
BS800.....\$2.50



Bumper sticker 3.75 x 15 inches
BS002.....\$2.50



EAA Key Chain, actual shape may vary
KC001.....\$1.50

Printed materials

CE	Selected Current EVents (<i>specify specific issue</i>)	\$3.00 each issue
CEFY	Current EVents - Full year (<i>specify specific year</i>)	\$20.00 each year
PB001	Discovered:The Perfect EV Battery	\$ 2.00
FW001	Flywheel Energy Storage	\$ 5.00
BG1995	1995 Buyer's Guide to Electric Vehicles (Feb 95 issue CE)	\$ 2.95
TT001	Team Tucson Land Speed Record Plans	\$ 5.00
IDX001	EAA Current Events Index - 10 Years!	\$ 4.00
XA100	EAA XA-100 Hybrid	\$ 5.00

Other EV Items

CS001	Current Solutions/Motor Show Video Tape (14 minute runtime)	\$14.00
WL001	Window Literature Holder (fits pages 8.5 x 11 inch)	\$22.00
PARK01	"EV Parking Only" Sign (18"x12") green icon on white background	\$22.00

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

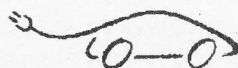
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* for Canada add 15% or for other foreign destination add 25%



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