Electric Auto Association

CURRENT EVENTS

May '96 Promoting the use of electric vehicles since 1967 Vol 28 No. 5

Rally to APS Phoenix

By Lynette Racine and Kathy Watson (Phoenix Chapter)

EAA Phoenix ushered in the 1996 Arizona Public Service Electrics with an event of their own. Gathering a contingent of EVs to salute the opening ceremonies at Firebird (Saturday, Mar. 2nd), Phoenix Chapter held a "Rally to the Race", an on-track parade, and an EV display.

Rally

Not all the Rally to the Race participants were local. EAA member Jeff Simpson and his black 1972 Porsche 914 conversion came all the way from Hillsdale, Kansas. Running on 20 Trojan T-125s, the 120 volt sportscar conversion has a top speed of 90 mph. The 914's 60-80 mile range took it 12,000 miles in 1995.

This car also has something rather unusual and state of the art in EV climate control — a highly efficient 500 watt air conditioner by Thermodynamics Control Research. Congratulations to Jeff Simpson and his 914 for a stellar rally performance!

Monty McGraw, President of the Houston, TX Chapter EAA drove his 1988 white Fiero GT. This 144 volt two-seater, his second conversion, was completed in 1995. Monty and his Fiero also competed in the Friday night drag races (and got a third place trophy!). Often Fiero conversions are heavy and slow, but this one obviously breaks out of the mold. Good job, Monty!

Long-time member Tom Convey, Vice President of the Phoenix Chapter, drove a white 1985 Chevrolet Sprint. Converted in 1993, it has racked up 22,000 EV miles. on a 96 volt system with 16 Trojan T-145 batteries.

Webmistress and Phoenix newsletter editor Lynette Racine was really truckin' with EcoElectric's "Desert Lightning" pickup. This gold beauty has a 144 volt system, 24 Trojan T-145 batteries, ABS brakes, Watermaster (TM) battery watering system, original GM automatic transmission, air-conditioning, and Kodiak Auburn controller. Later, during the Opening Ceremonies, the Lightning was paraded around the track by EcoElectric president Mary Ann Chapman.

An EV ponycar was also in the run. Phoenix Chapter members George and Janice Drum showed up in their burgundy 1966 Ford Mustang. This car seats five and runs on single series string of 18 Optima sealed 6-volt batteries (108 volts). With a curb weight of 3,120 lb. and an Advanced DC motor, it charges via an onboard K @ W 2 kW unit and has Goodyear Invicta rubber.

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New Air Conditioner Ideal For EVs

Thermodynamic Control Research (TCR) of Trenton FL has developed a compact, high-efficiency air conditioner that could meet the needs of EVs. The lightweight unit has power requirements that are 1/3 to 1/2 of currently available systems. By creating and storing ice, the unit can absorb additional heat and increase its efficiency. With such a low power demand, you can leave it on to cool a parked vehicle, or program it to cool down a vehicle at preset times. Even with this unit, using an air conditioner cuts an EV's range by about 20 percent. TCR suggests its unit could be run from a separate auxiliary battery, which wouldn't affect vehicle range.

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Jeff Simpson's 914 in the Phoenix Chapter Rally.

Photo credit — Jeff Simpson

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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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No More Hair Shirts

by Clare Bell

Forget what you've heard about electric vehicles lagging behind gas cars in terms of performance. Indications are that the agile, high-powered small cars of the future WON'T be gas — they'll be EVs. Pioneering work has shown that compact through mid-size vehicles can be built that have reliable ranges in excess of 100 miles, with hill-climbing and acceleration characteristics that EXCEED the average gas car.

For instance: The Impact EV1 has a 0-60 time of 8 seconds and outruns two gas cars in a publicity video made by GM. An electric Mazda RX-7 conversion built for drag racing can hit 90 mph at the end of a quarter-mile strip. AC Propulsion of San Dimas, CA builds a Honda CRX prototype with a 200 kilowatt alternating current (AC) drivetrain that yields over 200 hp. Individuals and high schools are racing EVs that have commercially-available 100-150 KW drivetrains exceeding 150 hp. Speedwise, "non-track-based" (running on land with tires) EVs have broken the 190 mph mark and there is no intrinsic limit on how fast they can go. High-speed electric trains hit 300 mph.

DC Improvements

The really spectacular developments have been in the AC systems mentioned above, but DC systems have also been improving, pushed in part by the demands of EV racing. One trend is toward higher voltage. Voltage is the amount of "push" in the batteries. Increasing the voltage to a motor increases spin speed and turning power (torque). Early "modern" conversions, such as those of the 60's and mid-70's tended to be 48-72 V systems, resulting in slug-like performance (and bad publicity) when compared to gasoline cars. The standard five years ago was 96V with occasional excursions to 108. Things have accelerated considerably since then, moving the standard further toward 108 or 120 V, with a 'hot' street EV at 144V and a racecar anywhere from 156 V to 200V and over. Even these lower-cost DC systems can, in their hopped-up versions, outperform many gas cars.

EVs with this performance are not prohibitively expensive. Many of these cars have been built or are being built by individuals or small companies on shoestring budgets.

Aerodynamics and lightweight construction have made huge improvements in EV range and performance. The GM Impact EV1 gets much of its speed and agility from its aluminum frame and teardrop shape. The Sunrise, a built-from-the-ground-up composite-bodied EV from Solectria Corporation of Massachusetts, is the size of a Honda Accord, has as much passenger room as a Ford Taurus and has a curb weight of only 1600 lb. In the 1995 Tour de Sol, the Sunrise used its aerodynamics and efficiency to run 238 miles per charge on a pack of nickel-metal hydride batteries.

These developments are also filtering down to the EV in the street. Individual EV conversions are starting to sport front air dams, wheel skirts and belly pans to improve aerodynamics. Using some of the later-model cars with aerodynamically-increased fuel efficiency and lower weight as "donors" for EV conversion has also improved range and performance. The everyday EV is getting the benefit of the new VRLA sealed battery types and is lighter and more agile than the older "lead sled". Some commercial conversions are using the more exotic battery types; for instance Solectria sells a nickel-metal-hydride version of its Geo-Metro-based Force.

Zap-up and Go

New electric energy-storage and transfer techniques are also whittling away at the present distance and convenience advantages of filling up with gas and diesel. If batteries can accept electricity faster than fuel can flow into a tank, then the advantage will swing to the EV side. Low-resistance batteries and fast-charging methods may enable a "quick-zap" recharge or quick battery exchange that leaves gas car drivers still staring at the numbers on the pump while their EV compatriots are back on the road. EV racers have pioneered such techniques with 5-minute dump-charges and 10-second battery-swaps during pit stops.

EVs with this performance are not prohibitively expensive. Many of these cars have been built or are being built by individuals or small companies on shoestring budgets. Even the high-tech AC powertrains, if built in lots of 10,000 or more, could compete costwise with gasoline engines.

So EVs don't have to be a "hair shirt" that one wears to further the aims of public health and environmental awareness. With today's EVs you can keep your ideals and still enjoy driving. — CB

Rally to Phoenix

Continued from page 1

Top speed is 75 mph. The conversion was done by AMFAB in Phoenix, AZ.

Among all the DC drivetrains was an AC. Phoenix Chapter Secretary Kathy Watson just had to be different, driving a Solectria E-10 pickup on loan from APS. This gorgeous aquamarine green machine has 144 V powering Solectria's dual-motor AC induction drive and single speed transmission. Running on sealed lead-acids, this EV pickup has ABS brakes and a 40-70 mile range. It was also a workhorse, hauling equipment for the display booth and later, gear for the WE'RE-IT team after the stock enduro race.

Second Place went to Monty McGraw's electric Fiero (shown here at the EAA National Rally. — Photo credit: Lee Hemstreet

On-Track Parade

After the Rally, participants joined in with the static display vehicles in the Opening Ceremonies track parade. Milt Stamatis, a member of the Kiwanis Club of Metrocenter paraded a replica Ferrari EV Daytona. This car was later raffled off at the APS Electrics Race on Sunday, March 3 to benefit APS' Project Share. Phoenix Member Gene Cosmano Rabbitted around in a yellow 1981 VW Rabbit pickup truck. A five-speed transmission, 132 volt system, air-conditioning, 1231 Curtis controller, 9" Advanced DC motor consoled Gene for not driving an electric Corvair or Formula Lightning. Gene's "105 mph for 5 miles on Optimas" (see CE, September 1994) red 1989 Chevrolet Spectrum made an appearance. New owner, Charley Wilson, who hails from Dallas, was proudly at the wheel. This car has a 120 volt system, automatic transmission, and air-conditioning. Its range, (in commuter configuration and when not being used as a road rocket by Mr. "Suicide Sled" Cosmano) is approximately 70 miles with a top speed of 85 mph.

Representing the Snowbird contingent was Jim Naylor, Member Phoenix Chapter EAA and SEVA, driving a 1994 B.A.T Geo Metro. Naylor winters in Chandler, AZ from his home in Lodi, CA. This commercial 72-volt conversion was for sale. — LR & KW

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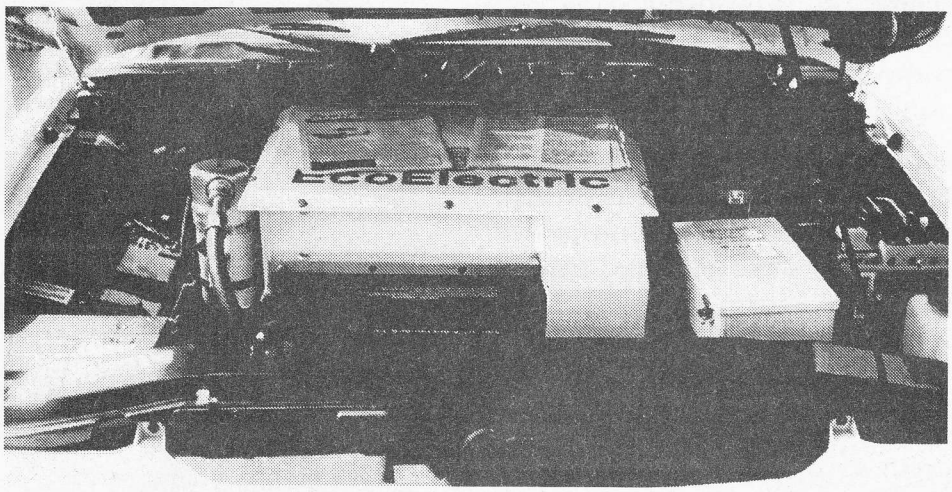

EcoElectric's Desert Lightning paraded on track. Looks pretty clean under the hood. Photo credit: EcoElectric Corp.

Letters to the Editor

EVAOSD Member Comments on ZEV Politics

Dear Ms. Bell
I am a member of the Electric Vehicle Association of San Diego and so receive Current Events. I look forward to receiving it each month. I especially enjoyed your comments on the op-ed page of the January 96 issue.

I once thought that the just maybe CARB members were above political influence, but alas, not so. After all, they are Wilson appointees!

If we EVers keep at it, maybe one day we'll breathe clean air again. Are you aware of the ZEVolutions publication put out by the Planning and Conservation League in Sacramento? They are doing a great lobbying job for clean air.

I hope soon to convert my small truck to electric. At least it will be one small contribution to clean air. Your publication is doing so much to help the public understand why we must have ZEVs.

Sincerely, Dale Malone, Encinitas, CA

Dale

Thank you for the good word, Dale. Yes, I do know about the Planning and Conservation League and their ZEV activist newsletter. When I went to Sacramento to testify at the CARB ZEV hearings, I met Jamie Phillips of PCL. I've set up a kind of informal alliance with her and have printed some of PCL's information in CE. PCL has done excellent work in the face of overwhelming opposition. Their funding is small, but it was better spent than the $24 M that was spent to overturn the ZEV mandate. Contact Jamie Phillips @ FAX: (916) 448-1769.

By the way, EVAOSC is a very active local EV organization. I hope to be able to print more about what you folks down there are doing. —CB

EV-1 Dealer Connection?

Dear Ms. Bell
I've been a member of EAA for a few years now and have built a VW Rabbit using Mike Brown's kit. Like most EV owners, I would like more performance. I have been watching the Impact (EV1) development and would like to get one.

Obviously Cincinnati isn't on the list of cities to get them, but I have a sister in Phoenix who could take delivery and send it here. Clearly it is not the most cost-effective way, but I am convinced that if more people take the chance, the easier it will be for everyone. Does the EAA have a dealer connection that might be sympathetic to pre-selling one with a discount? Do you think it would be better NOT to tell them the car is going to be shipped out of town?

We have been servicing Mercedes-Benz automobiles for nearly 20 years so I am not too worried about taking care of it, and though sophisticated, it is not a very complicated design. I'd appreciate any suggestions or leads you might have. Thanks and keep up the fine editorial content of the newsletter.

Sincerely, Dan FitzSimmons, Precision Motorcars,
Cincinnati OH. (513) 271-5565.

Dan

As far as I know, EAA does not have a dealership connection unless there are some EAA members who either own or work for a Saturn dealership. EAA Board Member Steve Lough, of Lough Motors in Seattle, is part of a family-owned GM dealership, but that is not a Saturn outlet. Does anybody out there qualify? In addition, Saturn has since changed their policy (see "One Foot in the Future - GM EV1 Update", page no. 14) and plan to lease rather than sell the EV1. In a way that is better, since that requires less upfront cash. However having the car under a lease may make it difficult to put it into service outside the target area.

I would still encourage you to do all you can to get one. Board Member Stan Skokan is looking into seeing if EAA might be able to get some EV1s at a discount through the State of California. I do not know the status of his effort.

I agree with you that the more people who take the plunge, the easier it will be for everyone else.

One should note that the EV1 isn't the only route to high performance. Higher-voltage packs and controllers are giving the lower cost DC systems some firepower (for example, see the Phoenix race coverage in the previous issue) . AC Propulsion's Honda CRX conversion also gives the EV1 a challenge. Nevertheless, I would like to see EV1s in the hands of EAA members.

If any of you DO get one, I'd like to run a piece on your experiences with it. I think that good publicity about the Impact test-drive PrEView results in publications (even CE) basically embarrassed GM into building the EV1. More positive press might convince them to loosen their hold on it and go to general availability. —CB

EAA CHAPTERS IN THE EAST US !

Participate and support the 1996 Tour de Sol, May 10-17. Contact NESEA at (413) 774-6051.

Learning from the Phoenix Racers — The GREAT Saturn

Passenger car design has long benefited from racing technology. That has been true for gas cars, and, more recently, electrics. Even if the entire design of a racecar can't be adapted for street use, certain key elements can.

One of the more interesting entries in the stock class this year was car #65, a 1991 Saturn converted by the GReen Electro Auto Racing Team. (GREAT) This San Francisco Bay Area team had some very impressive talent, including organizer Marianne Walpert, chief mechanic Mike Slominski, mechanical designer/fabricator Bob Schneeveis, controller designer Otmar Ebbenhoech, driver Kimberly Myers (from Sixty-Five Roses Racing) and many others. This car didn't perform well due to problems with its innovative automatic transmission driveline. However, its construction, especially in terms of battery boxes and body stiffness/strength shows how to build a really strong and safe EV.

The GREAT Saturn, Car #65, shown in the lineup for APS Phoenix Stock /Superstock race. — Photo credit: Paul Comption

How Much to Cut?

Some EV builders minimize the amount of body metal they remove for battery box cutouts, trying not to compromise the structural strength of the donor car. They avoid welding and design the battery boxes to fit in around structural members. Many of the commercial kits, such as ElectroAutomotive's Voltsrabbit and VoltsPorsche are done this way. Some home-builders who do a car from scratch don't sink their boxes, preferring not to cut at all. They rely on mounting inside the car. Some professionals, such as John Witt of EcoElectric, make cutouts to sink boxes, but weld a reinforcing frame into the square cutout. Bob Batson of Electric Vehicles of America chooses to convert only pickup trucks, which have a frame.

Bob Schneeveis, who directed the design of the GREAT Saturn's body modifications, did it completely differently. In order to sink their battery boxes as low as possible, he and other team members cut large portions away, right back to the structural areas. They removed the whole of the floor pan behind the driver and the trunk floor. Boxes were built as large as possible, running the entire width of the car's underside This enabled the crew to weld boxes and mountings directly to structural steel. A larger box also gives more flexibility in changing battery types and sizes.

Schneeveis and Dave Coale (Bay Area Action) fabricated each box from mild steel sheet 1/8 " thick. They used a nibbler to remove unneeded sections, bent the box sides up using a sheet metal break, but did not weld up any side seams at that point. They then installed the boxes in the car, tack-welded each one in place using a MIG welder, then seam-welded everything including the sides.

Bob and Dave made each box was only two (Group 31) battery widths across in its short direction to ensure that batteries were well-supported. In the long direction, the boxes spanned seven battery-lengths. By welding to structural members, the builders restored and even increased body stiffness.

Built to Withstand a 10-G Rollover

For the racecar, Schneeveis designed the boxes to contain batteries even in a rollover crash that involved forces up to 10 G. To accomplish that, he and Dave added additional features. Boxes were cross-braced inside by using half-height dividers located between every two batteries. These dividers were fabricated from the same sheet steel as the boxes and welded in place. They had to be less than full battery height since the battery tops are larger than the rest of the battery. In addition to strengthening the box, these dividers keep batteries from sliding.

All boxes were made taller than the batteries so that box lids fit down inside. the construction team made lids from orangeboard for electrical insulation, lightness and strength. Every six inches around the lid's perimeter, they mounted brackets made from 1 1/2 x 1 1/2 aluminum angle. Lids were secured by a bolt through each bracket that fitted a hole drilled in the box above the batteries. The six inch spacing ensured that every battery was held down by three or four bolts.

In addition to the two side-by-side boxes replacing the rear floor pan, the Saturn had a sunken box in the trunk floor and one mounted behind the front bumper. Altogether these battery boxes could contain 250 volts worth of Group 31s, yet the race car was under its required gross vehicle weight limit

Where's the Batteries?

In another Saturn converted for use as a daily driver, Schneeveis suggests that the battery box directly behind the driver

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And in this Corner . . .

by Shari Prange of Electro Automotive

The call usually comes on short notice. A local radio station is looking for someone to debate the pros and cons of Evs on a talk show. And of course, you agree to participate. After all, you believe in EVs, and you want to spread the word. Here are a few tips to keep you from walking into an ambush.

Know Your Enemy

Who's the anti-EV person? What myth do they espouse—power plant and battery pollution, high cost, danger? Be sure you are armed with facts relevant to their attack. Who funds them? There are a lot of "astroturf lobbyists" out there—fake grassroots operations funded by big industries to spread misinformation and panic. If you know where their funding comes from, you can figure out their agenda, and publicly "out" them so they can no longer pose as "just concerned citizens."

Know Your Audience

Your goal is not to persuade your opponent to your side. That's impossible. Your goal is to persuade the undecided listener that you make more sense than your opponent.

Pass The Ammunition

Before the debate, look up specific numbers you can use in your arguments, and jot them down on a sheet or note cards, along with the source of the statistic. Contact your local EAA chapter, or the national office if you need help. It is more effective to say, "Health care costs related to air pollution are $95 billion dollars a year, according to the American Lung Association, "than "Smog is bad for you."

Choose Your Own Battlefield

Don't let your opponent control the issues. Typically, they make a claim and you refute it, then they make another, etc. Instead of arguing defensively, make counter charges for them to defend. Rather than arguing about their facts, shift the focus to your facts. For instance, if they say, "The California ZEV mandate will cost $20 million dollars," don't try to audit every dollar on the air. Instead, counter with, "Hidden subsidies to the petroleum industry add up to $300 billion each year."

If your opponent or the moderator doesn't give you the opening you want, make an opening. Instead of answering the question you are asked, use it as a springboard to the issue you really want to address.

Make Them Fight Fair

Usually, these people won't compare apples to apples. Whatever they say against EVs, turn it around and apply it equally to gas cars. If they say, "Electric power generation is only 33% efficient," you can respond that "A gas engine is only 13% efficient. Looking at the big picture, from the raw material for energy to the wheels of the car, the electric vehicle is 54% more efficient than a gas car."

Control The Microphone

These people are often polished professional debaters. Once they get the mike, they don't let go, so you have to do the same if you want equal air time. Don't just answer the question or make your statement and stop. Instead, shift to a new topic and keep talking without a pause until you run out of breath. If you hesitate to think, they will jump in, but as long as you're talking, you're in control.

Keep Your Temper

They may be very good at pushing your hot button with outrageous lies. Losing your temper will make you less effective. Counter their charges calmly. If you can manage to be amused at the preposterousness of their claims, that can be more effective than rage.

Give A Phone Number

Find some way to include the phone number for the local or national EAA, "for listeners who want more information". That gives our side a chance to continue the discussion.

Learn And Improve

Every time you debate EVs, pay attention to the techniques your opponent uses, and think up better ways to counter that technique next time. —SP

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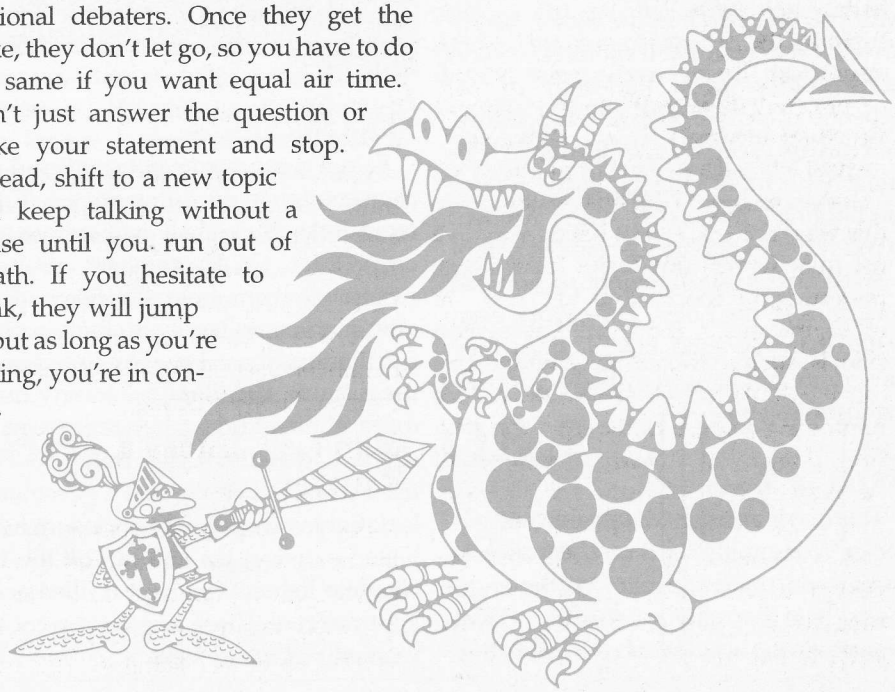


Taming that EV Hotbox

by Sparkz

With the cold winds of March still whipping around, it doesn't seem appropriate to discuss cooling your EV, does it? However, the weather has a way of changing suddenly, (especially here in ol' Sandy Cruz, CA). Before you know it, the sun is beating down and your EV turns from an icebox into a hotbox. Here are some possible low-cost quick gratification solutions that I've experimented with.

Ice-Chest A/C

Blue ice is that plastic-encased stuff you freeze hard in the fridge and then throw into the styrofoam cooler to keep your beer and soft drinks cold. It lasts longer than regular ice and doesn't drip. You can take the same setup and turn it into a quick and dirty air conditioner by blowing air through the cooler and into the EV. Just mount a couple of fans and ducting on a cheap cooler, mount it so that you can open the top and secure it well.

This one is a bit funky, but it does work. You just have to remember to keep some blue ice in your freezer, take it out with you and pop it in the cooler before driving off in your EV. It should keep you fairly comfy for a half-hour or so, depending on the outside temperature. You can also keep another insulated container with more blue ice in the EV for "recharging" the cooler when needed. Some varieties of blue ice come in sort of a Swiss cheese arrangement so you can stick cans in the holes. They work even better than the solid blocks, since they have more surface area available for cooling incoming air.

Down in the Swamp

This one is a variant of the old "swamp cooler" commonly used on older mobile homes and trailers It relies on the enormous heat capacity of water. (Heat capacity is the amount of energy needed when a material changes phase, i.e. from a liquid to a gas or solid to liquid). Swamp coolers have a large expanse of porous cloth or other material mounted so that air blows through it. One end of the material sits in a pan of water. Water "wicks" up the stuff and evaporates, reducing the air blowing past. The biggest problem is that the water spills if the unit gets tipped.

And there's always the "four-55" variety of climate control — all four windows open at 55 mph. Most efficient downhill, of course.

I experimented with setup number two (dishrag draped over swiss-cheezed blue ice with end dangling in pan of water inside picnic cooler, fan pushing air through) in a 90 degree garage and found that it dropped the temperature by fifteen or twenty degrees in a closed car The only problem was humidity — high dry heat was repaced with mugginess. This experimental setup was just shut inside the car (my 914) with no external air flowing in or out. An intake and exhaust would probably help the humidity problem.

From the Fifties

Before compressors got small and efficient enough to run automotive A/C systems, folks used small evaporative coolers. Older EAA members probably remember them from the fifties. These after-market units, about the size of a medium cardboard box, mounted under the dash or straddled the tranny hump (back in the old days before front-wheel drive flattened tranny humps). They used straw or batting, had a (sometimes) leak-tight and spillproof enclosure full of water, a (noisy) fan and ran off the 12-v cigarette lighter. You kept it filled and it kept you cool. These, like swamp coolers, worked best in dry heat.

You may be lucky enough to snag an old one out of something like a '56 Chevy (a friend recently bestowed one upon me) or you can build one cheaply from a small styrofoam cooler, a fan and lots of duct tape (which can fix anything 'cept a broken heart, believe me).

For those lucky or insightful enough to have converted Porsche 914 EVs (we don't let the prejudices hang out, do we?) you could probably modifiy the big air intake box on the front side of the firewall (if it's still in the car) to serve as a blue-ice or evaporative cooler. Other cars undoubtably have the same version of this box and can get the same treatment. It's a tidier way of doing things which probably would appeal to the obsessively neat freaks among the EV crowd.

Another possibility for those of a more tech-y persuasion is a Koolatron, which is a solid-state electronic refrigerator that doesn't need a compressor or refrigerant in pipes. I've seen those in mail-order catalogs for $90 or so. I don't know how much cooling capacity they have or how efficient they are. Or, for that matter if you have to run them off AC.

Or you might just call TCR in Trenton, FL (see story on p. 1) if you really are into doing things right and money is no objection.

And there's always the "four-55" variety of climate control — all four windows open at 55 mph. Most efficient downhill, of course. — Sparkz

NEW PRODUCT

Flexible-Voltage Amp Slammer

Current Technology of Albuquerque, NM, announces their Universal Lead-Acid Battery Charger, Model 9502. This charger is a robust, transformer-isolated, general-purpose unit intended for overnight charging of lead-acid traction batteries. The Model 9502 accommodates battery voltages from 96 V to 144 V of any amphour capacity. It provides a constant charging current during the entire charging period to minimize charge time and to optimally recharge partially discharged batteries. The Model 9502 is intended primarily as a general-purpose universal offboard system, but may also be used as an onboard charger.

Protection features include full transformer isolation, an input breaker, output short-circuit prevention, protection against reversed battery connections and a battery-sense-enabled output. The unit has a digital voltmeter and ammeter. It can handle battery voltages of 96, 108,120, and 144, with battery voltage selectable from a front switch.

Charge Current and AC Input Requirements

Four models available

- 35A output for 208-220Vac, 50A, 1 phase, 60 Hz (Electric Range Circuit)
- 20A output for 208-220Vac, 30A, 1 phase, 60 Hz (Electric Dryer Circuit)
- 5A output for 208-220Vac, 20A, 1 phase, 60 Hz (Air-Conditioner Circuit)
- 8 A output for 120 Vac, 20A , 1 phase 60Hz (Appliance Circuit)

Charge current is constant during the entire period

Temperature Compensation

Compensated for battery temperature from -40 degrees F to 150 degrees F for all battery voltages. Remote, internal or fixed 25 degree C (77 degrees F) compensation selected by front panel switch.

For price and availability, contact Dale Riddle, Current Technology, 505-260-0070

Q: What Kind Of Gauges Should I Use?

Digital vs. Analog. It's a common urge to use "high tech" digital gauges in an EV. Unless you're doing studies needing precise data, this will be a mistake. Both LCD and LED gauges are hard to read in some light conditions. Digital gauges take longer to read because they use a different part of the brain to interpret the numbers. The cockpit of any modern aircraft, where instant data is critical, is filled with analog gauges. Major car makers experimented with digital gauges, and abandoned them due to unpopularity.

Also, "precision" is not the same as "accuracy". What good are readings in hundredths of a volt, if the margin of error is in tenths--or whole volts?

What to Measure. Some type of volt meter or state-of-charge gauge is most important. If you're really into data you can use an amp/hour meter. Next in importance is an ammeter to measure efficiency. It's most effective when it reads motor current from a shunt between the motor and controller. A tachometer is a nice option, which can be driven by a magnetic or optical sensor. A voltmeter for the auxiliary battery is essential if you don't have a DC/DC converter, but nice anytime.

Quality. Insist on vehicle-quality gauges. Gauges for static electronic applications cannot survive the motion shocks, temperature ranges, dust, and humidity of a car dashboard.

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.

NEC Article 625 Overview

by EPRI and IWC (with thanks to Mary Ann Chapman of EcoElectric Co.)

Newly-added provisions of the National Electrical Code (NEC) now cover basic EV charging equipment and systems. The NEC is the adopted standard worldwide and provides guidelines for electrical safety throughout the US.

The code's language may sound obtuse to the uninitiated. This summary, adapted from the "Overview of New NEC Article 625" by the National Electric Vehicle Infrastructure Working Council (IWC), is intended to clarify it for EAA members and point out what sections apply to our EV chargers. (Note, this article keeps the capitalization conventions as used in a legal document such as the NEC.)

More About NEC

The NEC, published by the National Fire Protection Association (NFPA) is a model code that is followed by local jurisdictions in states and counties throughout the US, as each sees fit. The NEC is frequently adopted as written. It contains only minimum requirements for electrical safety, and does not specifically address mechanical, plumbing, or building safety (these are left to model building codes).

The 1996 NEC became available Sept. 1996 from the National Fire Protection Association, 1-800-344-3555. The NEC's new Article 625 covers all wiring and equipment installed between the service point and the skin of the EV. It does not cover the EV itself.

Just the Charger

The NEC covers wiring and equipment BETWEEN the EV and the utility system. It does NOT cover the EV itself or the electric utility equipment, e.g., meters, transformers, and distribution lines. The vehicle is primarily covered by the National Highway and Traffic Safety Administration (NHTSA) and the society of Automotive Engineers (SAE).

Need for Coverage

More and more people are charging EVs at home, work, public parking space, retail fast-charge stations and commercial parking lots. This is having a substantial impact on the average person's use of, and exposure to, heavy electrical equipment.

EVs have motors in the 20-100 kW range, and batteries in the 10-100 kWh range. This constitutes an electrical load requiring an infrastructure of charging equipment including unique power conversion systems, battery chargers, control and communications, and battery technologies.

EV Infrastructure Safety

The electrical safety features of the EV infrastructure have been developed by safety experts in cooperation with the automotive and utility industry. (Small EV conversion companies and parts suppliers have also played a role, primarily through the Electric Vehicle Industries Association, EVIA) These safety features, many of which are designed to be transparent to the consumer, must be clear and readily accessible to electricians and enforcement officials responsible for proper installation. Examples include sizing of supply conductors, interlocks on connectors that plug into EVs, special electrical cord types, and the ventilation requirements associated with charging.

The National Electric Vehicle Infrastructure Working Council (IWC) and the Electric Power Research Institute (EPRI) are working with the Society of Automotive Engineers (SAE) and over 20 other industry organizations and standards bodies to develop safety standards for EV charging. As new EV and EV charging technology is developed, IWC will submit proposals to add the technology enhancements to the NEC during the normal revision cycle. In 1996, after extensive review, the NFPA Technical Committees approved the proposed additions to the NEC, summarized below:

Article 625: This new article addresses the minimum electrical safety requirements for installation of EV charging system equipment based on currently available technology. This is the central reference for EV charging in the NEC.

Section 511-9: This Section, originating in the 1940's, is limited to commercial garages. It had not been updated in 43 years. It now references the reader to Article 625, where broader applications are addressed.

Table 400-4: This table, which covers all types of flexible cords and cables, now includes those used for EVs.

Article 625-1 defines the scope. It specifically addresses the external wiring systems supplying automotive types of EVs such as cars, trucks, busses and other vehicles designed and licensed for highway use. It specifically excludes the off-road types of EVs such as golf carts, forklifts, trams and other special-use vehicles. (Other NEC articles contain guidelines suitable for the off-road applications.)

Article 625 covers all wiring and equipment installed between the service point and the skin of the EV. It does not cover the EV itself.

Sections 625-2 defines the terms EV, EV Connector, EV Non-Vented Storage Battery, and EV Supply Equipment

625-3 to 5 list requirements pertaining to Other Articles, Voltages, and Listed or Labeled.

625-13 covers the safety requirements for EV Supply Equipment, including hardwired or cord and plug connected.

625-9 covers the safety requirements for the EV Connector, including polarization, non-interchangeability, inadvertent contact, unintentional disconnection and grounding poles.

625-16 covers the Means of Coupling, both conductive and non-conductive.

continued on page 20

January 17, 1996 — Energy Conversion Devices, Inc. (ECD), its subsidiary, Ovonic Battery Company, Inc. (Ovonic) and its licensee, Gold Peak's Singapore-listed subsidiary, GP Batteries International Limited (GP Batteries), announced on Jan 17, 1996 that they achieved an energy density of over 95 watt-hour per kilogram (Wh/kg) in advanced nickel metal hydride (NiMH) consumer batteries.NiMH batteries are widely used in portable electronic applications such as laptop computers, cellular telephones and video cameras. Initial commercial production of NiMH batteries in 1991 with an energy density of 56-65 Wh/kg achieved a much higher performance than conventional nickel cadmium rechargeable cells.

In 1994, GP Batteries, using the proprietary Ovonic NiMH technology, commercialized production of the world's first NiMH battery with an energy density of over 80 Wh/kg. Since then, GP Batteries has implemented major improvements in manufacturing technology. For example, the upgraded 4/3 AF NiMH laptop battery performance improved by over 30%, from a rated capacity of 2300 mAh in the first generation to the current rated capacity of 3,000 mAh. In addition, GP Batteries has recently achieved a breakthrough in the performance of its 4/3 AF prototype battery reaching 3900 mAh. This translates into an energy density of over 95 Wh/kg and 330 watt-hour per liter. In a laptop computer which now runs 3.5 hours with conventional NiMH, these state-of-the-art batteries with 95 Wh/kg will be able to run for 5 hours.

Commercial production of these advanced NiMH batteries is expected to commence before the end of 1996. This is the first time that a rechargeable battery is able to power devices such as portable tape players for the same length of time as a primary alkaline battery of the same size. This makes rechargeable batteries a viable alternative to (throwaway) consumer primary batteries.

Ovonics andf GP Batteries state that their 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. They expect to continuously improve performance to the 120-150 Wh/kg level.

GP Batteries

GP Batteries International Limited, a subsidiary of Gold Peak Industries (Holdings) Limited develops, manufactures and markets batteries and battery related products. It is currently a major supplier of specialty batteries, employing over 5,500 people. Listed on the main board of the Stock Exchange of Singapore since March 1991, GP Batteries presently has an extensive manufacturing network in Hong Kong, China, Taiwan, Malaysia and Denmark supported by sales and marketing offices in Singapore, Hong Kong, Taiwan, China, South Korea, Denmark, Poland, France, Germany, Canada, the United Kingdom and the United States.

Gold Peak Group

Gold Peak is an Asian multinational group engaged in the development,manufacturing and distribution of batteries, electrical installation products, automotive electronics, cable products, loudspeakers and high precision parts and components. Original article posted on Internet by Bill Yerkes.

BATTERY SPECS

Size, weight and performance of GM Ovonic Batteries

Specific Energy: 70 Watt-hours/kg
Energy Density: 165 Watt-hours/L
Specific power:
250 Watts/kg @ 50% SOC
220 Watts/kg @ 20% SOC
13.2 Volts nominal (16.0 Max charging, 11.0 Min discharging)
1.25 kilowatt hours
17.8 kg
90 Ampere hours.
102 mm x 179 mm x 412 mm physicaI package (7.5 L)
Life of 6OO cycles to 80% DOD

Operating Temperatures

< 45 C to achieve maximum life
< 55 C to obtain 80% of performance
< 65 C to avoid damage
Allowable temperature variation in module strings: < 8 C

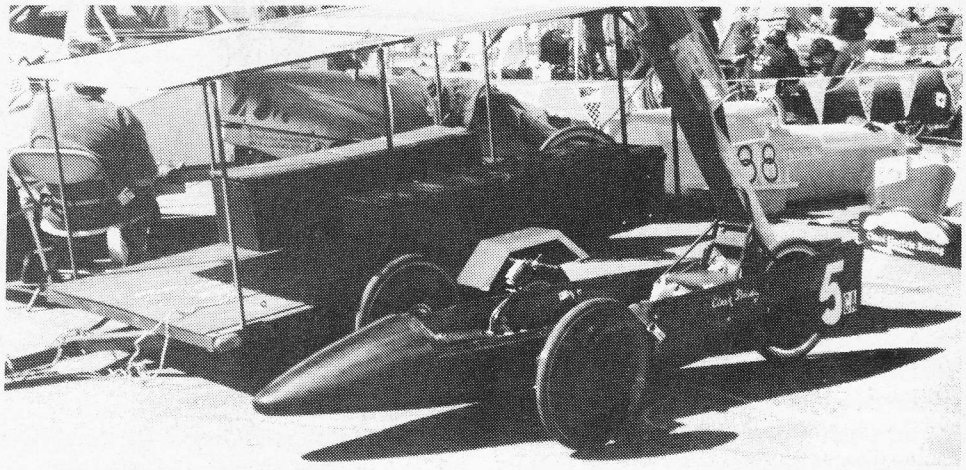
Charging

Nominal charge from 20 % to lOO % SOC: < 6 hours
"Quick charge" from 40 % to 8O % SOC: 15 minutes (advanced algorithm req'd)
No information yet on price or availability.

Information from Replica Roadsters, Torrance, CA. With thanks to Don McGrath <dwmcg@genie.com> or <vintner@genie.com> and Bob Jackson <bobj@HPBS669.BOI.HP.COM>

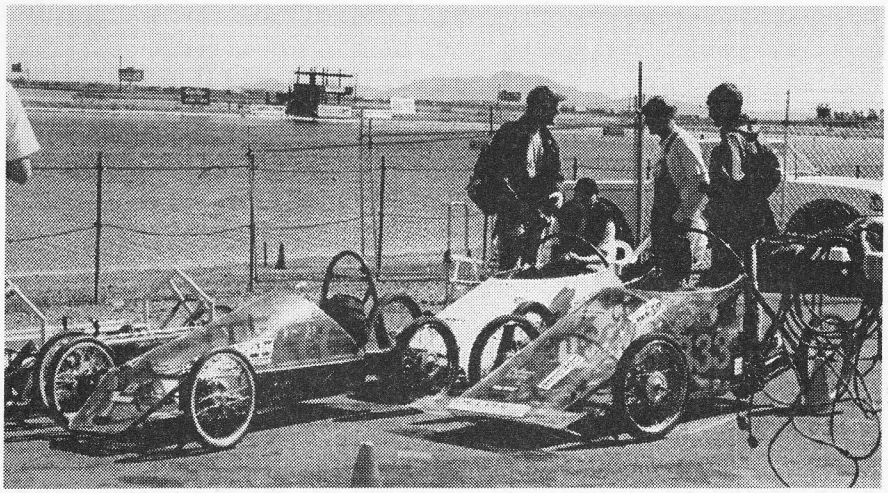
Electric Lightweights Run at Phoenix

The best-known lightweight cars and racers came to compete at the APS Phoenix Electrics on a 5,404 ft (1.02 mile) track that looked like the runway at LAX.. Entries in this growing sport of "brain racing" represented nine states and two countries; CA, CO, MA, ME, MI, OR, UT, WA and BC (Canada). Classes included Open Experimental and Open, College and High School Standard. Twenty-four cars vied for a total purse of $1000, setting a US record for the most cars on track at the same time. Among them were Clark Beasley and Steve Hill in their "Slingshots", Mark Murphy in his "Bubblecoupe" and Dave Cloud with driver Rick Doran in the latest Cloudcar torpedo. Internet EV Discussion List member Bill Dube brought car 96 CO, dubbed "the Canoe". This entry had a computer-controlled Active Leaning System, although it wasn't running that weekend.



Brain racing Slingshot takes a breather. — Photo credit: Paul Compton

The two cars from Team New England came via rail and didn't arrive until 8 AM on race day. Olaf Bleck and Ted Bohn frantically assembled #79 MA, the standard class entry, and showed up on track 15 minutes into the first race. The Maine entries hitched a lift atop the battery load on the Phoenix-bound Sunbelt Battery truck. The clever Canadians shipped their cars as Excess Baggage! People are still trying to figure that one out. LA EAA Chapter's Irv Weiss debuted his "Slingshot" for its maiden race at Phoenix. Irv, who is still working some of the mechanical bugs out, got generous volunteer help from Canadian students.



Three and four-wheelers prepare to compete in lightweight electric race. — Photo credit: Paul Compton

Car 10 MI from Lake Orion High School won the overall first place in the combined two-day standings. Second overall went to Mark Murphy in 9OR, third to Clark Beasley in 5CA and fourth overall to Rick Doran of Cloud Racing in 40 WA. The individual race results follow.

Lake Orion Beats the White Flag

In the Open Standard Division, it was Cloud Racing, with driver Rick Doran running 62 laps in 40WA and taking the buck-a-lap (approximately) purse of $62.19 for first. Mark Murphy's Bubblecoupe scooped up second with 61 laps, followed third placer 10 MI from Lake Orion. High School with 60. This car actually finished 31.73 miles before the white flag on day 2, 44 sec ahead of Cloudcar 40WA, which finished on the checkered flag. With this run, 10 MI set the Track Record at Firebird with the best time for all four classes and Divisions. This impressive entry was driven by Bill Walker. It ran a Pentad motor and controller with 24 volts of Exide batteries. The only entry in the Open standard, Olaf Bleck in 28 MA, the converted solar car from Team New

England, ran well until he skidded into the dirt and blew a tire. The College Standard Division had two entries, with 309 CA, Jim McCain of Citrus College finishing first over 29 CA, Wolfgang Fender of UCLA.

Race Engages Press and Spectators

This first national US race drew attention from both local and foreign (Japanese) press. Erika Judkins, the 18-year-old driver of Blue Mountain High School's car 9 ME was interviewed on camera. The competition evoked positive responses from people seeing the vehicles for the first time. Some high school teams are considering the cost-benefit advantages of switching from full-size electrics to the lightweights.

A Mac-based computer scoring system generated race results with Virtual Basic software written by Olaf Bleck of Team New England. Olaf has offered this program to any interested lightweight racing groups. The EVent was sponsored by Pentad Motors and Controllers in conjunction with the EVTC-organized APS Electrics.

Access: Gary Raymond (805)-492-5858 (PST)

Reference: Information provided by Delrina Fax and forwarded to CE by Shari Prange. The EVent was organized and sanctioned by Electrathon America.

National US Lightweight Electric Race Results

Overall Winners

Car #	Finish	Laps	Team	Voltage	Motor	Controller	Battery
10MI	1	31	Lake Orion HS	24	Pentad	Pentad	Exide
90R	2	31	Mark Murphy	12	Pentad	Pentad	Mac
5CA	3	31	Clark Beasley	36	Bosch	Curtis	U-1
40WA	4	31	David Cloud	24	Doran	Curtis	Interstate

High School Standard

Car#	Finish	Laps	Team	Instructor	Driver 1	Driver 2
101MI	1	52	Lake Orion HS	Pat MacIntyre	Mike Lumetta	same
111MI	2	48	Coopersville HS	Jim Nicholas		
333MI	3	48	Coopersville HS	Jim Nicholas		
10 ME	4	45	Caribou A. Tech Centr	Thomas Hale	Matt Buck	same
9ME	5	44	Mt. Blue HS	John MacDonald	Erika judkins	same
007ME	6	43	Mt. Arrat HS	Dianne Pelletier	Jason Ames	Rich Bradshaw
911BC	7	41	Quesnel Secondary	David Reeves	Rob Hnatiw	Marnie Graf
888BC	8	40	Sir Winston Churchill	Shane Kennedy	Matt Farrar	Anthony Ng

Open Standard

Car#	Finish	Laps	Team	Driver
40WA	1	62	David Cloud	Rick Doran
90R	2	61	Mark Murphy	Mark Murphy
10MI	3	60	Lake Orion HS	Bill Walker
25CA	4	56	Steven Hill	Steven Hill
777MI	5	53	Coopersville HS	
5CA	6	53	Clark Beasley	Clark Beasley
2CA	7	47	Sparky Bertagnolli	Sparky Bertagnolli
222MI	8	44	Coopersville HS	
88WA	9	36	Ron Breckon	Ron Breckon
4UT	10	30	Harry Van Soolen	Harry Van Soolen
79MA	11	18	Team New England	Olaf Bleck
96CO	12	12	Bill Dube	Farhad Ebranami
8CA	13	13	Irv Weiss	Irv Weiss

Open Experimental

28MA	1		Team New England	Olaf Bleck

One Foot in the Future — Update on GM EV-1

Saturn Corp. is moving ahead with plans to market the EV-1 (the renamed Impact) in 25 CA and AZ dealerships. Bob Purcell, executive director of GM Electric Vehicles, is counting on more than the environmental awareness of EV-1 buyers. The EV-1, he feels, will appeal to those who have one foot in the future — the early adopters who bought the first $2,000 VCRs.

Marketing & Promotion

The GM division plans to coddle these customers with sales and service perks that exceed those offered with the Saturn SL1 gas sedans. In a recent interview, Saturn dealer Bert Boeckman, owner of Saturn of the Valley in Sepulveda, CA listed some of Saturn's ideas for marketing the $35,000 EV-1.

- A two-year or three-year lease with a bumper-to-bumper warranty. It even covers the tires.
- A 24-hour roadside assistance plan. If an EV-1's batteries run out during a trip, Saturn will tow the car to a charging station, recharge it and return it to the owner.
- If the batteries are faulty, Saturn will replace them without any additional expense.

Each dealership may have an EV-1 sales specialist. The customer's meeting with the Saturn sales representative would be followed by an interview with the specialist. The specialist would then bring a demo EV-1 to the customer for a test drive and help the customer determine if the EV-1 is the right choice.

Benefits to Leasing

Why the short-term lease? Joe Kennedy, Saturn's VP of sales, feels that it has advantages. The car will be under warranty, the lease will expire when the car's lead-acid batteries need replacing, and, as the technology improves, owners can trade in their EV-1 for the latest improved model. They won't be stuck with an outdated electric car. The leasing arrangement does tie the EV-1 even tighter to the company's apron strings than before, i.e., Saturn has closer control over who gets the car and what they can do with it.

Saturn is pitching the EV-1 as a time-saver

Save Time — No Gas Stops

Saturn is pitching the EV-1 as a time-saver, i.e., no more stopping for gas, less maintenance downtime. The company is also coaxing California to open its car-pool lanes to electrics, thereby saving EV1 owners commute time and creating a sense of privilege and exclusivity.

The company is minimizing risk to both the customer and the dealerships, who may have to spend $10 K each to train mechanics and salespeople. Given the EV-1's different refueling needs, Saturn wants to be sure buyers know what they are getting. Southern California Edison is supplying 220 V chargers for homes or public parking lots.

Saturn knows they can't afford to make mistakes with EV-1 customers. Bob Purcell summarized the essentials of GM's marketing approach. "We will do everything we can to create and nurture enthusiasm among our owners."

Reference: David Sedgewick, "GM will lease first electric cars, promote service to early buyers." Automotive News. (CE thanks Bruce Parmenter of the EV Discussion List for posting the original story.)

Automotive News (AutoNews@ aol.com) Keith E. Crain, Publisher and Editorial Director, Fax#: (313)446-0383, Tel#: (313)446-0361.

Access: GM Electric Vehicles 1-800-25-ELECT

The GREAT Saturn

Continued from page 6

could be eliminated. You could hide the second one back under the rear seat, though the seat would need to be removable for watering. With the box in the trunk floor plus the one hidden behind the front bumper, you could still have 144V worth of Group 31s and the batteries would be virtually invisible! You could have great fun asking your friends to find them!

For a street Saturn EV, you probably don't need the number of dividers and hold-down brackets as the racecar used. You also don't need the rollcage which functioned as a tube frame, making the car much stiffer than stock in order to handle well on the track. For battery box design, on the other hand, the racecar is a good model and it's not a bad idea to build things as strong as you can.

Future Plans for the Saturn

GREAT is modifying #65 to run SCCA Solo Two Autocross and demonstrate the use of rapid charging. The team will pull out all the batteries except for a very light pack in the box behind the front bumper. That will give the car enough energy to run for several minutes. Since autocrossers make short fast runs, (under two minutes), that should suffice. Between runs a dump-charge pack sitting on a trailer will charge the Saturn. The car was designed for trackside dump-charging and has a secondary containment behind the driver's seat so that the driver can remain in the car while rapid-charging. The battery weight in front will help the front-wheel drive maintain traction.

SCCA Solo Two should be a great venue to show off the acceleration characteristics of a very light, very powerful EV, since the Saturn is running a 250 V 1000 A race controller built by Otmar Ebbenhoech of Electric Vehicle Components Limited. Watch out, gas car autocrossers. A GREAT beast is coming!.

Access: GREAT, c/o Marianne Walpert, 415-508-1489. Email, psol@alphaleo.eng.sun.com

More EcoElectric News ! !

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Northeastern U.S. Dealership
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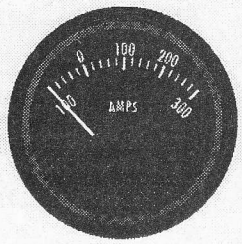
203-661-7747 • Fax 203-661-6558
Email: fw@ix.netcom.com

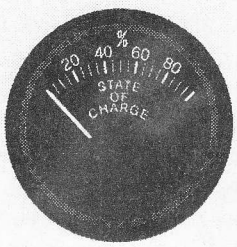
INTERNET

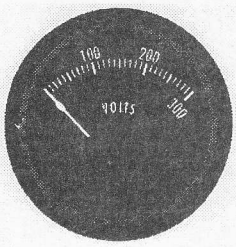
World Wide Web Home Page: *http://www.primenet.com/~ecoelec*
Desert Lightning Information: *http://www.primenet.com/~ecoparts/desert.html*
On-line Components Catalog: *http://www.primenet.com/~ecoparts*

ECOELECTRIC COMPONENTS SALES are now handled by email and the World Wide Web.
Visit our on-line components catalog at ***http://www.primenet.com/~ecoparts***
Our on-line parts sales manager will be happy to answer components questions by email at ***ecoparts@primenet.com***

ELECTRIC VEHICLE INSTRUMENTS







Analog Instruments to Monitor

- **VOLTAGE**
- **AMPERAGE**
- **BATTERY TEMP.**
- **MOTOR TEMP.**
- **VEHICLE SPEED**

High quality instruments for electric vehicles are available in a number of scale ranges, included expanded scale voltmeters for *fuel quantity*. Voltage and temperature instruments may be ordered with a optional *solid-state super bright warning light feature* which will warn of a battery "LOW FUEL" or a "HIGH TEMPERATURE" condition. Instruments are available in 2" & 3" round automotive style case made of MIL-SPEC nylon. Contact your local dealer or the factory for ranges available.

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News in Brief

Compiled by Ruth M. Shipley from information provided by Environmental Information Networks. If reprinted, please credit CE and Ruth Shipley.

LNL Makes Progress on Flywheel R&D

Lawrence Livermore National Labs has successfully contained an intentional flywheel disintegration in excess of 60,000 rpm. "Our containment of a disintegrated flywheel at high rpm is significant from the standpoint of safety, said Frank Tokarz, Livermore transportation program leader. "The fact that we contained those fragments successfully is key to meeting our objectives in flywheel technology." Livermore also has developed a carbon fiber composite material that is three times stronger than the other composite materials and costs only $15 per pound, compared to $50 per pound. Additionally, the lab has developed more compact and powerful, less expensive and easier to control transistors used to switch power.
(Green Car Journal: February 1996)

Hawaii Home to EV Data Center

The Electric and Hybrid Electric Vehicle National Data Center (EHV NDC), located at the University of Hawaii at Manoa in Honolulu, is dedicated to the collection, archiving, processing, analysis and distribution of information on EVs and HEVs. The center, established by the Department of Defense's Advanced Research Projects Agency (ARPA) in 1993, collects data from the seven consortia that comprise ARPA's EHV program. The EHV NDC offers a database and Internet-based services including resources housed on a World Wide Web home page. The center's home page address is http://www.ev.hawaii.edu. Information available through the center includes summaries, reports, tables and graphs, as well as access to modeling, simulation and visualization tools used by the EV research and development community.
(EIN Staff: 2/26)

EV to Achieve 200 Mile Range

Cambridge MA-Powercell Corp. will work with Daewoo Motor Co. of Korea to develop an EV with a range of more than 200 miles between charges. Powercell will make the zinc batteries that reportedly provide two-and-a-half times the energy of conventional batteries, while Daewoo has developed the lightweight aluminum space frame for the EV. As part of the project, Powercell's advanced Wave electric drive vehicle powerplant will be matched with appropriate drivetrain components and the aluminum chassis in an ASF Rangemaker. Last year, a Geo Prism with a Wave Powerplant went more than 175 miles on a charge and achieved highway speeds of 75 mph. The company said the project will lead to production of EVs priced "significantly below $20,000.
(Glean/EVNews: February 1996)

Tour of European EV Facilities

The French national electric utility company EDF, along with automakers Renault and Peugeot/Citroen will sponsor a two-week trip to France, Belgium, Germany and Switzerland for a select group of EV enthusiasts. The trip will last from June 16 to June 29. Highlights of the trip include visits to the cities of LaRochelle in France, Brugge in Belgium and Zurich in Switzerland, which all have large municipal EV test programs. Visitors will also tour the Neoplan EV bus manufacturing facility in Stuttgart, Germany, as well as EV assembly plants in Aniche, Germany and Nice, France. Additionally, the tour will stop at EDF's EV division at the company's headquarters. The trip will include a two-day stay in Paris. For additional information, contact Saxe Dobrin, Battery Powered Electric, 1630-A Franklin Street., Santa Monica, CA 90404, 310-453-1531, sdobrin@aol.com.
SEVA EVUpdate: February 1996)

Zinc-Air Battery Powers Subcompact

Edison SpA recently announced that it had successfully installed a refuelable 484-pound zinc-air battery manufactured by Electric Fuel Corporation in a subcompact automobile. Researchers from Edison SpA, a subsidiary of the MontEdison Group, tested the vehicle in the hilly terrain around Turin, Italy in subfreezing temperatures before declaring the project a success. "We are very pleased with the performance of the Electric Fuel zinc-air battery, especially in cold weather," said Edison SpA general manager Roberto Renon. "Pound-for-pound, the zinc-air battery offers us eight times the range of the lead acid battery. Edison SpA, Italy's biggest private energy producer, has secured licensing for the Electric Fuel battery technology for use in Italy, Spain, France and Portugal. the company currently is putting together a demonstration fleet of zinc-air battery-powered vehicles at its facility near Turin.
(G. S. Schwartz Release: 2/28)

California Launches EV Workshops

In an effort to help community leaders across the country address EV-related issues, Southern California Edison recently kicked off a series of 10 EV-readiness workshops to be held around the country throughout the year. The February 28 "EV Market Launch Workshop" — which took place in Diamond Bar, CA at the South Coast Air Quality Management District headquarters — addressed infrastructure issues relating to the establishment of EV-related policies, the creation of building codes, the deployment of charging equipment, the training of emergency response personnel, and the development of a public information program. For more information, contact Mindy Berman of the LA Department of Water

and Power at 213-367-1344, or Paul Klein with Southern California Edison at 818-302-2255.

CA "Quick Charge" Program Underway

A Newport Beach-based planning firm has been awarded a contract to serve as the coordinator of Southern California's "Quick-Charge" Zero Emission Vehicle Program. The Planning Center, a private consulting organization, is charged with spearheading the development of an EV infrastructure throughout the South Coast Air Basin through the Electric Vehicle Corridor Communities Program (EVCCP). The "Quick Charge" program is being run by the Mobile Source Air Pollution Reduction Review Committees and is designed to assist with the widespread introduction of EVs. The Planning Center will conduct a series of focus group studies and workshops designed to facilitate and support the deployment of EVs along designated corridors. For more information, contact DeSantis at 714-851-9444.
(Business Wire: 3/6)

France Launches EV Transit Program

Several major French metropolitan areas may one day have in place EV rental services if a new Praxitele rental EV program is successful in Saint Quentin-Yvelines. Six EV stations and 50 Renault EVs are expected to be in service throughout the city, located near Paris, by year's end. System subscribers will be able to access small Praxicar EVs at any time using Praxicate smart cards to get in and start the vehicles. Parking areas incorporating an induction method to recharge the cars will be sited near train and bus stations, airports and shopping centers. A control center, call Praxicenter, will receive information on each vehicle's condition via an optic-fiber-based system. The system will also feature a radiotelephone for assistance, information booths for customer service and video monitors and cameras for security.
(Green Car Journal: March 1996)

Swiss Stromboli Represents Future for Evs

Engineers from Swiss Stromboli, Ltd unveiled their Stromboli EV at the Geneva Motor Show in Switzerland in early March. The Stromboli may represent the next generation of zero-emission vehicles — an EV with enough space to fit four passengers comfortably. The car, the first of 11 planned test vehicles, will feature light-weight components and an advanced fuel system. The Stromboli is comparatively light, weighing in at a little over 1,200 pounds with just over 400 pounds of batteries. It uses current nickel-metal hydride technology and is capable of a range of over 100 miles on a single charge. The car can reach a top speed of 75 mph. Stromboli is negotiating with companies around the world with the hope of beginning large-scale production soon. For details, call Stromboli at +41-7- 761- 03-87.
PRNewsWire: 3/12)

Innovative Power Gauge Developed

Alps Electric has developed a smart battery power indicator for EVs that will display remaining possible travel distance and travel time. The BM-9 Series Indicator uses a 16-bit chip to perform electric power compounding. This capability allows it to adapt to the specific characteristics of the different battery types, such as sealed lead, nickel hydrogen, lead storage and lithium ion batteries. The BM-9 performs its calculations during vehicle operation, monitoring the battery's recharging current, temperature, voltage, idle time and undertaking real-time supplementation. It then displays the remaining battery capacity in easily-read analog and digital formats.
(COMLINE: 3/12)

January '96 Board Briefs

Minutes by Anna Cornell and Peter Barnes

The first meeting of the newly reconstituted EAA Board of Directors was called to order by Chair Stan Skokan at the Tandem Computer facility, 18922 Forge Dr. Cupertino, CA.

The Board welcomed its new members Tony Cygan, from the Sacramento EAA and Peter Barnes from Peninsula. Present were Skokan, Brooks, Slominski, Cornell, and H. Bell. C. Bell arrived at 1345. Absent were Gless, Koch, Lough. No proxies were presented from absent members. A quorum of Board members was present. No other EAA members or visitors attended.

Board Actions

Draft minutes from the Dec. 2nd, 1995 meeting were amended to show that the election results were approved and that the new Board members would start their terms on Jan 1, 1996. Those minutes were accepted.

Officers were elected from nominated candidates. For Chair, Stan Skokan, nominated by Slominski, seconded by H. Bell. For Vice Chair, Bruce Brooks, nominated by Slominski and seconded by H. Bell. For Treasurer, Slominski, nominated by Brooks, seconded by H. Bell. For Secretary, A. Cornell, nominated by T. Cygan, seconded by Slominski and P. Barnes, nominated by Brooks, seconded by H. Bell. Chair, Vice-Chair and Treasurer were elected unanimously, with respective candidates abstaining. P. Barnes was elected Secretary, with respective candidates abstaining.

The Board heard and responded to annual Committee reports. Re-elected Treasurer Mike Slominski presented the yearly accounting of income and expenses. Significant highlights: Dues dropped about $1500 from 1994 to 1995, the Buyer's Guide broke even, CE advertising produced more income than budgeted, the association was under budget on Buyers' Guide, Contingency, Membership Records, PCTEK (CE). and over budget (slightly) in Fundraising, Board and Finance categories. Slominski also reviewed forms and procedures for submitting EAA expenses. Uncashed rebate checks by Florida Chapter were referred to H. Bell to follow up with chapter.

Chapter Relations

H. Bell reported a net gain of 1 chapter (4 lost, 5 gained) in 1995.

Membership Records

Brooks noted loss of 50 members in 1995, paralleling the fall in dues. Suggested that the complimentary copy list for CE should be expanded. Current Events - Expansion to 24 pages with 4 tech pages was noted. 1996 EV Buyers' Guide replaced the Feb. CE. Ad revenue now provides 1/3 of CE's operating funds. C. Bell reported that reaction to GM's EV1 and the Air Board's action are keeping editor busy.

New Members

A. Cornell reported significant input to Activities from outside CA and 23 inquiries from news media. The EAA 800 number received 1300 calls in 1995, resulting in 672 information packets mailed, bringing in 164 members (or 1 member per 5 inquiries)

New Activities

The Board then opened the floor for proposals for new activities for the coming months to include:

- Continuing to support the ZEV mandate and monitoring actions by auto manufacturers and the Air Board (C. Bell, Z. Skokan)

◆ Looking into ways for EAA members to obtain the new GM EV1 at discounted rates through CA agency fleet purchases. (Z. Skokan)

◆ Develop, improve, expand World Wide Web Site for EAA (T. Cygan)

◆ Develop strategic plan for future role of EAA in light of commercial introduction of EVs. (P. Barnes)

◆ Membership drive to be implemented at the chapter level. National EAA would sponsor and organize effort by supplying literature and incentives. Initiate marketing effort on the Net. (M. Slominski)

◆ Produce directory of EV charging stations (C. Bell)

◆ Advocacy program to respond to negative editorials and discredit opposition. Ally with like-minded groups and organizations (GM, UCS, NRDF, utilities, CARB, NESEA, DOE, etc.

◆ Increasing value of EAA membership and giving EAA a national image and identity. Determining who is our customer and how best to serve them. (H. Bell)

◆ Form a By-Laws revision committee to discuss a constitution and rules. (H. Bell/B. Brooks)

◆ Acquire and publish EV Buyer's Guide (C. Bell). Publish an EV "Yearbook" describing and listing member and non-member Evs. Put the best articles from CE back issues on the Internet and WWW (C. Bell and T. Cygan)

◆ The Board also approved the recipients of the Keith Crock Award. 1995's KC to Bob Schneeveis to be presented at the Annual Meeting in Feb. 1996 award to James Worden of Solectria.

EAA BOARD HIT HARD IN MARCH

Lee Hemstreet

EAA and CE wishes to express our best wishes to former Board Member Lee Hemstreet, who underwent a heart bypass operation recently. He is now home, recovering. A member of Silicon Valley Chapter, Lee has been a mainstay of EAA from its early days, serving on the Board and as chapter president. He also drives what he describes as his "Hawaiian Racing Turtle", an imaculately converted whiteWV. Here's hopes for a fast and full recovery, Lee!

Bruce Brooks

EAA Board Member Bruce Brooks has resigned due to the ill-health of his spouse and other problems. Bruce has made a huge contribution to revitalizing the EAA Board and has been invaluable in CE's production and distribution. We will miss you greatly, Bruce and hope things settle down. CE wishes the best for you and your family.

Ken Koch

Anyone who has spoken to KTA Services recently may know that Ken's wife is seriously ill. Ken, who was recently elected, has been a strong ally in the fight to bring EVs to Southern California. The EAA board and CE staff would like to recognize Ken for his dedication and at the same time, extend to him our empathy and hope for his wife's restored health. We only wish we could do more, Ken.

◆ General discussion included developing an "emeritus" or "lifetime" award to honor past Board members John Newell and Lee Hemstreet, developing new awards such as an achievement award to members (for use by chapters and Board), recognition award for commercial/corporate achievement and a certificate of appreciation to agency and company for support. Chair requested that the Awards committee get input from members, review suggestions and make recommendations to the Board. Comments and suggestions should go to G. Gless.

◆ The Annual Meeting date was finalized as Feb. 10, 1996, at Hewlett-Packard, Cupertino, CA. First class postcard mailing will be sent to meet the By-Laws' member notification deadline.

◆ The Secretary was asked to create and maintain a list of EAA records held by various Board members

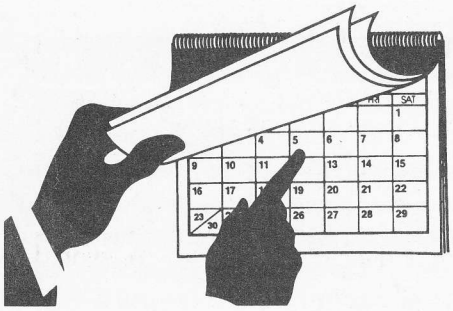
◆ The Board requested that A. Cornell and Z. Skokan speak to Scott Cornell about his willingness to take on the Technical Hotline.

◆ The next meeting was scheduled for March 23, at 10:30 with location to be determined. Meeting adjourned at 1510 by Chair Z. Skokan.

◆ The Board would like member input on the above proposals. Fax or phone ideas or reactions to any of the EAA Board members listed at the side (except Brooks and Koch - see notice).

EVents Calendar

by Anna Cornell



May 4

San Francisco Bay Area Electric Auto Rally (SF BEAR) will be held at Crissy Field. Charging might be available there. Benefits the American Lung Association. Contact Henry Deaton at (415) 861-5624

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 10-17

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.

July 20-26

World Solar Bicycle Race and Solar Car Rally, Ankita, Japan. Call 011-81-185-45-2111, fax 001-81-185-45-2162. The Solar Bike Race runs from July 20-22, the Car Rally from July 26-28.

August (Exact date TBA)

Rally for the Environment, hosted by Albuquerque Chapter of EAA, NM. AFV and EV display and demonstration. Ride and drive, possible EVTC/SCCA Solo 2 EVent. Call Dale Riddle at Current Technologies. Tel/Fax (505)260-0070

August 5-6

EV Conference, Troy, MI. Call (202) 508-5558

August 5-13

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

August 15

Thursday Night Thunder (Formula Lightning race) on ESPN TV. Call (317) 848-8937

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!)

NEC Articles

Continued from page 10

625-17 to 19 cover the New EV Cable, including types, ampacity requirements, maximum length, interlocks and Automatic De-Energization. 625-21 covers feeder and branch circuit Overcurrent Protection, including the requirements for the continuous duty rating initially assigned to EV chargers.

625-22 introduces a new protection concept to the NEC, Ground-Fault Interrupter Protection for Personnel. The may or may not include the traditional ground-fault circuit interrupters. The requirement is on the function performed, not the device used.

625-23 to 25 cover the Requirements for Disconnect Means, Grounding, and protection against backfeed upon Loss of Primary Source.

625-29 introduces another new concept to NEC by allowing EV Charging Equipment to be installed in Hazardous (Classified) Locations.

625-29 covers the requirements for charging EVs indoors, including the types of structures to be considered Indoor Sites, the Location and installation and installation Height of the EV Supply Equipment, and very specific rules pertaining to Ventilation Required and Ventilation not Required. The ventilation requirements for battery gassing found in table 625-29 (c) are the most definitive ever included in the NEC or any of the other Model Codes.

625-30 covers the requirements for charging EVs outdoors, including the types of structures to be considered as Outdoor Sites and the Location and Installation Height of the EV Supply Equipment.

For More Information: The mission of the Electric Power Research Institute is to discover, develop and deliver advances in science and technology for the benefit of member utilities, their customers, and society. An EPRI technical report on EV charging and electrical safety is now available. Please fax your request to Gloria Krein at Hart McMurphy and Parks; fax (415) 949-2973, tel. (415) 949-2970. For an update on activities of the National EV Infrastructure Working Council, please fax to EPRI Project Manager Layla Sandell, (415) 855-2737, tel. (415)855-2756.

FOR EAA MEMBERS ONLY

EV Want Ads

For Sale

For Sale: '73 VW Karmann Ghia — Eye Catcher. 96V, Advanced DC 9" motor, PMC 1221B controller, dual DC-DC converters, on-board 120VAC charger. Converted in 1992. Restored body and interior. $6500/($7500 with new pack)/offer. Call Bruce Brooks @ (408) 268-9130. (San Jose, CA)

For Sale: Black Magic needs a home! First Volts Porsche, 1976 Porsche 914 converted with the Electro Automotive "VoltsPorsche Kit". 20 6V US 2300's, 9" Advanced DC, Curtis 1221 B. on-board K&W charger. Performed 83 miles on charge in recent EAA rally. Ultra-clean professional conversion. Well-maintained. Has log book and manual. Asking $14K/or negotiate lease arrangement. Fax inquires to Clare @ (408) 469-3714.

For Sale: '75 Citicar. PMC controller, 48V, good batteries, 38 mph, 30-mile range. $2100/obo. Call (206) 646-1040. (Seattle, WA)

For Sale: Jet 007 Omni. 20 new 6-Volt batteries, 23hp DC Series GE motor, gas heater, PMC controller, lots of accessories. $6500. Call (415) 388-0838. (Mill Valley, CA)

For Sale: '83 Chevy S-10 Blazer. 120 V, 9" DC motor, 50-60 MPC, US 2300 batteries, Curtis controller, heavy duty suspension, power steering, seats 5. $16,000. Call Tony @ (407) 382-9598. (Florida)

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 small businesses, CE would like to offer a new commercial ad rate. For just $25 you may submit an ad up to 25 words for your small business. Each additional word, 50 cents.

Please submit a disk with a text file or hard copy that is typed to ensure accuracy . If you would like more information on this, please contact Susan Hollis at (408) 374-8605.

ADVERTISING RATES

Full page	7.25" x 9.25"
1 ad	$400 ea
3 ads	$300 ea
12 ads	$250 ea

1/2 page	7.25" x 4.50"
1 ad	$200 ea
3 ads	$150 ea
12 ads	$100 ea

1/4 page	3.50" x 4.50"
1 ad	$150 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, AdvertisingManager
Office: (408) 374-8605
FAX (408) 374-8750

Address

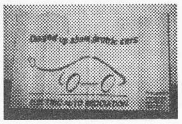
Make check payable to EAA. Camera-ready copy and payment for the ad should be sent to:

Electric Auto Association
18297 Baylor Avenue
Saratoga, CA 95070

CE ADVERTISERS

EAA **Reprint** Order Form

100% Cotton Cap
Forest Green
'Charging into the Future' EAA Logo
CAP001.....$7.50



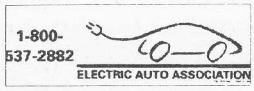
Auto SunShade
SS001.....$8.00

T w/EAA Logo
(adult small only)
TS001....$14.50

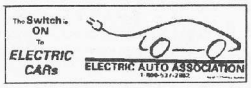
Thermal Auto Mug
MUG02...$6.00

Porcelain Mug with
'Charging into....Future'
MUG003.....$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 ***(specify specific issue)***	$ 3.00 each issue
CEFY	Current EVents - Full year ***(specify specific year)***	$20.00 each year
PB001	Discovered:The Perfect EV Battery	$ 2.00
FW001	Flywheel Energy Storage	$ 5.00
BG1996	1996 Buyer's Guide to Electric Vehicles (Feb 96 issue CE)	$ 5.00
BG1995	1995 Buyer's Guide to Electric Vehicles (Feb 95 issue CE)	$ 5.00
TT001	Team Tucson Land Speed Record Plans	$ 5.00
IDX001	EAA Current Events Index - 10 Years!	$ 4.00
XA100	EAA XA-100 Hybrid	$ 5.00

Other EV Items

PN001	Ball point pen with "EAA, 800 phone # & Charging....Future"	$ 1.00
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

Electric Auto Association **Reprint** Order Form
Send order to: EAA Reprints
5820 Herma St., San Jose, CA 95123-3410

Name_____
Address_____
City,St,Zip_____

Item#	Size	Quantity	Item Description	Unit Cost	Amount

Make check payable to: **EAA** (US dollars)

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

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

ELECTRIC AUTO ASSOCIATION

2710 St. Giles Lane, Mountain View, CA 94040

• Address Correction Requested •

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

EBAY
996

• Time Dated Material - Please Do Not Hold •