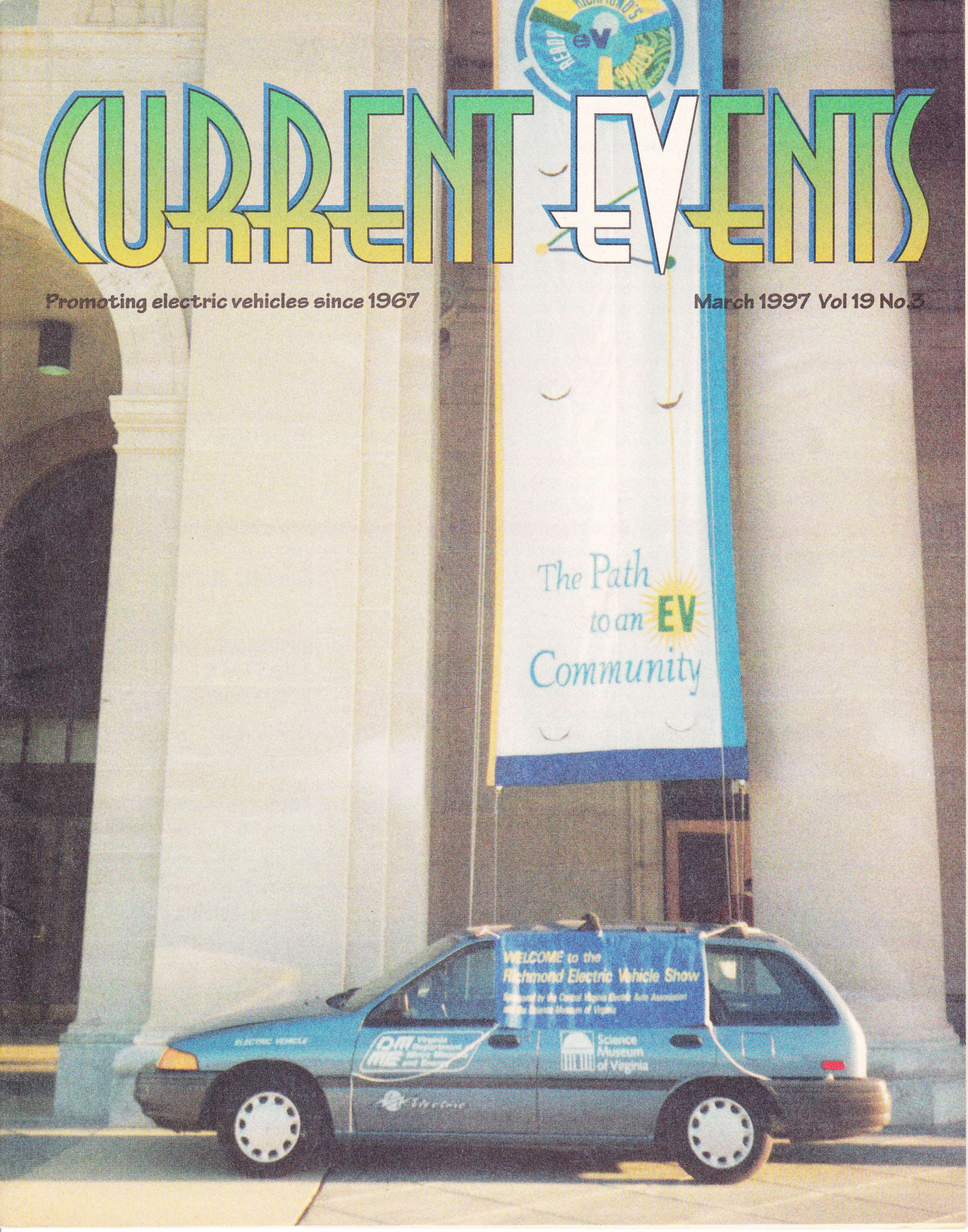
CURRENT EVENTS

Promoting electric vehicles since 1967

March 1997 Vol 19 No.3



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Central EAA is helping Richamond, VA be EV-Ready.

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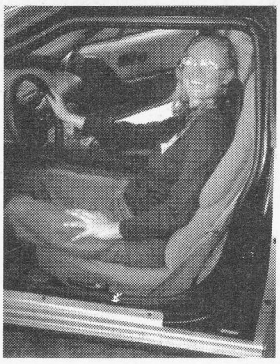


Hill-hoppin' E-Porsches

BY CLARE BELL

The Santa Cruzin' Porsches did it again. First Black Magic (1976 Porsche 914 "VoltsPorsche" conversion) proved that hopping the hill is feasible with a battery pack of 20 6-V batteries. Now her sister, #13, (1974 Porsche 914 electric) has made the same run on 144V worth of her 12V Horizon 12N95 batteries and wasn't even breathing hard when she got there.

This was another spur of the moment "impulse" trip, made because I wanted to run #13 at the SCCA Autocross event at Oakland Coliseum on Saturday (12/7). Had my fill of towing, and the car had just made a good test run from Bonny Doon (2300 ft) to Felton (300) and back (2000 ft in 12 miles). So in typical EV-enturing fashion, I decided to go for it.

Notes from the trip

Charged up overnight, pack read 165 on float voltage in the morning (12/6/96). Left from Summit Drive at about 1:30 PM. From Summit, up Empire Grade to Alba Road, down Alba Road to Hiway 9, into Ben Lomond briefly to add air to tires and gas to escort car (yes, this time I had a safety net, mostly due to time constraints). Tire pressure on all wheels upped to 50 psi, warm.

Along Hiway 9 from Ben Lomond to Boulder Creek, 2nd gear rolling hills, cruising amps sometimes as low as 60-70, 80 on slight grades. Under load, pack voltage steady at 155, going back up to 165 when coasting. Through B.C. on up 9, climbing in 1st from 25-30 speed range, drawing 80-100 amps, in 2nd 30-40 speed range, drawing 100-120 A. Only using 3rd and 4th on downhills (car freewheels more easily in higher gear.) Using some roller-coastering technique. Past intersection to Big Basin (236) climbing at 35-40. Continuing up 9, steady climbing, pack holding pretty steady at 150V. Trying to keep amp draw below 150, mostly between 100-120. Pack at about 140V by intersection of Hiway 9 and Skyline (Hiway 35). Turn left (north toward Palo Alto).

On acceleration from stop up initial hill of Skyline, pack pulling to 130 at 200 A draw, then settling at 130-150 (think I was in second gear) for the first grade. Topped grade, began roller-coastering, using downgrade to pickup speed and minimize amp draw. Speed averaging 50, 60 on some straight or gently curving downhill stretches in 3rd or 4th (car handles good on those curves!). Pack recovering during downhills to about 150 V. Climbing in 2nd at 40-50, 130-140, occasional spikes to 200. Pack at 125 under 150 Amp load by the turn-off for Page Mill. Down along Page Mill, 25-30 (narrow road), sometimes higher in longer stretches. Having much fun since almost no traffic (but looking out for bicyclists). Pack recovering during downhill, drifting back to unloaded voltage of 140, then 145, then 150 V. Stiff batteries!

150 V by the bottom of Page Mill, heading into Palo Alto under the 280 overpass. Gunned it to impress traffic, saw meter touch 300 A, 2nd gear, accelerate from 30 to 55-60 up freeway-grade hill (5 %). Pack didn't pull lower than 125V.

Hotrodded it in triumph the last 2 miles to friendly plug on Hanover in Palo Alto. Pack still strong, holding 125 and recovering during coasting. Arrived, pulled into driveway, 3:00 PM. On charge - 3:20.

OK, GM EV1, try that!

(and more praise to you if you can do it — I'd welcome a demonstration!)

- 43 miles of winding mountain roads, time, 1:30-3:00, or about 1.5 hours.
- Pack drop, 165 (float) to 135 (float)
- No controller cutouts, overhead shut-downs or power-drops. Car could have probably gone 5-10 mph faster and still stayed strong to the end.

Car configuration

- Race car - no side windows, vented rear window (flowthrough)
- 14 Horizons on board, 12 hooked up (All charged)
- Pack weight - 14 x 61 LB = 854 lb.
- Curtis 1231C controller (144 V nom max pack voltage)
- Goodyear Corsas, 165/R15s, 50 psi
- Badicheq on-board battery monitoring and charge control
- Mentzer 220 V , 16 A "Cube" Charger (onboard)
- Curb weight w. driver and stuff (rollcage too), 2650 lb.
- 120 lb of it was batteries that weren't being used. 140 of it was driver, maybe 15 of stuff.

As of 8:20 PST, #13 was charging away happily in Palo Alto, getting ready for the SCCA Oakland Autocross. Da gas-guzzlers better watch their behinds!

[Later — Porschie and me did a 33 second run on a track where stock streets driven by rookies were pulling 37s, mod streets were pulling 35-32, Corvettes were pulling 32-30 and A-mods were pulling 25-28. My best run, even though it was a fun-run (not scored). We nipped 'em in the seat a little.]

There was absolutely no need for the chase car and next time I will do without it.

Tire pressure VERRRY IMPORTANT.

Again, this shows that it is possible to do electric commuting from Santa Cruz to the SF Bay Area. Not only on the traditional 6 V wet cells, but on the new 12V sealed lead-acids.

The Horizon 12N95s did very well. They stayed stiff, no sagging, giving plenty of git-up-and-go at the end. (Which helps — when you drive a car that looks like a Porsche, it oughta go like a Porsche!)

continued on page 20

TECH TIPS FROM THE NET

Wet, Bang and Controllers

BY CLARE BELL

I'm beginning to think that moisture has a part to play in the downfall of Curtis and perhaps other controllers. These units are supposed to be sealed, but in truth there is no way to seal an enclosure with air inside that goes through thermal cycling, which a controller does. Even if it was sealed when it came from the factory, a few heating and cooling cycles will lead to small cracks in the potting, allowing moisture to enter.

During heating, the controller will "exhale", i.e. hot air inside will expand and force its way out. During cooling, the controller will "inhale" as pressure drops inside and outside, moisture-laden air flows in to equalize pressure. Once inside, moisture condenses and may accumulate on critical components, causing shorts and corrosion.

How does one stop this? The best way may be to jacket the controller with an additional enclosure (except for the part in contact with the heatsink), designed to minimize the entry of moisture.

Another way is to slant the controller so that accumulated moisture can drip down to the lowest part of the case and drain out.

One possiblity might be to have a controller warming circuit so that any moisture once inside will evaporate. It might also minimize the effect of cycling. The controller-warming circuit can be like battery warming and run only when the car is plugged in.

Thermal cycling can cause enough cracking in the potting that the end of the controller can come apart. Bob Schneeveis told me that one in his Fiat did that. He found out when he put his hand up to feel it and accidently stuck his finger into the guts of the controller. I think it was a 1231C. His suggestion when installing a new controller was to RTV the hell out of it, especially over the potting.

Maybe us EV folks need to adopt the method of some of the automotive electronics packagers who use boots and seals and electrical grease. They have to worry about the same sorts of problems.

Comments?

Otmar Ebbenhoech writes:

Clare,

You're right on about the Curtis moisture problem. I've seen many die due to water in them. Sometimes they fill up 1/4 full of water before the circuit traces corrode enough for them to stop functioning.

Total seal is one possibility. It is difficult to implement and verify. We could seal them and then pressurise with nitrogen. Then a pressure gauge would indicate a good seal. That all sounds compicated and expensive.

I've decided that if you can't seal it from all humidity then double-enclose it in something that has drain holes.

Golf cars have the same problem. They get hosed down with a garden hose on a daily basis. I saw one with a double enclosure. The Curtis controller has a dust cover that is not water tight. In addition the controller is mounted on a heat sink that is significantly larger than the controller. The heatsink then has a plastic cover over the controller that is sealed on three sides and open on the bottom. This allows any condensation buildup to drain out. The heatsink sits at about a 20 degree angle from vertical. What have other people found?

—Otmar
Electric Vehicle Components Ltd.
Otmar Ebenhoech
otmar.evcl.com

Leon Levasseur responded,

The H2 from Zapi is totally sealed with rubber gasketing on the end plates; unlike the H3 which was virtually totally open. But I still wouldn't use it in a bucket of water.

Leon
"Leon E. Levasseur"
<leon@ZIPLINK.NET>

Duane C. Johnson of Red Rock Energy responded,

I haven't thought this out fully but others may have.

Many of us have vacuum power break boosters. These use electric vacuum pumps. Why not connect the vacuum to the controller housing. This would apply the vacuum to the insides of the controller and evaporate any water that might leak inside. Of course the controller should be sealed with RTV. If any leak formed then it would be evident from pump cycling.

Now for the physics. When a vacuum is applied the partial pressure of the water requires that the water be either colder or evaporate. Since the controller is about ambient temperature the latter happens. Even if the controller lagged behind temperature changes and water condensed on the outside the lower pressure on the inside would require that it be in gas form and not a liquid.

I don't think the partial vacuum applied to the driver electronics is much of a problem. Power electronics is heatsinked to the outside and not affected by the reduction in cooling caused by the vacuum.

Wild thought.Why not eliminate the vacuum reservoir altogether and only use the controller case. Would Curtis have a problem with this? Any comments from the crowd?

redrok@pclink.com
(Duane C. Johnson)

continued on page 6

Wet, Bang and Controllers

continued from page 4

Mitch Oates responded,

Come to think of it, the first time the H3 went out and the time that it went explosive were both times when a heavy dew had fallen. Might also explain why Brad Jackson's was still working last I heard, his being mounted inside the car in what would be the baggage area.

Wonder how much help it would be, after all the components are assembled and prior to sealing the case, coating everything with the same dielectric acrylic sealer they use on the logic boards?

Mitch Oates
<RRKR45A@PRODIGY.COM>

Moisture in Controllers

From: LEE A HART
<XURQ03A@PRODIGY.COM>

Electronics that are going to be used outdoors must have excellent moisture protection, or they are going to die. Most companies apply conformal coatings to circuit boards for cosmetic or "feel good" reasons. It goes like this:

- Company X designs a great new product with very tight spacings.
- Specs say it must survive 100 hours at 95 deg.F and 95% humidity.
- Product fails after 1 hour.
- So they add the cheapest coating that will barely survive 100 hours.
- Florida customer buys one. It dies after a week (168 hrs) of hot, muggy weather.

So what options are available?

The usual cheap conformal coatings (like acrylics) are very thin, and leave lots of holes, gaps, and cracks. They don't stick well to many things, and so easily flake off and get into connectors, switches, etc. They only delay moisture problems, they don't prevent them.

The military has used some excellent coatings, but they are very expensive and so rarely used on civilian equipment. Paralyne is one; it's a vacuum deposited coating that coats extremely well without buildup.

Others are thick viscous honey-like coatings like a heavy varnish. But they are almost impossible to remove for repair, and you have to be sure the coated parts have compatible thermal expansion coefficients. Otherwise heat and cold will cause cracks in the coating, or worse, in the parts themselves.

Or there are silicones; rubbery translucent materials that stop water but can be dug off the board for servicing.

You can pot it in an epoxy or other resin. Potted circuits are great for keeping the nasty world out (including prying eyes), but non-repairable. Finally, there is hermetic packaging. Put the circuit in some kind of waterproof enclosure. It stays clean and dry, yet you can still open it up for repairs or adjustments.

I think a product's packaging is an excellent indicator of the builder's practical knowledge. Inadequate packaging tells me the builders are clueless as to the hazards of the real world.

To Eric; there's no reason why you can't immerse a Curtis controller in mineral oil. It will indeed improve cooling. Just don't try this with anything with switches, relays, or other moving parts inside.

To Clare; using the controller as a vacuum reservoir would take some engineering. You have to make sure all of the parts inside have sufficient conductive heat dissipation to survive in a vacuum (which is a perfect insulator). And be sure the extrusion can withstand the outside air pressure (up to 15 lbs on every square inch; the flat bottom might collapse). And the case would need new end covers; the potted ends would just get sucked in.

To Bob; the simplest solution might be to "bag" the device in a polyethylene baggie. I did this once for a circuit board that had to survive in a very wet location. Just heat sealed it in the bag with the wires coming out.

—Lee Hart
E-mail XURQ03A@prodigy.com

APU for WABBITS

From: DAXcontrol
To: EV@sjsuvm1.sjsu.edu

While I was in San Diego for the NAEVI conference, there was a company there who converts VW Rabbits. The owner, Ed Myers, brought his red cabriolet for ride and drive, which I did. His system used 20 US2400 6V batteries which were placed in the back seat and under the hood. He also had a 4-8kw (I forget that exact number) Honda type generator in the rear of the car where the trunk used to be. I could not believe he was able to stuff all those batteries and a APU into that car, but his company was able to do it cleanly and effectively. He said the APU was not used while driving (although it could be) but was primarily used to charge the vehicle while it was parked.

They have the experience and technical know-how to put an APU in that exact vehicle and at least could probably tell you certain things to avoid.

—Marc Kohler

American Electric Conversions. Contact info: Ron Larrea, VP, tel: (619) 632-9179, fax: (619) 941-4363

The Old Power Plant Argument

BY MITCH OATES

Just as with EVs and ICE-powered vehicles, the technology involved with large-scale electrical generating plants has also been progressing.

An argument that continually comes up when discussing the pros and cons of EVs concerns the difference in pollution levels between a population of ICE vehicles and a population of EVs powered by fossil-fuel power plants. What is the efficiency of the overall energy cycle (production, distribution and use) of gasoline versus electricity?.

Both sides assume that the emissions and efficiency of current fossil-fuel power plants are a constant. The discussion proceeds from that point.

However, just as with EVs and ICE-powered vehicles, the technology involved with large-scale electrical generating plants has also been progressing. Most, if not all, fossil-fuel plants operate using the basic steam cycle, or the more technical term, a Carnot Heat Cycle. Fossil fuel is burned to produce high-pressure steam, which typically runs through a turbogenerator to generate electricity. It then is condensed and run through the cycle again. From my experience, the best efficiency available from this basic type of plant would be in the mid 30 percent range.

Co-generation

However, many plants are now making use of cogeneration. Basically, this attempts to make use of what would otherwise be waste heat in the above cycle to improve efficiency and generate additional electricity. Recent articles in the IEEE Spectrum have reported plants with thermal efficiencies in the 60 percent range using this method.

Changes in the actual combustion process are also resulting in increased efficiencies and reduced emission levels. Computer control of individual burner elements in boilers and new combustion methods, as promoted by the Clean Coal Technology Act of 1995, can reduce NOX emissions by 100 times. In fact, such reductions are actually mandated by the above legislation.

Is this justification for keeping a coal-fired power plant, in areas where it could be replaced by a cleaner one? In my opinion, no. However, as with the hoped-for widespread use of EV's, the conversion of power plants to cleaner methods of power generation will be a long-term initiative, just given their complexity and the capital investment involved. If we must live with coal-fired plants for lack of a better source, the advances being made can improve their near-term efficiency, operation cost, and emission levels and help combat the "just as dirty as ICE" argument —MO.

Sources: IEEE Spectrum, Popular Science, "Today's Environment" weekly TV show hosted by Ed Begley Jr., and my own experience over the past 20 years operating submarine nuclear power plants for the Navy.

Lotus EV Supercar

British sports-car maker Lotus says it will produce an electric-powered version of the Lotus Elise. A prototype of the 200-horsepower electric Elise, developed by Lotus and British motor manufacturer Zytek, will be unveiled next month at an engineering conference in Detroit. in Detroit. It is said to be lighter and much faster than GM's EV1.

DETROIT, Jan. 27 (UPI)

97-01-28 05:48:34 EST from brucedp@juno.com (Bruce {EVangel} Parmenter) AKA: Ca'pitan Rayito

EV Buyer's Guide in April

Look for the EAA '97 EV Buyer's Guide in April. This 44-page reference guide will replace the April issue of Current EVents.

This issue is bigger and better than EV-er.—CB

East Bay EAA is Online

The East Bay EAA is now available online. The email address to contact them is: ebeaa@jun.com, c/o of Scott Cornell. Come visit the site for valuable EV information.

Electric Motorcycle

BY BOB BURNSIDE

You'll be able to buy one soon at Golden Gate Cycle in San Francisco, California, for around $3000.

Scott Cronk, founder of Electric Motorbike (EMB) has a strong background in electric vehicle development and business. With this combination plus his familiarity with companies in the field, he is more prepared than most to make the launch of his Lectra bike a success.

In an area of Sebastapol that is becoming known for its several electric vehicle makers, Cronk's business occupies space in a building behind a deli on busy Route 12, which has the potential to expand with his business.

The Lectra's prototype leans on its kickstand in Cronk's spacious warehouse. Its slightly "retro" look gives it a '60s personality. In April, assembly will begin on the production model. You'll be able to buy one at Golden Gate Cycle soon afterward for around $3000.

The money you spend will buy some important new technology. The EMB-developed motor, a variable-reluctance creation with no brushes to wear out, boasts 92 per cent efficiency and 8 horse power at a maximum speed of 10,000 rpm. This compact powerplant was not possible until the computer technology was invented to provide the necessary precision to the pulses of electromagnetic power to pull the unique unwound rotor around on its axis. The only windings are found on the stator located toward the outside of the unit, providing optimum heat dispersion. A 4-to-1 gear reduction is further reduced 3-to-1 by the drive belt. 'Fat boy' tires and a feisty low profile give the impression that this machine is definitely more than a toy.

The bike's response is immediate and powerful as it jumps into action. Bill French who normally rides a powerful Yamaha YZS 750 says, "It is a weird feeling to sit noiselessly at a stop light. When I screwed it on, it would have beat my bike on acceleration. It really ripped up the hills. The seating position is comfortable. I didn't want to bring it back."

The ample horsepower is reversed when the rear brake is applied providing electrical braking and also generating battery recharging power. This system offers full braking power when first applied and gradually reduces to zero electrical braking at 4 mph : a natural anti-lock feature. There is an auxiliary rear drum brake. The front disk brake is a dual- piston, floating-caliper system developed in Japan.

An onboard 440 watt charger brings the four batteries of this 24 volt system from 20 per cent to 95 per cent charge in about four hours. An optional 1.3 kilowatt model does the same in one hour. Current is usually limited by a signal controller to prevent strain on components. A boost button cancels this function offering 30 percent more power for special situations like passing. A state-of-charge meter gives accurate readout of energy/time remaining and there is a device that stops the motor at 20 per cent charge. It can be reset for an extra 5 miles of reserve power.

Cronk was working at Delco Electronics in the Midwest when Ted Morgan of US Electricar offered him a job as director of business development for the small start-up. Morgan had been impressed by Cronk's book, Building E-Motive Industry (1995), which grew out of his thesis project for his MBA. US Electricar provided Cronk with an education in a growing and then declining business. The company outgrew its ability to attract capital and has been restructured to a fraction of its former size. Cronk saw his opportunity, left US Electricar and started Elephant Motor Bikes in April 1995 with Rich Whisman. The present company grew out of that.

The Lectra prototype has been carefully developed and tested resulting in the EMB model that will add a substantially different alternative to two wheeled transportation this year. The future may bring a more powerful model with a better range and a sidecar.

Cronk's long term goal is to do a two wheeled electric circumnavigation of the world.—BB

Contact: Scott Cronk, (707) 823-2453

TECH SPECS

Range: 35-50 miles
Speed Limits: 35 m.p.h./45 mph with boost
Power: 8 hp peak
Electrical system: 24 volts
Braking: "Anti-lock" plus regenerative
Acceleration: 0-35 mph, 2 seconds

Scott Cronk's EMB Lectra shown with battery cover off.

Is Mass Transit the Answer?

BY RUTH SHIPLEY

I wanted to respond to California Assemblyman Gary Miller's statement (see below) that California can best deal with air pollution by scrapping its efforts to support EVs and urging consumers to use mass transit. I suspect that Mr. Miller does not use mass transit on a regular basis.

On August, 11, 1991, the San Francisco Examiner published a front-page story documenting that more and more people were dropping mass transit in favor of cars. In fact, at that time I had estimated from literature provided by local transit agencies that only 12% of the commuters in my county were using mass transit on any given day.

The Examiner's story did not surprise me, since I had accumulated almost two years' daily experience with my county's mass transit system. I wrote a letter to the editor, which was never published. Perhaps this is a good time to bring it up again. So here is my original letter, with an update at the end:

So "mass transit [is] losing to car-happy commuters" Does this surprise anyone who — like me — uses mass transit? Here is a sampling of the times mass transit let me down recently:

On my way home from work one Saturday, a combination of infrequent buses and a connecting bus that was a half-hour late caused me to arrive home three hours after I had left work. I live less than 10 miles from work.

Another Saturday, I reached a bus stop five minutes before a bus was to arrive, according to the schedule. It never came. According to the schedule, another bus should have stopped 15 minutes later. It never showed up either. I waited 35 minutes for a bus that day.

The day I read the Examiner report, I was on my way to class at San Francisco State University. I got to the bus stop at the usual time, but the bus never showed up. Was it early? Or did it take a wrong turn into the Twilight Zone? All I knew is that I had to wait a half-hour for the next one. Consequently, I was late for class. On the way back home after class, I waited 45 minutes on a route where the bus supposedly runs every 12 minutes. The total commute time from home to SF State and back — about 40 miles round trip — was over two-and-a-half hours.

And then there was the time the bus went sailing past the bus stop, even though I was standing there!

No, it doesn't surprise me at all that mass transit is losing. It's losing because it's extremely frustrating to spend an hour on mass transit making a trip that only takes 15 minutes by car. It's frustrating when you have to transfer to two other buses to ultimately arrive at your destination. It's frustrating when you're trying to get to work — or class — on time, and the bus never shows up.

And the people on the Metropolitan Transportation Commission who think that we can reduce air pollution by using mass transit have obviously never seen the plume of thick, black smoke that rises from the exhaust pipe every time a bus pulls away from a bus stop. In fact, I often wonder if any of the officials who urge us to use mass transit ever use it themselves. Whenever I rode the bus, I hardly ever saw men in three-piece suits.

Has it occurred to anyone on the MTC that if Californians are unwilling to give up their cars, then perhaps we need to attack this problem from a different angle?

How about putting pressure on Detroit to produce cars that pollute less? How about cars that don't pollute at all? Naturally, this wouldn't solve the problem of rush-hour gridlock. How about providing tax breaks to businesses that implement a ride-sharing program? Or shift work? Or home work?

How about building affordable housing so people won't have to live so far from their jobs? How about designing mixed-use communities so people won't have to commute at all?

I am by no means suggesting that we abandon mass transit altogether. Obviously, it works very well in some communities. All I'm saying is that it isn't the only answer.

Instead of pouring more money into an inconvenient and unreliable mass transit system, let's change the cars we drive, the work we do, and the communities we inhabit.

UPDATE: Since I wrote this letter, I have moved to another town in the Bay area. I now live 16 miles from work. It takes 25 minutes to get there by car and 2 hours by bus. —RS

Groups Oppose EV Infrastructure

BY RUTH SHIPLEY

A broad coalition of interests in California has urged the California Air Resources Board (CARB) to cancel a contract for the design and demonstration of an EV recharging system. Opponents say the $500,000 CARB contract with Bevilaqua-Knight, Inc. (BKI), duplicates existing efforts and would result in little or no environmental benefit. "If public dollars are to be spent for mobile source pollution reduction, they should be channeled to programs with proven track records in fighting smog, such as removing older, higher-polluting vehicles from service or getting people out of their cars altogether through improved efficiency and availability of public transportation," said state Assembly Budget Committee Vice Chairman Gary Miller. "The CARB has estimated the cost per ton of emissions reduced through scrappage programs at $4,000," said Anita Mangels of the group Californians Against Hidden Taxes (CAHT). "By contrast, the cost of EV subsidies is over $225,000 per ton. $500,000 could eliminate 125 tons of emissions by retiring gross polluters, or two tons by subsidizing EV programs."— (CAHT RELEASE: 1/23)

EVs—Think Small... Regeneration For The Masses

BY JIM MCGREEN, ZAP BIKES

If you own an electric car to contribute less pollution to the atmosphere, read on... you might be making a mistake!

If you are traveling less than 20 miles, an electric bicycle will get you there at up to 20 times the efficiency, not to mention the fun, the money, the time you save on parking, and even the possibility of improving your health. This isn't a toy either; electric bikes can be serious transportation. The ZAP Power System (U.S. Patent No. 5,491,390) can turn nearly any bicycle into a highly efficient human/electric hybrid vehicle, complete with 400 watt dual permanent magnet motors, quick-change batteries, and a two-speed controller with regenerative function.

With over 100 million bicycles in the U.S. and only 4.3 Million actually being used for commuting, bicycles can be a vast untapped resource for reducing air pollution, not to mention traffic congestion. But riding any appreciable distance on a traditional bike can be a sweaty, exhausting ordeal. Once you make it to work and put in your eight hours, a return trip home starts to look less and less attractive. Using the electric power-assist, you'll breeze quietly by your unassisted, spandex-clad roadmates, wearing your work clothes and a smile. Hills you used to swear at will be no-sweat. ZAP has two electrical speeds and can travel from 8 to 15 miles depending on user input and terrain. The more you pedal, the greater your range. A single charge runs about four cents. The motor has two modes of operation, engaged and disengaged. Disengaged, the rider can pedal normally without resistance from the motors, although the motor will engage if needed. Engaged, the rider can use ZAP regenerative braking feature. ZAP's regen is most effective when coasting downhill. When the wheel speed is 12 MPH or greater and the throttle is engaged in the LOW speed setting, the voltage output of the motor/generator is greater than the battery, allowing current to flow back into the battery. At 20 MPH the ZAP will generate 40 amps of recharging power. You don't need to be going downhill to use the regen. If you are looking for a great workout, you can even use the regen on the ZAP as a mobile exercise machine. As long as you're going over 12 MPH with the system engaged in LOW, you'll be getting plenty of exercise while charging your battery. Serious home energy advocates even put their ZAP on a stationary bicycle stand for generating power for their home energy system, lights, even small appliances. Imagine health clubs of the future generating enough power to light an entire city!

Editor's Note: For further information, contact ZAP at 1-800-251-4555 or log on to their web site at http://zapbikes.com.

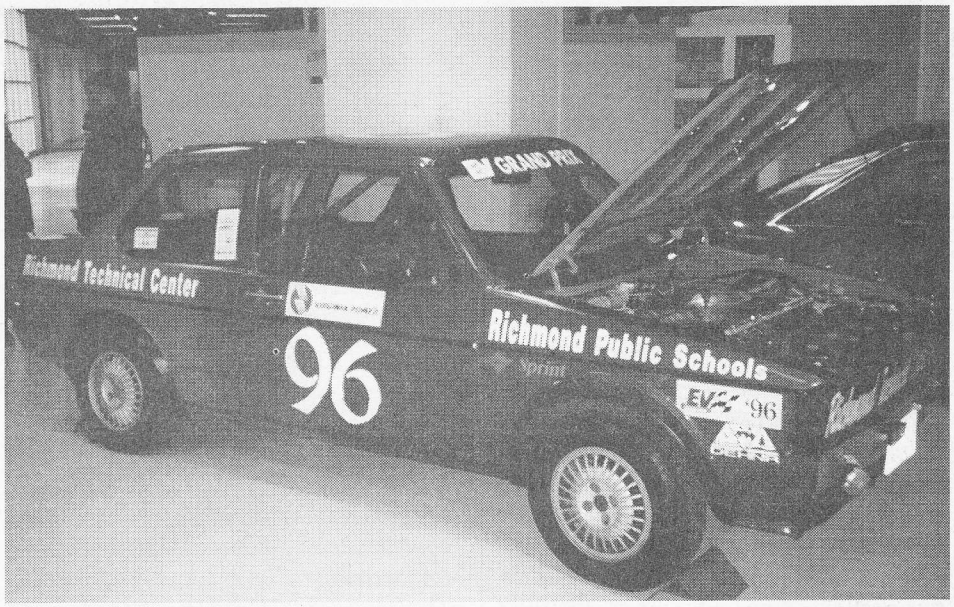
Alex Campbell <zap@zapbikes.com>

The 3rd Annual Richmond EV Show

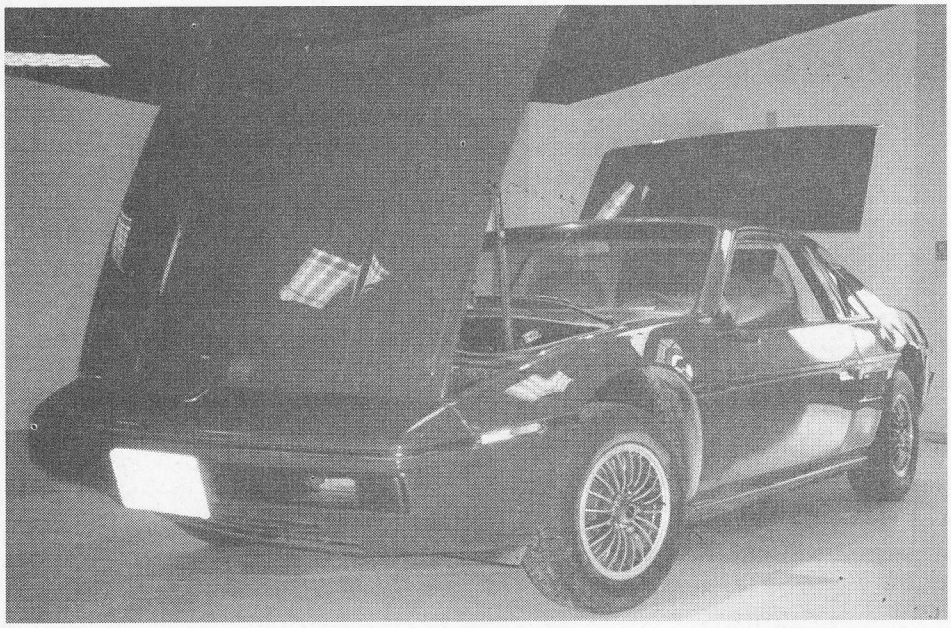
BY BOB OLDHAM, CEVA

The third annual Richmond Electric Vehicle Show, sponsored by the Central Virginia Electric Auto Association (CEVA — a chapter of EAA) was held at the Science Museum of Virginia. Co-sponsored by the Science Museum, the show took place in the Lower Concourse exhibit area, on Saturday, January 11, 1997, from 10 am to 4 pm. This was arguably the best CEVA show so far, exhibiting nine electric cars, an electric pick-up truck, four electric bicycles, and a solar-powered robotic electric lawnmower.

Matt Merkle brought a Chevrolet Lumina hybrid EV conversion done by students at Virginia Tech University. Virginia Power showed a Geo Prism EV conversion and a Chevrolet S-10 EV conversion along with an exhibit on the Hughes inductive charging system that they are marketing. Students at the Richmond Tech Center of the Richmond Public Schools displayed a Volkswagen Jetta EV conversion (they built this car as an entry in the 1996 EV Grand Prix). CEVA member Ernie Moore brought the Mercury Lynx EV conversion which he drove to first overall in the 1995 Florida Sun Day Challenge and 8th in the 1996 Tour de Sol. Other EV conversions included CEVA President Bob Oldham's Volkswagen Rabbit, CEVA member Charlie Rawlings' Ford Escort station wagon, CEVA Secretary Harold Bushong's Subaru station wagon, a Pontiac Fiero EV conversion also brought by Harold; and the Science Museum's Ford Escort station wagon. This EV sported a banner saying "Welcome to the Richmond Electric Vehicle Show". It was displayed in front of the Museum building under a large banner which proclaimed "Richmond's Getting EV Ready".



Your school tax dollars at work—students -built VW Jetta by Richmond Public Schools Tech Center.



CEVA Secretary Harold Bushong brought this classly-looking Pontiac Fiero EV.

In addition to the cars, Tony Rutherford of Dick Strauss Ford, dealer for the EV Warrior Electric Bicycle, brought two of these. CEVA member Charlie Rawlings brought his two electric bicycles, one built from scratch, the other built from a Zap kit. Also Buhrman and Sons, a nearby implement dealer, loaned a Weed Eater solar-powered robotic lawnmower to round out the vehicles exhibited.

CEVA member Brian Murphy continued the survey he has been conducting for over a year, asking show visitors about their preferences and expectations for electric vehicles. He collected about 100 responses at this year's show, bring the total number to about 300. This show was also successful in terms of attendance.

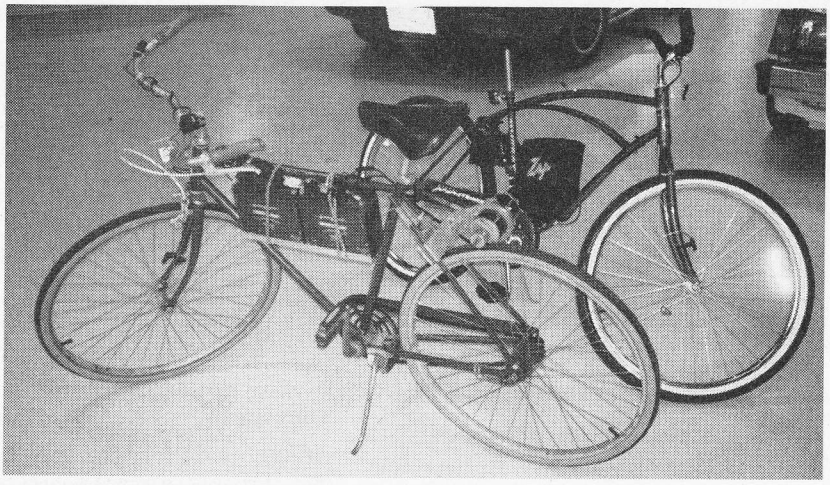
January 11th was the Science Museum's 20th anniversary, the dedication date for the first section of a new major Life Sciences exhibition, and the announcement of a major gift to the Museum in support of the Life Sciences exhibition.

It is estimated that more than 1500 people came to the Science Museum for the day. Probably a fourth of them spent some time in the Electric Vehicle Show. One was a reporter from the Richmond Times-Dispatch, whose story about the EV Show appeared in the next day's paper.

Visitors on this important occasion included US Senator Chuck Robb and Virginia Governor George Allen and his family. Both Senator Robb and Governor Allen visited the Electric Vehicle Show; the Govenor even taking a spin through the exhibit area on one of the EV Warrior electric bicycles.

There were a few disappointments - four vehicles we had hoped to lure to the show didn't materialize: a 1917 Detroit Electric from a private collection in Manassas, VA; a new electric city transit bus acquired recently by the Greater Richmond Transit Company; the EV Grand Prix entry from the Hermitage Tech Center of the Henrico Public Schools; and one CEVA member's EV, which had a burned-out motor. Maybe next year's show can be a little bigger and better.

CEVA members who participated in the 1997 Richmond Electric Vehicle Show were: Harold Bushong, Ernie Moore, Brian Murphy, Bob Oldham, Charlie Rawlings, and Jim Robb.—BO



Zap bikes along with member home-built e-bike.

The new EV Warrior.

Virginia Power's S-10 EV opens its hood to the public.

EV1-UPs

BY GARDENER L. HARRIS

Welcome to the EV1-UPs column. I picked that name because I feel that General Motors got the One-up on the rest of the industry by releasing the first purpose-designed production EV since the old early 20th century Bakers.

When I say purpose-designed, I mean that the EV1 is not a converted anything. It is the culmination of a 5-year corporate effort to bring the public a viable electric car that performs at highway speeds as well as around town.

No doubt you are wondering just who Gardner L. Harris is and why I been asked to produce a continuing column dedicated to owner experiences with the GM EV1.

Well obviously I am a EV1 lessee and the very happy driver of serial number 41. I will be 57 years old by the time you read this but I am not the fabled six-figured-income earner that news media have led the public to believe that one must be to qualify. I'm a business person who has been involved with the two-way radio industry since 1962. I have also been involved with various areas of the entertainment industry including audio engineering, TV and film acting, singing and production positions. My writing experience is limited to instruction manuals for the electronics industry (Ham Radio to be specific) and a few technical articles for various Ham Radio magazines over the years. I have also flown a few planes, and a blimp over the years but never got past a solo student certification in Cessna 150 and 172 aircraft. So this is a new experience for me and I hope it will as informative and pleasurable for the reader as it is a challenge for me.

The Magic Vehicle

On to the EV1 experience. For many years I have been aware of electric vehicles. As a small boy in Metuchen, New Jersey I saw my first silent car which was driven by two very elderly ladies. I was enamored of a device which traveled with no apparent motive power. Compared to my parents, 1942 and 1945 Dodges, this was a magic vehicle. Later of course my dad explained to me that it ran on batteries, had a very short range and why it had no steering wheel. It had a tiller! In any case it was that day I knew that some day I had to have an electric car. But alas, by the time I arrived at the age I could drive there wasn't a electric car to be found. The ladies had long since passed on and their magic car was gone with them.

Enter EV1

Cut to the fall of 1996. GM announces that their first production electric car will be available at Saturn dealers on Tuesday December 3rd. Darned if I could make it to my local dealer that day but by the following Saturday I was there for the barbecue and test drive. It was that day that I met Mr. Ric Ostrov, one of the Orange County EV specialists who had been trained by GM to fully explain the advantages and disadvantages of leasing the car. Wouldn't you know it? The first thing he did was to try to talk me out of getting one. He wanted to know why I wanted it, how much driving I normally did and what my driving habits were. How many passengers did I normally carry and would the EV1 replace or supplement my ICE vehicle?

In my particular case, the EV1 was to replace an aging 1982 Volvo diesel wagon but it was not going to be my sole vehicle. I also have a 1984 Volvo diesel in near showroom condition as well as a 1985 Caravan with 116K miles which is in very good shape for its age.

As a total fallback there's also a classic 1965 Volvo 1800S coupe which I purchased new in November of 1964. It has a quarter million miles, continues to run well but is registered and insured as a classic, which severely limits the allowable number of miles per year.

Test-Drive

With the qualifying factors out of the way, Ric was then willing to let me test drive the car. So we took off down toward the beach and up Pacific Coast Highway with Ric giving me technical information and driving hints all the way. Now I am a pretty conservative driver, so out of consideration for the car and my driving record, I kept the speed to the flow of traffic, with smooth starts and stops. However on the way back to the dealership, Ric insisted that I pull over, wait for traffic to pass, then do a high performance takeoff. That blew me away! While I was aware of the steep torque curve advertised, it really didn't mean much until I tried that quick start. I did not try to spin the tires but I didn't need to know that I could have.

The decision was made. I had to have the car. Needless to say that since I have a domestic partnership, I had to include my wife in on the decision to negotiate the lease. I brought her to the dealership the following day and invited her to take a test drive with one of the female salespeople so that she get a woman's perspective as well as mine and/or Ric's. Since she seemed to be enthusiastic about the deal, I proceeded to sign the appropriate papers and took delivery on December 18th.

Fuel Cost Savings

It is a decision I have not regretted. In case the reader is not aware, diesel fuel in California has a 24 cent per gallon tax. Add to that the apparently artificially high wholesale price of the stuff, and you are talking $1.70/gallon these days. I now use 1 tank of diesel per month rather than

one a week. Compare that to the cost of electricity at the off- peak time-of-use rate of $.0405/kWh and you see a whopping fuel savings. One must of course bear in mind that the 6 kW charger cost an additional $2450 including installation in my home. That's a one-time cost which can be amortized over the lives of several cars unless of course the battery-powered car gives way entirely to hybrid, flywheel or fuel cell technology. One can purchase a lot of diesel fuel for that kind of money. But then there are the byproducts of diesel fuel combustion. They're called oxides of nitrogen, particulates and just plain smoke and smell. Older diesels are pretty hard to clean up although Mercedes-Benz has done a marvelous job with the new E320D. The EV1 draws people like a magnet. The most common question is, "How many miles before you have to charge it?". The next most popular one is, "How fast can it go?".

My stock answer to question #1 is that I honestly don't know because I have never run out, nor have I come close to doing so. GM says 50 - 70 miles depending on driving conditions and individual driving habits. One person did intentionally run one out while cruising the LA freeways and got 104 miles before the battery-low warning light came on. That's roughly equivalent to the distance from my home to Palm Springs. However if one stays south of the Hollywood Hills and San Gabriel Mountains, there are no hills between here and Palm Springs.

Ah, But There's Regen!

Hill-climbs really use resources in a hurry. But what goes up must generally come down so that much of the energy expended in climbing a hill is recovered on the other side thanks to the excellent regeneration system built into the controller.

As an example, but a bit closer to home, there is a restaurant atop a 900 foot hill. The climb is very steep and runs about a mile. My wife and I started up with 36 miles left on the instrument panel as the approximation of remaining distance left in the batteries. We arrived at the top with 29 miles remaining. In returning to the bottom, we gained all but one mile back in regeneration and we drove for about another hour, arriving home with the same number of miles on the clock as when we left.

In normal freeway driving I am consistently finding that I get about 3 - 5 miles of travel for every mile decremented on the panel. Of course, that's with conservative driving but not intentionally so. Could my car be driven to Palm Springs without a recharge? Quite possibly but I'd like to have an option or two open before I try it. Thanks to EdisonEV, a wholly owned subsidiary of Edison International the parent company of SoCal Edison, our local utility, charging stations are going in very quickly. I personally know of chargers available at such diverse location as McDonalds, banks and of course every Saturn dealership. As for question #2, my stock answer there is "much faster than current speed limits". The car is electronically governed to 80 mph but would probably surpass 130 were that safety factor removed. —GLH

[I'd like to welcome Gardener Harris to the pages of Current Events I am sure CE's readers will enjoy his adventures with EV1 #41 as much as he enjoys writing about them! I did. —CB.]

Availability of EVs-EV1 Grassroots Campaign

"Someone at GM is listening to us." That's the message that Morris Altschuler of EVA/DC (Washington, D.C.– Baltimore EAA Chapter) is getting in his correspondence with the GM Saturn EVI Home Page (http://www.gmev.com).

When Morris sent an email message to the EVI "Comments" Line at <gmev@speedymail.com>, he didn't get the answers he wanted, but he was sufficiently impressed by the GM-Saturn response to suggest that other EV enthusiasts carry forth the message to GM.

What follows is a blow-by-blow account by E-mail of an evolving idea that EAA members could help spearhead. Morris Altschuler and David Goldstein of EVA/DC would like to see a simple grass roots campaign to bring EVI's to everyone in the US.

To: gmev

I would like to know when GM expects to mass produce EVs that will meet the pocketbook needs of the average person ($15,000 to $20,000). Also, when will they be available in the Northeast? The current range of the EV-1 is satisfactory for my second car needs, but the cost is too high. I also would like to know if GM expects to use the NiMH battery to increase range anytime soon.
—Morris Altschuler
[SMTP:maltschuler@worldnet.att.net]

GM replied:

Thank you for taking the time to write. I need to address each of your questions as a separate issue. First, the availability in the northwest. The batteries do not like the cold. It can considerably shorten their range. You may not see [EV1s] available until better batteries are available.

Second, the cost is related to the technology that went into creating and making the vehicle available. For the price to come down to the ranges you mention, batteries that are cost-efficient to produce, easily chargeable, recyclable and environmentally friendly need to be developed and brought into the marketplace.

Arizona and Calfiornia offer rebates and incentives through local governments and utilities which can lower the lease price to $26,000-$30,000.

Third, GM is still doing research on the NiMH batteries. We do not have any availability information at this time. Fourth, you ask about the NiMH batteries in regard to increasing range. Yes, they increase the range, but they are also much more expensive to use. The Honda electric vehicle which is expected to use the NiMH batteries has a suggested range of 120 miles and it also has a price of approximately $50,000. Continued research and testing is key to providing long term solutions.
—Morris Altschuler

To:gmev
RE: Availablity of EVs
Please see my comments below.

Cold

We in the northeast (not northwest. I am located in Maryland) can tolerate a shorter range, if necessary, but we do still want an EV produced by a major manufacturer. Solectria, located in Massachusetts, produces Evs for use in the northeast and there are something close to 100 converted Evs currently in the Baltimore-Washington area (I am a member of the local EV ass'n). Perhaps if you put a NiMH battery in the EV1 it would give it the range needed in cold weather.

Batteries

Lead acid batteries (the type that you are currently using) are known to be recyclable and environmentally friendly. Currently lead acid batteries in cars are about 95% recyclable and the process of producing them and recycling them is strictly regulated with only minimal emissions, making this a very environmentally friendly process. Considering that nickel is less toxic than lead, there is no reason to believe that a NiMH battery would be less environmentally friendly. Most people have no problem with a 3-hour charging time at 220 volts or better yet an infrastructure that would provide 480 volt charging stations (could be placed at existing car servicing facilities) that would return the battery to 80% of capacity in 15 minutes. That sounds easily chargeable. The price would come down if the cars were mass produced in larger quantifies, some of the frills were left, and if the R&D costs were spread out over a large number of cars (perhaps several hundred thousand, rather than over a few hundred or thousand).

Many other states (including mine-Maryland) also provide rebates, in addition to the nice federal rebate. Also, the local utility (Pepco) offers lower off-peak rates for electricity for EVs.

Cost

The Honda is a much bigger and bulkier car than the EV1 and that is why it will only get 120 miles out of its NiMH batteries. Your much better designed car will get many more than the 120 mile range of the Honda. Keep in mind that a Solectria Sunrise, four-door, four-passenger, although small, sedan, got 373 miles on a single charge using a NiMH battery last year. I'm not suggesting that you will get 373 miles, but 200 miles sound feasible.

Again, the key to lower cost is mass production. As long as the EVs or the batteries (NiMH or others) are handmade in very small quantities they will remain high in cost.

I hope that you emphasize the environmental and other societal benefits that will result in the use of EVs in your ads, in addition to the unique futuristic nature of the vehicle. There are a lot of people out there, other than a few environmentalists, who want to be part of this movement to a better future.

Thank you for the opportunity to comment on your EV program and I wish GM success in this great venture.

Eagerly awaiting the day when the EV1 will be available on the East Coast.
—Morris Altschuler

From: gmev <gmev@speedymail.com>
To: "'maltschuler@worldnet.att.net'"

I'm glad to see the resent message reached you. The interest by consumers in electric vehicles is growing. In addition to the EV1 being chargeable at home there are businesses expressing interest in having charging stations at their locations. As the network of support services grows and consumers become more aware of the value of electric vehicles it will help bring the costs down. Use of the NiMH batteries will probably raise the cost though until consumer demand reaches the point where mass production is economically feasible.

Gas powered vehicles faced many of the same challenges when first introduced that electric vehicles now face. Affordability, convenient refueling sites and getting sales and service support when and where you need it. Gas powered vehicles went through many changes to gain the popularity they now have. Electric vehicles will probably follow that same route. Thank you for your support. I hope you have the opportunity to own an EV1 in the future.—GM

Morris Altschuler wrote to David Goldstein of EVA/DC:

Dear Dave: This is my latest message from GM. I gave them a short thank you answer. I guess that will be it for me. Obviously, they don't wish to say anymore. I strongly suggest that others in EVA/DC send GM messages to indicate interest in EVs to GM. — Morris

Goldstein replied:
Morris,

Thanks for your letter and suggestion about launching an EV1 E-Mail Campaign ("We Want One, Too!"). I like the idea of starting a letter-writing campaign to GM, but I think it needs to BROAD-BASED to be truly effective. A handful of similar-sounding letters from the DC-Baltimore region couldn't hurt, but probably wouldn't impress GM as much as a grass-roots nationwide E-mail campaign. The obvious way to do that is by writing an appeal in Current EVents. You could fax an article proposing such a campaign - with a sample letter - to Clare Bell, Editor, at <CE96ed@aol.com>. If you decide to do this, please let me see a draft beforehand, so that I can sign on to it and perhaps offer a few suggestions.

Whatever you decide, I also like the idea of a local campaign and agree that I should write such a letter to our members.

This does suggest, however, that we might want to begin our local campaign by congratulating GM/Saturn for bringing the EV1 to Washington for the Inaugural Parade, and then express our feelings about having the opportunity to own or lease an EV1 in our area. We especially need to ask GM "WHY" they can't install a thermal management system in the thing, just like they do on their similarly-priced S-10 EV fleet conversions which are being marketed nationwide.

As you have confirmed, the address to send comments to GM on the EV1 is <gmev@speedymail.com>.

And anyone else who has any suggestions on this campaign, please forward them to me.
Thanks, and regards,
—Dave

Goldstein wrote to Kevin Connor at Advocacy: goldie.ev1@juno.com (David E. Goldstein), kconnors@advocacy.org, ebeaa@juno.com, CE96ed@aol.com

When will GM mass-produce EVs that will meet the pocketbook needs of the average person? When will they be available in the Northeast?

FYI, Copying you on this memo regarding a proposed grass roots campaign. The originator of the idea is Morris Altschuler who is a former EPA official and a member of EVA/DC, the Washington-Baltimore EAA Chapter.
Regards,
Dave Goldstein, EVA/DC President

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

EV Industry Study Released

The Freedonia Group, Inc., a Cleveland, OH-based industrial market research firm, has released a report which estimates that EV sales will increase 83% each year in the U.S., bringing the total amount of units to 40,000 by the year 2000. Upcoming mandates requiring the sale of zero-emission vehicles in New York, California and Massachusetts will spur the demand for EVs. The largest market for EVs is anticipated in California, where the state's growing infrastructure of public charging stations, lack of cold weather, and various incentive programs will make the new technology even more appealing. Hybrid electric vehicles, which are in the early stages of development, will also be a viable alternative in the future, the report states. Contact Corinne Gangloff at 216-921-6800.

(FREEDONIA GROUP RELEASE: 1/15)

ERC Licenses Nickel-Zinc Battery

Energy Research Corporation (ERC) has signed an agreement to license its rechargeable nickel-zinc battery technology to Corning, Inc. Under the license agreement, Corning will have exclusive worldwide rights to a wide range of product applications and will take the lead role for further development, manufacture and sale of ERC's nickel-zinc battery for those applications. ERC said the cycle life of its sealed nickel-zinc battery technology has improved steadily over the past three years. More than 600 cycles at an 80% depth of discharge and 7,000 cycles at a 10% depth of discharge have been achieved in 15 Ah single cells. Depending on size and rate, the battery also can deliver an energy density of 60 to 75 Wh/kg. Furthermore, the battery can operate over a broad range of power levels, delivering 300 W/kg at the 6-minute rate of discharge.

(ENERGY RESEARCH CORP. RELEASE: 1/21)

Multi-Cell Fuel Cell Developed

Giner, Inc. of Waltham, MA recently announced that it has moved from testing direct methanol fuel cells (DMFC) in the single-cell level to a multi-cell stack, bringing the company's technology closer to reality. The company has demonstrated stable performance with the stack for a total of 2,800 operational hours, during which over 200 start/stop cycles were conducted at ambient temperature. A large portion of the testing was performed with liquid feed DMFCs based on proton-exchange membrane fuel cell (PEMFC) technology. According to Giner, the DMFC system is better suited for transportation and portable power applications than indirect systems using methanol reformulation because the liquid methanol fuel cell has no hazards associated with handling and storing gaseous reactants such as hydrogen.

(BATTERY & EV TECHNOLOGY: JANUARY 1997)

Transportation Institute Evaluates NEVs

Researchers at The Institute of Transportation Studies at the University of California, Davis (ITS-Davis) have examined the market potential of neighborhood electric vehicles (NEVs). NEVs are smaller than other "conventional" EVs, and generally have more limited range and speed requirements. Therefore, their battery packs are likely to be smaller. The multi-year study included case studies of resort towns and other communities where NEVs or golf carts are in high demand, focus group studies, ride-and-drive clinics, a statewide survey and weeklong NEV household trials. Issues examined in the study included the special design requirements for a NEV infrastructure, vehicle design, and policies and rules that could make the purchase and use of NEVs easier.

(ITS-DAVIS BIENNIAL REPORT: 1996)

NiCad Recycling Coming to Midwest

A major new effort is underway by Ameritech Cellular and Paging to recycle nickel-cadmium batteries. Such a program could set an example for the future EV industry when and if these batteries become the battery of choice for Evs. Ameritech said it will locate "Battery Drop Stops" at more than 1,000 centers and authorized dealers across the Midwest region. The batteries then will be shipped to a special recycling facility in Pennsylvania, which uses a high temperature recovery process to recycle the batteries. The company is teaming up with the Rechargeable Battery Recycling Corporation (RBRC) — a national, nonprofit consortium of battery manufacturers — to ensure that the program meets all federal and state environmental regulations. RBRC also will provide special battery collection boxes and coordinate the recycling.

(AMERITECH RELEASE: 1/23)

SatCon Develops Power Controller

SatCon Technology Corporation of Cambridge, MA recently announced that it is developing a power controller for Williams International, which will be used in a hybrid-electric turbine engine prototype. General Motors (GM) demonstrated the prototype at the recent Detroit International Auto Show. The controller, which demonstrated a 98% generating efficiency in laboratory testing, is used to start the turbine engine and control the power transfer from the turbine to the battery. SatCon utilized advanced power electronics packaging to achieve the controller's compact size and high efficiency. GM plans to build a working prototype of the vehicle this year, with a marketable version projected between 2000 and 2005. Williams International will supply the turbine engine.

(BUSINESS WIRE: 1/24)

Fuel Cell Advocates Getting Restless

Firoz Rasul, president of Vancouver, Canada's Ballard Power Systems has no doubt that his company's non-polluting fuel cell technology eventually will make the transition from being a great idea to being an actual money-making business. Ballard has had a working fuel cell since the late 1980s. While the first joint ventures with automakers such as Mercedes-Benz and Volvo came five or six years ago, the company's cells are still in trial testing, making some observers impatient for a concrete financial payoff from the company's research. Rasul said that trials of buses fitted with Ballard cells will take place along regular city routes in Chicago and Vancouver this year. If successful, Ballard plans to start producing buses equipped with fuel cells, hopefully in partnership with established bus companies, in 1998 or 1999 for $400,000 a piece.

(GLOBE & MAIL: 1/21)

Update on HORIZON Batteries

Improvements in the HORIZON battery relating to specific energy, shelf life, cycle life and production capacity, were the topic of discussion by Bill Craven, director of Electrosource EV programs, at the 12th Annual Battery Conference on Applications and Advances in Long Beach, CA recently. In 1994, the HORIZON battery was being tested in only five EVs, with just one pre-production battery model available. In comparison, HORIZON batteries last year were installed in hundreds of different products. Furthermore, two production models and seven prototypes are now available, with three more in design phases, Craven said. In addition to electric-powered automobiles, trucks and minivans, HORIZON products include batteries for hybrid EVs, scooters and golf carts.

(NEWS ON THE HORIZON: JANUARY 1997)

Honda Previews EV PLUS

American Honda Motor Company recently announced that its EV, the first to use advanced NiMH battery technology, is now available at four Honda dealerships in Southern California and Sacramento. The four dealerships previewing the EV PLUS are Costa Mesa Honda, Mel Rapton Honda (Sacramento), Miller Honda (Van Nuys) and Scott Robinson Honda (Torrance). While the vehicle will not be officially offered for lease until May, consumers may conduct test drives and pick up lease applications and product education materials. The four-passenger EV PLUS features all the amenities of a gasoline-powered car such as power windows, door locks and mirrors, an AM/FM/CD stereo system with four speakers, anti-lock brakes, a climate control system, power steering and a versatile cargo area.

(HONDA NEWS: 1/29)

Lotus To Unveil Electric Elise Supercar

British automaker Lotus will unveil an electric version of its Elise model car at the Society of Automotive Engineers (SAE) International Congress and Exposition in Detroit. The car will feature a 300-volt nickel-cadmium battery pack manufactured by Zytek. The electric Elise will be capable of a maximum of 200 horsepower, while weighing 1,930 pounds. It will have a top speed of 90 mph and a range of 120 miles. It's batteries can be recharged to 95% capacity in an hour. Computer simulations estimate the vehicle will be capable of accelerating from 30 to 70 mph in five seconds. The vehicle conversion was conducted entirely by Zytek, including motors, gearboxes, control electronics and cooling system.

(LOTUS RELEASE: 1/29)

19 Tour de Sol Entries So Far

Nineteen entries have been submitted for this year's Tour de Sol Road Rally Championship for Electric Vehicles, and two more have been added to a waiting list. This year's race will begin in Waterbury, CT on May 17 and will conclude in Portland, ME on May 24. Major automakers Ford and Toyota will compete in the production category. Solectria will be represented by the Solectria Force Sedan, which will incorporate Ovonic's nickel-metal-hydride battery technology, as well as the Solectria/Horizon, which will feature the Electrosource Horizon batteries. Student-built vehicles will be featured as always, including entries from Cornell University, the University of New Hampshire, and Warren Harding High School in Bridgeport, CT.

(TOUR DE SOL NEWS: FEBRUARY 1997)

EV1 Charges GM

The EV1 is in demand and GM/Saturn are in the catbird seat. In the same month that they were offered, 76 EV1s were leased from Arizona and California Saturn dealers and more folks want them. 469 consumers are now (Jan 26, 1997) negotiating to lease EV1s. Saturn is also looking for a third state, possibly flat and warm Florida.

If GM brings the EV1 to Florida, it will find a competitor already there — Honda's EV Plus. The size of a Civic, Honda's car runs on 24 NiMH batteries. Saturn's president, Don Hudlar welcomes the competition. "There'll be one more horse in the race, and that will focus more attention on electrics."

Hudlar says that lead-acid has gotten the EV1 to market. Nickel-metal-hydride will be needed to win public acceptance and probably lithium batteries to make electric cars universally acclaimed.

If nickel-metal hydride replaces lead-acid, EV1 owners need only drive to their Saturn store for a new battery pack. Nickel-metal-hydride batteries will be able to be retrofitted to existing EV-1s," Saturn's Hudlar said.

More powerful, lighter lithium batteries will give greater range, but may require a change in vehicle platform. Lighter than lead-acid or nickel-metal-hydride, lithium batteries will allow GM to reduce the weight and dimensions of the vehicle.

With a plastic body that will never rust, you need only keep replace the batteries and the car will outlive you. Turn-of the-century EVs had service lives of 30, 40 or even 60 years. Hardly planned obsolescence.

Don't look to a market in used EV1s, at least not soon. Saturn will probably recondition cars that come back from the 36 month new-car lease and offer them to consumers under a used-car lease.

Some feel battery-powered cars suffered a minor setback when one new EV1 owner in California got stranded on the freeway. He left for work in the morning without recharging his batteries. Hearing of the incident, Saturn's Hudlar commented, "All of us at one time or another have run out of gas, too. You do it once and resolve never to let it happen again."

Hybrids that combine battery power with a small gas or diesel engine may ease fears about battery range and running out of energy. Hudlar was optimistic.

"Alternatives are available to us and are being explored. For now, the EV-1 represents [GM's] best bet for the market, but we're sure there will be others in the future."

Source: "GM Gets A Charge Out of Electric Car's Early Success", Jim Mateja, Chicago Tribune. Knight-Ridder/Tribune Business News, AP NY 1/26/97. Posted on the EV Discussion List EV Newz by Bruce Parmenter, brucedp@juno.com

97-01-13 03:51:06 EST. RRKR45A@prodigy.com (MR MITCHELL L OATES)

The website mentioned by Don Bright some time ago, concerning a company manufacturing thermo-electric generator modules, is an independent attempt along this same line.

continued from page 3

One could probably build an equivalent system with Optima yellowtops (double-strung, probably). The Horizons seem to have about 1.0-1.2 kWhrs per 12V battery at 61 lbs apiece, Optima Yellows, 0.6 KWhrs per 12V battery at 44 lbs. Double the Optima Yellows and get 1.2 - 1.4 Kwhrs at 90 lbs. Horizons are higher capacity, but for early production, waranteed batteries, they cost me $440 per battery. #13 also placed well in two Phoenix Electrics races on Horizons. Electrosource did stand behind their product and replaced batteries that failed. I think I have a good pack now, and a good charging system, which, admittedly had been a problem (mine).

This set probably has less than 30 full cycles on it. I expect performance to get even better when I "stretch" this pack a bit. My rebuilt 9 inch motor may still be running in a bit too. So far I am very happy with it.

WARNING: Bad Joke Ahead

What do you have if you have two 914s parked before and behind your house? A front Porsche and a Back Porsche. ho, ho, ho
—Sandy Claws

914 EVs Rule!

Charging toward the EVent Horizon... —CB

MEMBER WANT ADS

For Sale

1977 Plymouth Arrow Hatchback - featured in "Convert It". 20Hp G.E. Series-wound motor, 102 volt battery pack (6 in front, 11 in hatch), PMC Controller, Wards Grappler 2 tires, Lester Charger - 108vdc and 12vdc out (110v or 220v input), original 5-speed trans. and clutch, electric heater, $1100/obo. Call Larry at (408) 257-7519; evenings only. (**STATE**)

Chevy S-10 Blazer - Solar Car corp. coversion with full documentation. 120vdc, seat 5, power steering, heavy duty suspension, low mileage. Complete details given on inquiry. Desperate to sell. Asking $12,000. Call Tony at (407) 859-6802. (Florida)

'73 914 Porsche. 9 inch DC motor, Curtis 96-140 volt, all new electronics pro-built. 1996 sale price. $5,500. Call Bill at (619) 363-6424. (California)

8-inch Advanced DC Motor Model 203-06-4001. $650. (Used but good condition.) Call Dale at (408) 378-0883 or FAX: (408) 378-0879. (California)

How to Submit Want Ads

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

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

For corrections or updates, please send a written note or fax to EAA Want Ads @ 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

Electric Robotic WeedEater. What not?

AD 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	$250 ea
3 ads	$175 ea
12 ads	$125 ea

1/4 page	3.50" x 4.50"
1 ad	$200 ea
3 ads	$150 ea
12 ads	$100 ea

1/8 page	2.0" x 3.5"
1 ad	$150 ea
3 ads	$100 ea
12 ads	$75 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 is required to be prepaid.

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. Make check payable to EAA. Camera-ready copy and payment for the ad should be sent to: EAA AUTO ASSOCIATION, 18297 Baylor Avenue, Saratoga, CA 95070

Advertising Manager

Susan Hollis, PCtek
Advertising Manager
OFFICE: (408) 374-8605
FAX (408) 374-8787
EMAIL: pctek@ix.netcom.com

CE ADVERTISERS

Welcome to the Electric Auto Association calendar of events. Listed are events of direct or related interest to Electric Vehicle Enthusiasts and Alternative Transportation Technology Businesses. If you know of an event that should be listed, please email event information to kawatson (evchdler@primenet.com)

1997

March 7-9

APS Electrics, Phoenix, Arizona. EVTC conducts electric vehicle competitions as a means to increase public awareness of electric vehicles, develop an electric vehicle educational infrastructure and advance EV technology, all in an effort to support commercialization of electric vehicles in accordance with Energy Policy Act mandates. EVTC competitions provide laboratories for High School and University students to work out real life solutions to textbook problems. Location of EVent: Firebird International Raceway. Classes (additional classes maybe added however): ABB University Spec Series, Formula E Class, Prototype Demonstrations, High School Challenge Series Street Stock Class, Super Stock Class.

Contact: EVTC, tel. 602.256.2599, fax 602.256.2606, email: karner@aol.com

March 19-20

7th Annual AFV Fleet Operators Mega Event, Los Angeles, CA. An industry conference and trade show will be held at the Los Angeles Convention Center about AFV transportation, but it will feature up to 20 electric vehicles from large and small manufacturers. This is the largest event of its kind in the West. Also on Mar. 21, a major conference & show about advanced transportation. Time of Event: 9 am - 5 pm each day for the conference, 11 am - 5 pm for the Trade Show.

Contact: Marc Merson - President,
tel. - 818.906.2700, fax - 818.906.0367
e-mail: ecoexpo@aol.com

April 7-10

EnV'97, Detroit, Michigan. Fifth annual Environmental Vehicles Conference and Exposition is held concurrently with the 12th Annual Advanced Composites and 6th Annual Advanced Coatings Technology Conferences and Expositions at the Westin Hotel. Sponsored by The Engineering Society of Detroit and SAE.

Contact: Kristin Karschnia, ESD, 29355 Northwestern Hwy., Suite 200, Southfield, Michigan, 48034, tel. 810.355.2910, fax.

April 21-22

First Annual National Storage Battery Conference, Boca-Raton, Florida. Hosted by Albercorp, 990 South Roger Circle Suite 11, Boca Raton, Florida 33487

Contact: tel. 407.997.2299.

April 27-30

Solar 97 Conference, Washington, DC. This conference will focus on improvements in technology, environmental sustainability, and growth in solar-related businesses. Sponsored by the American Solar Energy Society, the Solar Energy Industries Association, and the American Society of Mechanical Engineers in cooperation with the American Institute of Architects Committee On The Environment.

Contact: Becky Campbell-Howe, American Solar Energy Society.Tel: 303.443.3130, fax: 303.443.321. E-mail: ases@ases.org

May 15-17

Electric Grand Prix, Raleigh, NC. The Electric Grand Prix is a ABB University Spec Series and High School Student Electric Competition sponsored by Electric Vehicle Technology Competitions, Ltd (EVTC). The competition will be held at Southern National Speedway.

Contact: EVTC, tel: 602.256.2599, fax: 602.256.2606, email: karner@aol.com

May 17-24

NESEA Tour de Sol, Connecticut. After a record breaking 1996 season, the ninth Tour de Sol promises to be another exciting race. The road rally will start in Waterbury, Connecticut and finish in Portland, Maine. Goodyear is a major sponsor of the race.

Contact: NESEA 50 Miles Street, Greenfield, MA 01301, tel: 413.774.5051, fax: 413.774.6053. E-mail: nesea@nesea.org

July 17-20

Electric Grand Prix, Cleveland, Ohio. The Cleveland Electric Formula Classic is a ABB University Spec Series Competition sponsored by Electric Vehicle Technology Competitions, Ltd (EVTC). The competition will be held at Burke Lakefront Airport.

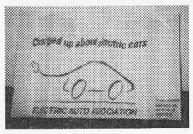
Contact: EVTC, tel: 602.256.2599, fax: 602.256.2606, email: karner@aol.com

The intent of this Calendar is to provide a comprehensive list of events that will help to increase awareness and participation in the ever-growing interest and use of Electric Vehicles. Your support and input is greatly appreciated. Thank you.

Produced by kawatson (evchdlr@primenet.com)

EAA **Reprint** Order Form

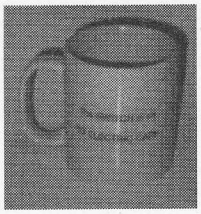
100% Cotton Cap
Forest Green
'Charging into the Future' EAA Logo
CAP001.....$7.50



Auto SunShade
SS001.....$8.00

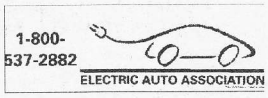
T w/EAA Logo
(adult small only)
TS001....$14.50

Thermal Auto Mug
MUG02...$6.00

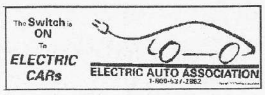


Porcelain Mug with
'Charging into....Future'
MUG003.....$5.00

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%

CATALG6A.EPS

1996 04 04

ELECTRIC AUTO ASSOCIATION

2710 St. Giles Lane, Mountain View, CA 94040

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

• Address Correction Requested •

• Time Dated Material - Please Do Not Hold •