ELECTRIC AUTO ASSOCIATION

CURRENT EVENTS

Promoting the use of electric vehicles since 1967

June '97 Vol. 29 No. 6

Ed Rannberg Remembered

Long handlebar mustache

Infectious enthusiasm and smile

Endless optimism towards our EV future

Friendliness and warmth towards the least and smallest of our EV family

He made us all feel as important as corporate titans

Even if we were only backyard tinkerers.

by Steven S. Lough
—Ecomotion

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IN THIS ISSUE

PHOTO CREDIT—PAGE 1

"In remembrance of Ed Rannberg, a wonderful person and pioneer EV designer. Here he is sitting on his Kawashocki Electric Motorcycle at the 95 APS Electrics. That evening he went on to win the Motorcycle Div. of the Friday Nite Drags with a quarter mile time of 13.5 sec. Ed also broke the 200 mile barrier at the Utah Salt Flats in the fall of 96. We will miss him. —Bruce Meland, Electrifying Times"

Photo, Bruce Meland.

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

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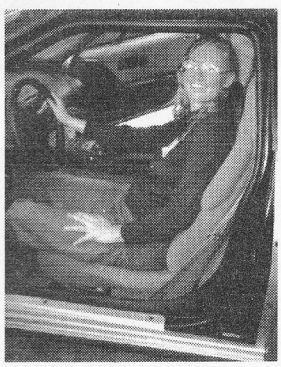


EV1: Lower the Hurdles

The price drop is a good start, but more needs to be done.

A few months after GM announced the EV1, the media are bemoaning the fact that the cars aren't flying out of the factory. Leasing 176 in five months isn't enough, they say and muster the old and tired refrain about electric cars don't sell. Having announced the EV1, GM did the right thing. Now they've done another right thing, namely, lowered the lease price (see lead story) in response to customer complaints about cost. Here are some other "right things" GM could do to up demand for the EV1.

◆ Hurdles are too high for EV1 buyers

At present EV1 lessees must meet some fairly stringent criteria. They must own their own homes so that the Hughes MagneCharge can be installed, they must meet a certain income threshold, they must already own a "primary" (gas) car so that the EV1 becomes a second vehicle and there are other hurdles. The fact that the car is only available on lease has also discouraged possible purchasers.

◆ CA TV ads didn't say where to get the car!

In addition, the TV advertising, while attention-getting and cute, omitted one essential piece of information for would-be customers in California - where to get the car! The TV ads I saw made no mention of GM's Saturn Division as the source. Arizona Public Service Company, which is helping GM to market the cars in Phoenix and Tucson, has done a better job of telling customers where and how to get the cars. Hence more EV1s have been leased in Arizona than in Southern California.

◆ Bay Area and Sacramento left out

In deciding to market the EV1 only in Southern California and Arizona, GM passed over Northern California, possibly due to concerns about climate and temperature. That, I think, was a mistake. There is a tremendous amount of interest in the Bay Area and Sacramento, as shown both by the response to the test-drive programs and the fact that there are more EV conversions on the road (especially in Sacramento) than anywhere else in the US. And don't forget good old Santa Cruz, or "green-scene" places like Ukiah or Willetts.

◆ Suggestions for GM

1 Lower the hurdles. The price drop is a good start, but more needs to be done. The requirement that customers own their own homes wipes out a large segment of the market. Those who own condominiums, live in apartments, rent, share or have other situations should not be excluded. If power can be provided for the MagneCharge, if permission is given in writing for it to be installed, say from a landlord or a condominium association that is all GM should need. In assuming a lease, the individual taking on the responsibility also assumes any liability for any problems caused by the car or the charger. GM should not be involved except for the technical aspects of the installation. The own-your

continued on page 6

Help EAA Grow!

The Board is seeking Volunteers in several areas

1. **Assist editor with newsletter contributions.** This would include proofing, handling the letter column, editing. The person would work alongside present CE editor and be trained as a backup.
2. **Handle administrative duties connected with distribution and mailing**. This would include EAA publications CE and the EV Buyer's Guide.
3. **Act as a business manager for EAA fundraising.**
4. **Handle the administrative functions of the EAA Board.**

Experience in the applicable fields preferred. Please contact Stan Skokan, (415) 366-0643 for details.

EV1 Lease Cost Drops

BY CLARE BELL

In order get more EV1s into the hands of EV-interested consumers, GM has dropped the lease price by 25 percent.

The lease, calculated based a sticker price of $34K, presently ranges from $500 to $640/mo, depending on the amount of offset from government or state subsidies. It does not include the $50/mo. lease cost of the Hughes charger.

Initial interest in the car was high (over 1,000 inquiries in the first month, but has since fallen off due to price concerns and lease restrictions (see editorial, P. 3.). "A percentage of customers didn't buy because they said it was too costly," said GM representative Nicole J. Merritt.

After talking with 800 potential customers and finding they were discouraged by the monthly payment, GM has taken heed.

Under revised terms, the EV1 lease price will be $399 to $549/month, depending, again, on subsidies from the state. The company's announcement appeared on Saturday, May 3 in California and Arizona newspapers, however it originated in a letter received by EV1 owners on May 1st. the news came to CE via Internet from Phoenix Chapter on the same day (see sidebar).

MEMO

Subj: EV Good News
Date: 97-05-01 23:04:12 EDT
From: evchdlr@primenet.com (Phoenix Electric Auto Association)
To: ev@sjsuvm1.sjsu.edu ('Multiple recipients of list EV')

Good News,
We have just heard from Lisa Thomas, EV1 Specialist in Arizona, that it will soon be announced (in Arizona), that the EV1 lease price will be $549 including charger. . .installation at your cost, but the Department of Energy Alt. Fueling station grant will cover that.

Lisa Thomas
EV1 Specialist
(520) 471-5066

Please spread the good news.

Kathy A. Watson, Secretary Phoenix Chapter EAA. Email: evchdlr@primenet.com
Phoenix EAA Home Page — http://www.primenet.com/~evchdlr/

While the EV1's $34K sticker price remains unchanged, GM has lowered the lease rate by dropping the interest from 9.5% to 8% and increasing its estimate of the car's worth after the three-year lease ends.

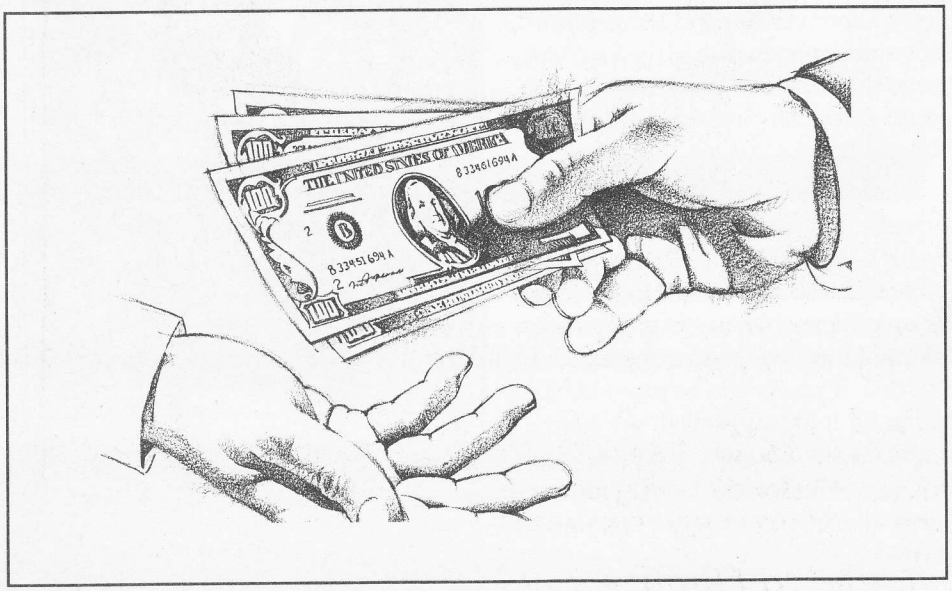
GM states that current EV1 drivers would be eligible for $4,600 credit on the total cost of their leases.

The price cut, plus an agreement to help fund 50 public charging stations in Southern California, will, GM hopes, attract more customers and head off competition from Honda's EV Plus and Toyota's RAV-4. GM wants to lease 100 EV-1s per month.

It will also help solve what J. Joseph Kennedy, GM Saturn's sales VP, calls a chicken-and-egg problem. In a letter to EV1 owners, Kennedy said, "To expand our infrastructure quickly, we have to get more cars on the road, but to do that, we need to have more infrastructure in place."

This infrastructure consists of 47 public recharging sites in Southern California plus 22 additional in Arizona. This doesn't include the leased home rechargers. Owners of other potential public charging sites have hesitated over the $10K cost of installation. With GM now paying 1/2 the cost, Edison EV, the company building the stations, expects to double the network by June.

Even though the cars are backlogged in Lansing MI, the factory is continuing to make them —CB



Sources

"GM Cuts Electric Car Lease Price 25% Amid Slack Sales". AP-Dow Jones News Service. Dow Jones Newswires, May 2, 1997

"Lease Pace Too Slow For GM", San Jose Mercury News, Section C1, Mercury News Wire Services.

continued from page 3

own home requirement should also be dropped if a city or neighborhood is willing to put in charging stations nearby (for example, Sacramento.)

2 The lease-only availability also narrows the customer base. Yes, it does enable GM to keep control of what happens to the car, however it eliminates those more independent-minded folks who want the car to be theirs free and clear without anyone leaning over their shoulder telling them dos and don'ts. Environmental awareness and concern, which is after all, a primary reason for driving electric, tends to go along with a certain independence of mind, from what I've seen For those who don't want to worry about service or upgrades, a lease is fine. For those who have the knowledge, the motivation and the bucks to own the car outright, let them. Hey, you can always sell them a service contract.

And, GM, when/if you do decide to sell the EV1, make it available with the same low-interest financing that you have on the gas cars.

3 Make the EV1 available in EV-friendly areas such as Northern California, Florida, the SouthEast and Southwest. And as for the colder areas, people there already drive EVs. Equipping the EV1 with battery heating would go a long way to opening markets in Oregon, Washington, New England and, of course, Canada. Solectria Corporation, Boston Edison, and various private EV owners in the US and Canada have shown that a properly-equipped EV can survive well in the cold.

4 Don't let the love-affair with the Hughes MagneCharge restrict EV1 availability. Give folks a choice of having, say a hardwired in MagneCharge for fast-charging (the present arrangement), a version of the MagneCharge (perhaps slightly slower to charge) that doesn't have to be hardwired, but that can be plugged into a standard 220V dryer or range outlet, a standard-type offboard unit using conductive charging and switchable from 110 to 220VAC, an onboard conductive unit that can pull in more juice than the present onboard unit and that is also switchable from 110 to 220.

Equipping the EV1 with battery heating would go a long way to opening markets in Oregon, Washington, New England and, of course, Canada.

Folks don't want to be locked into the inductive paddle. This has already been shown by the fact that some EV1 drivers are dismounting the wall units and carrying them in the car for effective opportunity charging from 220V as well as 110.

You can't force people into an infrastructure that doesn't really meet their needs — they will just find various ways to circumvent it.

5 Fix your snazzy and cute commercials so that they give basic information, such as how much and WHERE to get the product.

6 Consider advertising in publications that are targeted toward EV advocates and drivers, (such as CE for instance!). CE's readers include many folks who are ALREADY leasing EV1s — a proven market. I might venture to say that EAA and affiliated organizations probably have the highest per-capita number of potential EV1 customers of any group.

In encouraging GM to expand their EV1 marketing program, I do not mean that I want to see business taken away from the existing EV conversion and parts suppliers. On the contrary, I hope the interest in the EV1 will make the number of less expensive conversion EVs grow. The EV1 is designed to appeal to the segment of our membership (about a third to a half, I believe), and of the general population, who have been waiting, for various reasons, for an EV from a major US manufacturer, and who are willing to pay for it. These are people who, because of limitations of time, knowledge or other factors, are not driving an EV conversion.

Hey, like I keep saying, there's room for everyone, EV1 drivers and conversion owners alike, big mass-market guys and small specialty EV and parts suppliers, two seater hotshots like the EV1, and family cars like Jet Escorts and the Solectria Sunrise. The idea is to increase the total number of EVs on the road. —CB

The EV Community Mourns Ed "Eddy Current" Rannberg One Heck of an ElectroMotive Force

Rod Wilde, Wilde EVolutionS

One of the greatest EV pioneers of our time passed away last night. Ed Rannberg, founder of Eyeball Engineering in Riverside, California, has left a gaping hole in the EV movement which will be extremely hard to fill.

When I first got involved in EVs several years ago I loved the simplicity of design, but felt the public would never except them because of their poor performance. I made many phone calls seeking advice on performance EVs. All roads led to Ed Rannberg. Everyone I spoke to said call him, he should be able to help you. In fact he did more than give me his years of experience and advice for free. He also inspired me. He became not only my mentor and hero, but also a man I was honored to call my friend. He will be deeply missed by us all.

Roderick "Suck Amps" Wilde
Rod@Wilde-EVolutions.com
Wilde EVolutions, Inc.Jerome, AZ &
Port Townsend, WA

From Bob Rickard <Bob@WILDE-EVOLUTIONS.COM>

Randy Holmquist, Canadian Electric Vehicles Ltd.

I am very sorry to hear of Ed's passing, he was one of my favorite stops on our yearly trip south.

Ed had interesting stuff on the go and was always willing to share his information.

Randy Holmquist
<canev@ISLANDNET.COM>

Bruce Meland, Electrifying Times

I first met Ed at a Clean Air Revival EV race near San Francisco about 6-7 years ago and he was racing an electric skateboard(he had just completed another one of his first unique designs) through the streets. Now this was quite a site! Ed was no small person-can you imagine him laying on his backside flying through the streets on this skateboard-wow it was designed like a tank and faster than a speeding bullet and what a sight. We will miss him. The last time most of us saw him was at the 97' APS Electrics and I remember clearly him telling about his newest and almost complete project, An EV with a Kostov Motor and a battery tray that rolled out to the rear. We will miss him.

Bruce Meland
Bruce Meland <etimes@TELEPORT.COM>

[Bruce also quoted the article I wrote, "Winning More than Records" that appeared in a recent CE and Electrifying Times. He said that the piece was a wonderful way to remember Ed Rannberg. Since it was a fairly recent article, I won't repeat "Winning" here, but I'd like to thank Bruce for mentioning it. — CB]

John Wayland, E-Car

I too, had the pleasure to know this very kind EV pioneer. I first talked with Ed years ago by phone, then, had the chance to meet him in person at the '96 APS Electrics....definitely the highlight of my trip there!

He had approached to tell me how much he enjoyed watching the White Zombie do the burnoff, and how much he liked watching my 1/4 mile runs he had seen. This was my first real clue as to how humble and nice of a fellow he was.....Here was THE MAN, the guy who was blasting down the drag strip in the world's quickest electric motorcycle when I still had on my EV diapers, complementing me! This was THE MAN who had built the 200 mph 'Lightning Rod' salt flats streamliner, doing his best to make me feel like I had accomplished some great feat!

When I was in Phoenix last month, one of the first people I wanted to see again, was Ed. He and I did get together, and we had many wonderful conversations, and some good laughs. We talked about EV drag racing, and I was happy that we talked about the things he had accomplished. It was inspiring just being around him and listening to what he had to say. As usual, I came away knowing something new about EVs and high performance.

Ed was one of the first in the Arizona sun to wear 'The Coat', although it was kind of small on him. After the coat, Ed honored me by accepting and wearing an Oregon Electric Drags T-shirt, even though it fit pretty tight.

I remember that we talked openly about his failing health, and I wished him well, hoping that he would stay with us as long as possible.

One of the last things he said to me was, "God willing, I'll see you all at the Oregon Electric Drags."

I guess that sometimes things don't always turn out the way you want them to. I am sad today and feel that the EV community has had a great loss. I only hope that history will remember this man's great accomplishments and his great kindness as well.

Ed, thank you for paving the way for the rest of us!

See Ya.....John
<dat1200@EUROPA.COM>

Lou Tauber, E-CAR

We all owe a great deal to Ed, as one of the trail blazers of EV technology. I was fortunate to have met him. He willingly shared information, and was respected by everyone.

I hope to talk Bill Dube into writing an article about Ed in the first issue of the NEDRA newsletter, so everyone can marvel at his many accomplishments.

What a great man he was.

Lou Tauber <ecar@EUROPA.COM>
Wed, 16 Apr 1997 22:41:37 -0700

Tony Barros

My condolences to all who knew Ed Rannberg. I did not know him personally, but he has had a profound influence on EV thought-ology and do-ology. His ideas and inspiration will not be forgotten.

Tony

Gale De Los Santos (Chip)

I really wanted to meet Mr. Rannberg... Does he still hold the record for fastest Electric Motorcycle (1/4 mile) ??

Chip
Gale De Los Santos
chip009@loop.comhttp://dmz.net/chip
Steady Beat Recordings
http://universe.digex.net/~stdybeat

Dan Pliskin

I remember Ed, talking about that bike. He would take a nitro pill (for his heart) slip it under his tongue and hit the switch. It always bruised his tail bone, he would complain/boast.

Ed was one of these guys who lived to try to go faster, in whatever he was working on. But, you didn't get the impression that he was suicidal, about it. Maybe, that was because his wife was right there with him. Maybe, by the time I met Ed, he had slowed down enough, so that she was no longer feared for his life. I think it was because he was such a good designer and craftsman, that his vehicles were safe at those speeds. You got the sense that, with a little design effort and a few trial runs, Ed would be able to pull it off.

I think it was Ed who designed the first commercial electric scooter. He took those motors and used them to compete in our first Northern California Electrathon. His vehicle was a three wheeled leaner. I had never seen anything like that, before, and took endless pictures of it's mechanisms.

Ed hadn't even bothered to paint it. To me, it looked like a piece of kinetic sculpture.

Daniel Pliskin
<dpliskin@GATAN.COM>

Charles Hirst

I would like to add my name to the list of those who respected and admired Ed Rannberg. I am honored to have had the opportunity, as a student at the University of Redlands, to work with such a fine man, and to learn about the field of electric vehicles from a true pioneer. He will be missed, but never forgotten.

Charles Hirst <chirst@IX.NETCOM.COM>

Gary Flo, InnEVations

In tribute to Ed Rannberg, I just want to add my great admiration for him and appreciation for all the help he gave me over the last four years I knew him.

For example: When someone asked me recently how high they could run the voltage on their X-91 7" motor, the first person I called was Ed. Who else would know but Ed? He had already done it on his drag bike at 192V. This kind of experience allows me and others to improve the performance of on-road EVs by taking advantage of the testing that Ed had already done.

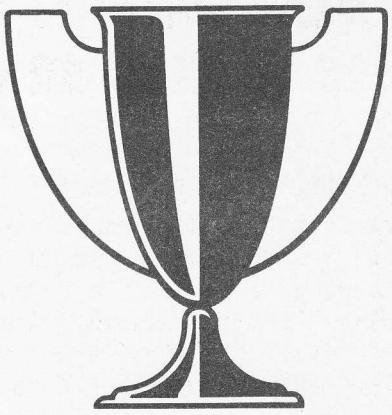
Most importantly, Ed exemplified the spirit of mutual aid and camaraderie that makes EVs such a great industry to work in. He always shared everything he knew freely, encouraged those of us with less experience, and enjoyed it all in the process.

I hope there will be an award in his name. A racing, and particularly drag racing award would be suitable.

Gary Flo <innevate@PACIFIC.NET>

How about a "Rannberg Cup"?

BY JOHN PARAMORE



I only met Ed via the phone, and always hoped I'd have the chance for a real meeting someday. He's responsible, as much as anybody, including contestants, for the success of E-boats by taking time to talk to fellow maniacs and providing a wealth of advice and information. And Ed's bike showed us how to trim and tune for performance in a small package.

In APBA Region 10 the Babcock trophy is presented annually to the best performer in Inboard, Outboard and OPC categories. This perpetual trophy is named for the late George Babcock, who owned a local boat company and Seattle International Raceway, and who decided one day about 35 years ago to go boat racing. He ran 7 liter hydro...not a class for the faint of heart. George just lit up the boat racing scene, with multiple championships and records, and quality race promotion and innovation. When George was killed in an accidental fall at the raceway, the perpetual trophies were established in his name and are among the most coveted in boat racing, ranking on a par with the APBA Hall of Champions award.

With the hopeful advent of NEDRA [National Electric Drag Racing Association] and drag series don't you think it might be appropriate to establish a perpetual "Rannberg Cup"?

John Paramore <wizprodj@ESKIMO.COM>

Remembering A Friend

BY SHARI PRANGE

When Ed Rannberg died on April 16, the electric vehicle community lost a lot more than a technical innovator. We lost a very special human being and friend.

Ed had lots of friends, because anybody he talked to for more than a few minutes became one. His warmth, humor, and generosity were as well known as his genius with vehicles.

Ed was a native of Montana, but spent most of his life in Fontana, California, moving recently to Riverside. His business, Eyeball Engineering, was a design and fabrication shop specializing in motorcycles.

Gotta Be A Better Way

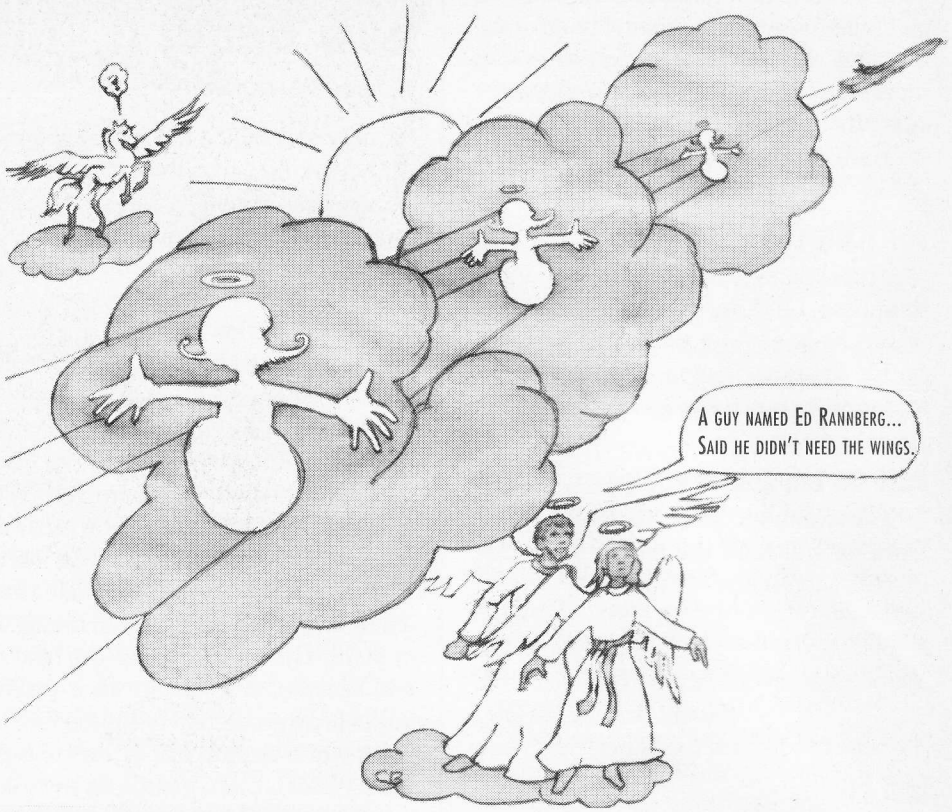
In the mid-'60s, Ed got fed up with oil companies and pollution, and developed an interest in electric vehicles. He started with car conversions, but soon moved to his real love—racing—with an electric drag bike.

Over the years, he got involved with all kinds of electric vehicles, from go-karts to a land speed record streamliner, with help from his son, Randy. He loved a challenge. He also built more than 100 EVs for customers from all over the world.

Committed To The Cause

In the early '70s, he was one of the founders of the Electric Vehicle Association of Southern California (EVAOSC). The club began to hold rallies, and eventually instituted several awards named after the club's founders. The Ed Award was for technical ingenuity.

When Clark Beasley brought the electrathon concept from Australia to southern California, Ed was right there. Clark's first trophy in this country was in the three-wheeler class of the EVAOSC rally. The trophy was sponsored by Ed Rannberg.



Farewell, "Eddy Current" — CB
Illustration: Clare Bell

Ed was the first board member of Electrathon America, and its first sponsor, donating money for banners. He also competed in the earliest electrathon events in this country, and supplied motors and controllers to Clark.

Fellow salt flat racer Lloyd Healey found in Ed a mentor, a hard competitor, and a best friend. "For the past few years, Ed was always there with a bear hug, supporting me through my struggle with cancer," said Lloyd. "Then, in the last months, the roles reversed."

Ed will be missed on the salt flats this summer, but will be there in spirit. Lloyd will dedicate his race to Ed, and will carry Ed's racing gloves with him on his bid to join the "200 mph Club", so the two of them can achieve the goal together.

Recently, Ed had combined forces with Roderick Wilde of Wilde Evolutions. As always, he was searching for new tricks to wring a little more performance out of a car.

Ed's vehicles were marked by his meticulous style. While he might jury-rig an experimental component for testing, his finished vehicles always showed professional workmanship. "His hands-on, common sense approach was just what the EV field needed," said Mike Brown, of Electro Automotive.

Ed's contributions were acknowledged by his community just a few days after his death. His wife, Geri, was asked to drive a GM EV1 to a dedication ceremony for a new charging station. The mayor, supervisors, and other dignitaries made speeches about the significance of the day, ending with a description of Ed's efforts to promote EVs. Then the scissors were handed to Geri and she was asked to cut the ribbon, on Ed's behalf. She was delighted to accept. "It was just like a kiss on the cheek for Ed," she said.

A Very Special Person

You cannot talk to anyone about Ed without hearing about the human being as well as the technical wizard. He was generous with his time, and always lit up the area with his smile, his curly snow-white

handlebar moustache floating above it for emphasis.

The descriptions of Ed are all the same. "He didn't have a mean bone in his body," said Ken Koch, of KTA Services. "You could not meet a finer, more sincere gentleman," said Clark Beasley.

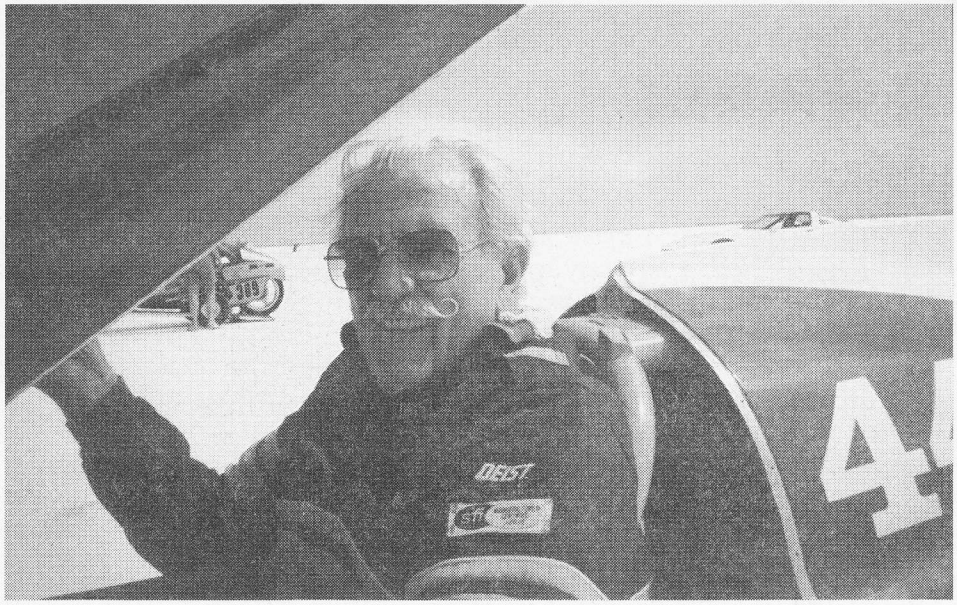
Then there was his sense of humor. For the past few months, he had been battling prostate cancer. When he started chemo and hormone therapy, he took it in typical style. "With my luck," he told Geri, "my moustache will fall out and I'll grow boobs."

Like the Cheshire Cat, his grin lingers behind him. His humor rubbed off on those around him, and now helps sustain them in his absence. His wife goes by her nickname, Geri. "My given name is Doralee, but don't use that," she said. "Ed's friends will think he'd taken up with some strange woman."

Ed had also had heart problems over the years, including triple bypass surgery. He developed severe cramping and an infection related to his cancer, and had been in the hospital for two days. He had just been transferred to the ICU, when he sat up and swung his legs over the side and took a deep breath. "Well, I got to go now," he said, and he was gone instantly.

The doctors said it was a massive heart attack, triggered by the rigors of the cancer treatment on his already weakened heart. There are a lot of us that have a hard time accepting that. For whatever reason, it was time that Ed had to leave us. But it was not due to a failure of heart. Not that heart.

Shari Prange
POB 1113
Felton, CA 95018



"Ed Rannberg preparing to pilot his EV Streamliner "Lightning Rod" on the Bonneville Salt Flats. Photo, Shari Prange, ElectroAutomotive.

U.S.F.R.A.

Car # 447
Class .....
Record 175.437
Direction ... D

5:59 PM 9/28/96

SEGMENT	ET	MPH
2 1/4 MILE	5.2294 ..	172.103
3 MILE	20.1078 ..	179.035
KILO	..	T.O.
4 MILE	18.7434 ..	192.067
EXIT SPEED	.4462 ..	201.703
5 MILE	18.0947 ..	198.898

Run # 274
..... CompuLink System IIIs
Qualifying Run!

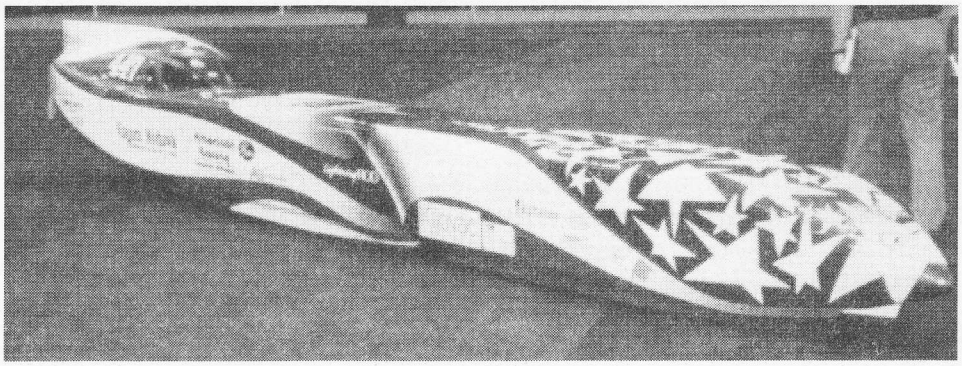
U.S.F.R.A.

Car # 447
Class .....
Record .....
Direction ... 1

8:46 AM 9/29/96

SEGMENT	ET	MPH
2 1/4 MILE	5.2835 ..	170.341
3 MILE	20.3755 ..	176.682
KILO	..	T.O.
4 MILE	19.1194 ..	188.290
EXIT SPEED	.4567 ..	197.065
5 MILE	18.5089 ..	194.501

Run # 1090
..... CompuLink System IIIs
AVG. 196.199



Advanced Motors

BY SPARKZ

SRM technology is very much in its infancy and presently suffers from noise, which is not a common problem with other motor types.

The DC brushless motor is a result of modern electronics and rare earth magnets. In this type, the conventional DC brushed motor armature is replaced with a relatively small-diameter rare-earth permanent magnet armature. This is sleeved in an insulating material capable of withstanding high RPM. To control the DC brushless type, the field windings are excited by complex electronic signals which allow very high speeds and torques.

Lacking brushes, this type of motor requires no brush maintenance, has none of the headaches of mechanical commutation, such as arcing at high voltages and coming apart at high RPM. It can sustain very high speed, on the order of 14-15,000 RPM.

The DC brushless motor can achieve stall torques similar to the series-wound type and speeds and efficiencies greater than AC synchronous motor systems. The penalty is, of course, cost; in both the complex electronics and the rare-earth magnets.

Because of the relative ease of implementing regenerative braking with a brushless DC permanent magnet type, a few of the larger EV manufacturers, such as Toyota, are using it in vehicles such as the RAV4.

AC Systems

The revolution in electronics has made it possible to drive AC electric motors with DC battery power, a previously unthinkable option. AC induction motors are very commonly used in industry and are some of the cheapest types available. AC motors can run on single-phase current, such as standard household 110 AC, however those are for low-power applications,and are not suitable for EVs.

To get the torque and speed to power a car, EV engineers use a 3-phase AC motor. These motors have three AC fields, each 120 degrees apart, generating strong rotating magetic fields. The 3-phase AC can generate more power for less weight and operate at higher speed than other motor types. Allan Cocconi, who designed the prototype AC drivetrain used in the GM Impact/EV1, used the characteristis of the AC 3-phase motor to give the car outstanding performance.

Unfortunately, to control the systems required in traction applications requires very complex and expensive electronics. For a three-phase AC induction motor such as that used on the GM EV1, each phase is separately generated and controlled, more than tripling the complexity of the controller.

AC drives come in two types; synchronous and asynchronous. In the synchronous motor, the armature, with permanent magnets, runs at the same frequency as the rotating magnetic field. In the asynchronous motor, the armature can run slower than the rotating magnetic field during motoring and faster during regenerative braking. If the armature is "pushing" or running behind the field, as when motoring, the phase difference is negative. If the armature is "pulling" or running ahead of the field, the phase difference is positive

Both types of motor vary the speed by varying the magnetic field frequency and vary torque by changing the the AC current amplitude.

There is no difference in driving electronics between the synchronous and asynchronous systems.

Switched reluctance (SRM)

The switched reluctance may be the motor of the future. It resembles the brushless permanent magnet type, except that it replaces the permanent magnets in the armature with solid iron. Magnetic dipoles in the iron line up to create a magnetic circuit with the shortest possible path, however there is a slight delay between the time that an external field is applied and the time that the dipoles align. This behavior, called hysteresis, gives the phase offset needed between armature and field. Power is derived from the speed of the motor.

In the SRM type, the rotor is a simple set of laminations each shaped in the form of a toothed cog. Around the outside of the motor is a 3-phase coil set, driven by the control system. The main advantage of this motor is that it does not require either expensive materials for the armature. It does require electronic control that is as complex as 3-phase AC. The motor itself is also more complicated than the 3-phase AC. Only the armature is simpler, since it needs no electrical windings.

SRM technology is very much in its infancy and presently suffers from noise, which is not a common problem with other motor types.

(CE thanks Rob Fowler of Electric Drive News and Stan Skokan of Electric Vehicles, Inc. for assistance with technical details of motor descriptions)

Helmet Law Exemption for Corbin Sparrow

Assemblyman Peter Frusetta, R-Tres Pinos, has introduced legislation to exempt Sparrow drivers from California's helmet law. The Sparrow is a 900-pound, electric, single-passenger ``personal transportation module'' designed by motorcycle accessories manufacturer Corbin Pacific Inc. Several prototypes have already been produced at Corbin's Castroville facility.

Though the state considers the less than 1,500 lb. vehicles to be motorcycles for purposes of classification, Frusett's bill, AB 1029, would allow Sparrow owners to drive helmet-free. Current law requires Sparrow drivers to wear helmets.

``This is just a common sense thing,'' said Frusetta aide Devin Brown.`If you want to really interpret the statute literally, then people driving golf carts should have to wear helmets.''

Corbin's Sparrow has car-like features that make it safe to mix with larger vehicles without need for a helmet. These include a seat belt and steering wheel.

Delay in Implementing Helmet Exemption

Even if AB 1029 is adopted by the Legislature and signed into law, the helmet exemption won't take effect until next January, months after the Sparrow hits the market.

New Sparrow owners will be required to sign a form informing them that they must wear helmets until the new car is exempted from current rules.

``When you've invented something new, something cutting edge, you fall kind of between categories,'' said Corbin VP, Tom Corbin.

Corbin Pacific broke ground on a 82,000-square-foot facility in Hollister where the Sparrow will be assembled. The first Sparrow could roll off the assembly line this August, according to company vice president Tom Corbin.

Designed for short-distance commuters, the tiny car holds one driver plus briefcase and/or laptop computer. The Sparrow has three wheels -two in front and one in back, with an enclosed body made from fiberglass composite. The vehicle, roughly 4 feet by 8 feet, runs on 8 12V 1-kilowatt batteries to go 60 miles at 60 mph. The Sparrow will cost about $12,500.

AB 1029 was approved 12-3 by the Assembly Transportation Committee on Monday, April 21.

Source
California Lawmaker Pushes For Helmetless Sparrow
BY CHERYL MILLER HOLLISTER, THE DISPATCH, GILROY, CALIF. Knight-Ridder/Tribune Business News (lafuente@knight-ridder.com), http://www.cnnfn.com/news/knight_ridder/

LETTERS

Dear Clare,

Thanks for the great work on the buyers guide. My section came out very well. In the latest Current EVents you had the Phoenix heat race results, and promised the Feature results next issue. Could you also print the results of the qualifying round? I think it is very instructive about progress over the last year in raw power and about AC vs. DC.

In summary: Last year only two cars broke 1:10 lap times in qualifying, this year FIVE cars broke 1:10. Although there were fewer cars they were faster.

AC vs. DC: I think the qualifying round proves that VOLTAGE is more important for raw speed than AC or DC. Places were as follows:

1) 336V AC 1: 03.266 Probe
2) 216V DC 1: 05.866 Spyder
3) 162V DC 1: 07.206 Saturn
4) 312V AC 1: 07.809 Firebird
5) 312V AC 1:07.969 Camaro
6) 144V DC 1:12.480 Colt
7) 144V DC 1:12.872 Geo
8) 144V DC 1:13.872 Ghia
9) 144V DC 1:13.820 Isuzu
10) 144V DC 1:17.74 914
11) 120V DC 1:18.750 300AX
12) 108V DC 1:24.627 Ghia

Incidentally, the driver of my car (Spyder) said his 2nd qualifying lap was faster than the first, but the breaker popped on the last turn. We might have taken the Probe. The photo on page 13 must be the lineup for the heat race. The qualifying results explain the lineup.

BTW if you look at the 96V High School results, Gloucester H.S. had a 1:09.449 lap time during the feature race! VERY fast for a 96V car. They are apparently using bypass.

Gary Flo
innevate@pacific.net

[Due to time and space constraints, the remaining APS results will be in the next issue. Thanks Gary, for the info and your comment on the EVBG —CB]

BOOK REVIEW

The Electric Car and the Burden of History:

Studies in the Automotive Systems Rivalry in America, 1890-1996

by David A. Kirsch, Ph.D.

BOOK REVIEW BY BOB WING

This history of EVs is a complete (325 page), scholarly but easy to read reference. It is a doctoral dissertation which I found it extremely interesting in the depth of coverage of electrical transportation especially in the early years before my time.

There is a discussion of the early choice of an automotive prime mover — steam, gas or electric. For example, I did not know that the early steamers stopped frequently at horse water troughs for their water supply. But hoof-and-mouth disease started spreading and steamers had to add condensers on board to extend their water supply as farmers would no longer permit car owners to use horse watering troughs.

In the early years, hundreds of different motor vehicles were built powered by gasoline, electricity or steam. Although the last two showed early promise, by 1910 gasoline was quickly recognized as the superior technology.

Kirsch says "Even as urban enthusiasts discussed the development of an "Electrant" — a curbside electric hydrant that would dispense a set amount of electricity for a modest charge — a technical report on the Madison Square Garden Auto Show in 1900 bemoaned the proliferation of plug designs. " We have not learned much in 97 years with GM pushing the paddle and most other companies using the plug design which everybody knows how to use.

Battery exchange, which has been discussed and practiced for years, is another subject for frequent discussion today. Kirsch writes "Only in 1912, when the Hartford Electric Light Company took the further step of offering battery service... all customers could exchange batteries to extend the range of their vehicles. The customers could swap discharged batteries for fresh ones as many times as needed, and at the end of the month, the battery service provider would bill the customer for electricity based on the number of miles traveled."

By the 1980s the (EAA) hobbyists were still the only people who regularly drove electric vehicles."

There is a chart showing towns with generating stations willing to sell current to charge electric vehicles in the summer of 1897. From NYC (42nd Street) there were stations every 5 to 19 miles to Hartford CN, then 7 to 18 miles to Boston MA. There is no mention of the quality of the roadway.

History repeats itself as the Sacramento Municipal Utility District has just issued a 40 page booklet with maps showing conductive 120V and 208V (some 240V) dual outlet charging stations in Sacramento County, one to 3 at public garages, 5 at the Sacramento International Airport, 16 at regional rapid transit stations and 36 at the McClelland AFB. There is one inductive station at the Arden Fair Mall, more are planned later.

The section, "The 1960s: The Second Battle" covers the 1967 conference held at San Jose State College sponsored by the Santa Clara Valley Engineer's Council and the IEEE on "The Electric Automobile: New Engineering Frontier." At the conclusion of the meeting, Walter Laski, a former Ford engineer, asked for a show of hands of those interested in forming an ongoing organization dedicated to the development and enjoyment of electric vehicles. The EAA (Electric Auto Association) was on its way.

William Palmer and John Newell joined this initial group of founders of the EAA. Palmer, Newell and Wing, three of the five Directors on the EAA Board in 1992-3 were interviewed by David Kirsch. Newell made his personal papers available and Wing his EV history library. In this dissertation there is an 11 page summary of the history of the EAA based on these interviews and personal papers. Kirsch says "By the 1980s the (EAA) hobbyists were still the only people who regularly drove electric vehicles."

SAE or some other book publisher should pick up the option to print David Kirsch's thesis. This is a truly great written history of EVs and will be in great demand for one's own library or in public libraries.

After all, it has been already edited and in digital format, all SAE or some other publisher has to do is press a button and put it between hard covers. —BW

Access: David Kirsch is a Visiting Assistant Professor at the Anderson Business School, at UCLA, Box 951481, Los Angeles CA 90095-1481, <david.kirsch@anderson.ucla.edu>.

Bob Wing <bobwing@NBN.COM>. Bob Wing is West Coast Correspondent for EV News and an EV Consultant. He can be reached at POB 277, Inverness, CA 94937-0277, Tel 415-669-7402, Fax 415-669-7407

Indonesia Turns to Molek EV

3/31/97 Jakarta, Indonesia — A private company, PT Wahana Bhakti Utama (WBU)has submitted a proposal for a three-wheeler pollutant-free public transport vehicle called the "molek" to the city of Jakarta.

The proposal has reportedly almost been approved as last month, WBU was presented the molek to Jakarta Governor Surjadi Soedirdja.

"Molek" — Cute Car

Molek literally means "cute" but WBU officials said it is actually short for "mobil elektrik" or electric car.

Next month, according to a WBU company public relations official, month, 100 moleks will be put on trial operation in three areas in Jakarta.

Presently Indonesia's small residential such streets are served by the "ojek", an ordinary motorbike used to transport people —and sometimes goods— over short distances. The problem of insufficient public transport has troubled Jakartans for years. Ojeks are a solution, but uncontrolled motorbike engines in such numbers generate air pollution. While the Jakarta administration has never sanctioned the use of private motorbikes as a means of public transport, the ojek has continued to be in demand. It cannot be phased out, unless there is a replacement.

People will welcome the molek, saying that the fact that it does not run on gas has enhanced its image among the environmentally conscious.

Meanwhile, WBU's plant in Cirebon, West Java has been readied for the large-scale production.

Another optimistic statement came from Eka Tedja of PT Fajar Utama Cemerlang (FUC), the distributing company of the molek, who said that so far, he has received an order for no less than 5,000 cars.

The three-wheeler has easily won the hearts and minds of many people mainly because it is economical. A bajaj (truck-bus), for example, consumes gas worth Rp 58 per kilometer while a molek, which has a maximum speed of 40 km to 50 km per hour, only needs Rp 10 worth of electric power. A molek can also cruise 80 km before its batteries need recharging.

Each car will reportedly be sold at Rp 10 million, which Tedja acknowledged is rather high compared to other small public vehicles. However, he added, the price should not be a problem because the car could be obtained on credit.

Pay-off Incentive

"No need [for] a down payment. So long as one is ready to pay an installment of Rp 10,000 per day, the molek is his or hers," he said. However, a car obtained through credit will not be equipped with a home-based battery charger.

"We will only provide the charger when the car is fully paid. They will install chargers in public areas within the molek's area of operation.

The presence of the pollutant-free car is expected to reduce the role of the ojek. Observers said that although the ojeks are officially considered illegal, they have for many years been an important source of livelihood. Hence, city officials will take a very cautious step in banning ojeks, afraid of this possibly sensitive issue.

Source
EVLN ("MOLEK or mobil elektrik" EV TO CRUISE JAKARTA'S STREETS)[The Internet Electric Vehicle List News. For Public EV informational purposes.POLLUTANT-FREE "MOLEK" EXPECTED TO CRUISE JAKARTA'S STREETS SOON. Antara - The Indonesian Nat'l News Agency Tue, Apr 01 1997 Jakarta, http://www.antara.co.id/

Mama and Baby Delivered by EV

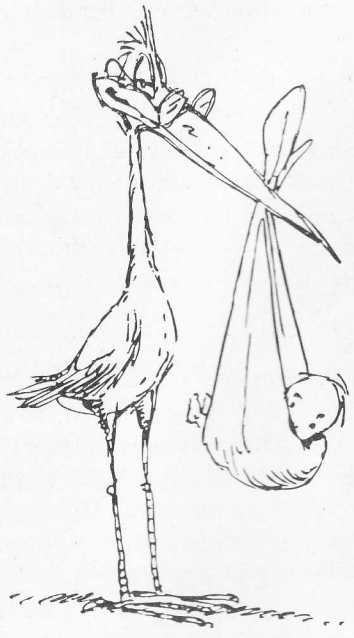
In 1982 when my wife Donna went into labor, we rushed off to the hospital in our nearly new (old US Electricar) Lectric Leopard. Two days later Daddy, Mama, and Shannon ELECTRA Lough, came home in the same car. The white Renault LeCar (Lectric Leopard) was subsequently sold to the program director, Peter Neuman, of the local Classical Music station here in Seattle, KING - FM

Steven S Lough <slough@HALCYON.COM>ECOMOTION Electric Cars. WWW Site URL: http://www.halcyon. com/slough/ecomotion

How 'bout in the early part of the century, when doctors who preferred EVs for their reliability, made house calls and visits to deliver babies.

Chip Gribben <futurev@RADIX.NET> Electric Vehicle Association of Greater Washington DC

EV Information Network Website: http://www.radix.net/~futurev



EV1 Driver Ingenuity— On-Board MagneCharge

An EV enthusiast in Los Angeles reports that some of the people leasing GM's EV-1 are already solving the so-called charging infrastructure problem on their own. They carry their 6.6 kW MagneChargers with them in the car and plug in to standard 240V/30A or 208V/40A outlets. The estimated number of such outlets is over one million in the LA Basin alone (vs fewer than 200 total MagneCharger sites).

The MagneCharger is the inductive battery charger that must be leased or purchased along with the EV-1. It is intended to be hard-wired into the electrical system at the garage or parking lot where the car will be charged. With actual EV-1 driving range reportedly varying from 50 - 80 miles, dependence on Magnecharger sites limits its operating radius to as little as 25 miles. By carrying the MagneCharger in the car, EV-1 drivers can experience the freedom to drive and plug in almost wherever they may wish to go. By using the existing electrical infrastructure, they can enjoy their EV-1 now rather than wait for a costly network of charging sites that may never happen.

Most of the EV-1 drivers who have gone to onboard charging have simply adapted a suitable power cable and plug to their wall-mount MagneCharger. To recharge they take the unit out of the car, plug it in, and insert the inductive paddle.

At least one onboard convert chose to use the floor-mount charger because it has a longer cable for the inductive paddle. The longer cable can reach the charge port from inside the car, so the charger can be semi-permanently installed behind the passenger seat. To recharge, the charger is connected to a heavy-duty extension cord. The passenger window is lowered about one inch to allow the paddle cable and extension cord to pass to the outside. The extension cord is plugged in to an appropriate outlet, and the paddle is inserted in the charge port. Since the charger and one end of the extension cord are inside the car, they are protected from weather, curiosity, and theft.

According to this EV-1 driver, adaptation of the floor-mount charger for use as an onboard unit is relatively simple, although it probably voids the charger warranty. If the charger is purchased rather than leased, no lease terms can be violated. The adaptation involved these steps:

- Removing the charger with paddle and cable and from the floor-mount housing. This involved removal of all external housings attached to the charger.
- Installing a power cable. The cable is 3 feet long, made from 10 gage/3 conductor wire and is equipped with a 50A plug. The cable is connected to the charger power lines via a terminal strip (#8 screw size) enclosed in a junction box. This protects the internal charger power lines from any mechanical stress.
- Defeating the fan interlock (for ventilation of indoor sites) with a jumper.
- Protecting the charger information displays with a clear cover.
- Installing 1" - 2" spacers on the bottom and back side of the charger to allow adequate circulation of cooling air.
- Securing the charger with straps , on its side, behind the passenger seat.

This setup has been successfully used at business and household locations. It requires a heavy-duty extension cord of at least 10/3 wire, long enough to reach outlets in garages or buildings (20 feet minimum). The charger requires a 240V/30A or 208V/40A outlet at minimum. It will trip breakers of lower power outlets. It is advisable to unroll the extension cord completely before charging to avoid the possibility of local heat buildup.

E - TRUCKS

E-Truck Aerodynamics How GM Does It

BY ICHIRO SUGIOKA

GM reduced aerodynamic drag (CD) from 0.45 for a stock S-10 to 0.35 for their S-10 EV by means of a completely new air-dam under the front bumper. Lower and slightly wider than standard; it also does not have any openings. More significantly, it incorporates a flat horizontal panel underneath that extends back to the front wheels. You can order one of these fancy air-dams at your local GMC dealer later this year and mount them on any S-10.

The UPPER-HALF of the grill has been sealed.The gap between the cab and the cargo-bed was sealed using a rubber door-seal-type extrusion. You may be able to adapt a rubber hose.

An aluminum-honeycomb-sandwich-panel covers roughly the REAR-HALF of the cargo bed. (If somebody sees one of these trucks, please measure exactly how much of the bed is covered.) Although this may look like a big air-scoop with standard tail-gate in place, experiments years ago established that this configuration has the lowest drag. You can use a 1" plywood sheet to accomplish the same thing. (I would use aircraft plywood to minimize weight. [Or orange-board (fiberglass/kevlar honeycomb composite) — CB]

So, how much is all of this trouble worth? Guessing the frontal area to 2.3 square meters, let's calculate the reduction in power requirement at 62 mph...that's 100 km/hr or 27.8 meters/sec. With air density at 1.2 kg/cu. meter, the dynamic pressure is 464 Pa. This means that 0.1 reduction in CD will reduce the air drag by (0.1 x 2.3 x 464) = 107 Newtons. Thus, the power required to maintain 62 mph is reduced by 107 x 27.8) = 2.97 kW!

(From a conversation with a General Motors engineer) From: Ichiro Sugioka <ich@ALUMNI.CALTECH.EDU>

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.

Ford to Develop Fuel Cell Vehicle

Ford Motor Company will team up with the Department of Energy (DOE) on a project aimed at developing a fuel cell vehicle. The collaboration is part of Ford's recently announced P2000 project, an initiative tied to the Partnership for a New Generation of Vehicles (PNGV) program. Ford will develop a number of lightweight research vehicles under the P2000 program, with the ultimate goal of creating a high-efficiency, low-emission automobile. The Commerce Department oversees the PNGV program, a collaboration between the federal government and the US Big Three automakers. Ballard Power Systems, Inc., Mechanical Technologies, Inc. and International Fuel Cells are expected to supply fuel cells to the project.

(FWN: 4/21)

Edison Offers Employee EV Incentive

Edison International (EI) has announced that it will offer $1,000 to the first 500 employees who lease or purchase an EV for their personal use. The grant is part of an incentive program to promote the use of EVs by employees of EI-held companies. The 1997 EI Employee EV Ownership Program also enables employees with qualified EVs to receive an additional $5,000 buy-down grant from the South Coast Air Quality Management District (SCAQMD) and a 10% federal tax credit. preferred parking, limited EV recharging at company recharging stations and membership in the Edison Employee EV Drivers Club are among the benefits of the program.

(CURRENT: VOL. 2, ISSUE 2)

Hydrogen Delegation to Visit China

A delegation of US scientists, educators, engineers and corporate representatives involved in the use of hydrogen have been invited to visit the People's Republic of China by the China Hydrogen Energy Association and the China Association of Science and Technology. The purpose of the visit is to foster discussion on zero-emission energy technology, the role of industrialized nations in fostering the development of this technology, hydride storage technology, and US- China cooperation in the research of hydrogen and fuel cells. The delegation will depart from San Francisco on August 30 and return September 12. Participation in the delegation is on a first-come, first-served basis at an estimated cost of $4,350 per person. Contact Kathleen Sieler, 509-534-0430, extension 422.

EIN STAFF: 4/21)

Vattenfall and Electric Fuel in Licensing Deal

Electric Fuel Corporation and Vattenfall AB of Stockholm, Sweden recently announced an agreement that licenses Vattenfall AB to establish and operate the Electric Fuel EV infrastructure for markets including Sweden, Denmark, Norway, Finland, and St. Petersburg, Russia. The 25-year agreement accounts for royalties and considerations to Electric Fuel and gives Vattenfall exclusive ownership rights over commercialization of the Electric Fuel System for EVs.

Vattenfall plans to own and operate regeneration operations, run refueling and battery exchange stations, distribute Electric Fuel batteries, and build and operate a 250kg/h demonstration regeneration plant in Stockholm.

(ELECTRIC FUEL RELEASE: 4/15)

CARB Prototypes Could Presage Affordable EVs

The Zero emissions/World Electric Vehicle (ZE/WEV) prototypes unveiled by the California Air Resources Board (CARB) recently could go a long way toward the development of an affordable EV. The vehicles, a six-passenger minivan and a car/truck hybrid, were developed with cooperation from a host of interests, including the Department of Defense, Troy Design and Manufacturing Company and the Pennsylvania Department of Environmental Protection. The minivan prototype features low-weight composite plastics and a sodium-nickel-chloride battery that allow the vehicle to achieve a reported range of 150 miles on a single charge. CARB believes the vehicles could be sold for as little as $25,000 if production volumes reach 10,000 or more units.

(AUTOMOTIVE NEWS: 4/14)

Opponents Slam CARB Contract

Opponents of an agreement between the California Air Resources Board (CARB) and contractor Bevilaqua-Knight, Inc. (BKI) for the design and demonstration of an EV charging system have again urged the deal to be scrapped. Citing questionable air quality benefits from EVs and more cost-effective methods for battling pollution, the deal's detractors, led by the Californians Against Hidden Taxes (CAHT) coalition and some state legislators, criticized the arrangement as a waste of money. The contract with BKI is valued at $483,650, which opponents say translates into little more than a giveaway of taxpayer funds without approval of the taxpayers. "I am strongly opposed to any tax dollars being used for a backward program like the electric car," said state assemblyman Rico Oller.

BUSINESS WIRE: 4/11)

Daimler-Benz, Ballard to Collaborate

Daimler-Benz AG of Stuttgart, Germany recently announced that it is teaming up with Vancouver, Canada-based Ballard Power Systems, Inc. to develop and market novel fuel cell engine technology. Under the memorandum of understanding signed by the two companies, Daimler-Benz will acquire about 25% of the shares of Ballard with the goal of increasing capital to aid in the development of fuel cell systems for series production in automotive applications. The two will form a new company to produce fuel cell systems, with Daimler-Benz holding two-thirds share and Ballard a one-third share. "The fuel cell is the only so-called 'alternative engine' with the potential to bring mobility and environmental concerns together in harmony," said Daimler-Benz management board chairman Juergen Schrempp.

(BUSINESS WIRE: 4/14)

Duracell/Varta Contract Extended

Duracell, Inc. and Varta Batterie AG have been granted a $14.5 million, two-year contract extension by the US Advanced Battery Consortium (USABC) for continued development of lithium-ion battery technology for EVs. This work is included in USABC's Phase II activities, which includes the verification of battery safety, life, cost and process capability from scale-up to manufacturing. The Duracell/Varta team has been developing safe, high-performance rechargeable lithium-ion EV battery technology for over two years. "The Duracell/Varta team has made significant progress during USABC's Phase I contract toward increased safety, reliability and low cost," said Duracell Worldwide Technology Center vice president Harry Taylor.

(USABC RELEASE: 4/14)

Progress on Nickel-Zinc Battery

Energy Research Corporation (ERC) of Connecticut recently announced that its sealed nickel-zinc rechargeable battery completed over 11,000 cycles at a 10% depth of discharge. "This result combined with earlier reported performance of over 600 cycles at deep discharges (80% depth) suggests that this battery could be used in a broad range of hybrid electric (HEV) and EV propulsion systems," said Allen Charkey, vice president of ERC's battery division. The ERC nickel-zinc battery uses an environmentally friendly, high-voltage zinc negative electrode and a nickel-graphite positive electrode, which has demonstrated higher energy per unit weight. The battery is also lightweight because it doesn't require as many cells as other batteries such as nickel cadmium.

(BUSINESS WIRE: 4/10)

Zebra to Develop Batteries in US

German battery manufacturer Zebra said it plans to open a new US headquarters office in Detroit to develop its sodium nickel chloride batteries. According to Zebra's Cord Dustmann, the company is testing the batteries in numerous European programs with automakers such as BMW, Mercedes-Benz, Volkswagen, Renault and Opel. The batteries also have been chosen to power the composite-bodied taxicab developed by Switzerland's Horlacher for a Thai consortium. Dustmann noted that these batteries are the first from a pilot facility that were able to meet the mid-term power goal of 150 w/kg set forth by the US Advanced Battery Consortium. Bench tests of new Zebra variants suggest the potential for even more powerful production units in the future.

(FLEETS & FUELS: 4/7)

DTI, Daimler-Benz to Market Fuel Cell

DTI Energy, Inc., a Los Angeles engineering firm, recently announced that it is talking with Daimler-Benz about an effort to jointly commercialize a direct methanol PEM-type fuel cell being developed at NASA's Jet Propulsion Laboratory (JPL). Todd Marsh, president and CEO of DTI Energy said the German automaker has done "a stellar job of packaging" its fuel cell vehicles, and that the company has the engineering capabilities to transfer the fuel cell concept to automotive applications. The fuel cell operates on a mixture of 97% water and 3% methanol, used as both fuel and coolant. The JPL fuel cell would result in "significantly lower system size, weight, complexity and temperature than in existing fuel cell systems," according to Gerald Halpert, JPL's fuel cell team manager.

(HYDROGEN & FUEL CELL LETTER: APRIL 1997)

Comments received on member renewals or applications. (With thanks to June Munro!)

Woodcliff Lake, NJ

"I love my electric truck" (Dodge RAM pickup, 1987)

Mill Valley, CA

"Ken Koch, your back page advertiser, is a gem. Great advice, Great Service. I love Current Events. It gave me the 6V-8V transition idea."

Bellingham, MA

"I actively read the email list, so enjoy charts, pictures in CE which don't work with email. Conversion is registered and on the road. Just have to finish installing heater, DC/DC, tilt bed, minor body work (1986 Dodge Ram50, w/DC-DC, tilt bed, insulated batt. boxes and cab)." Dubique, IA "Plan on having my EV running by March. Looking forward to it! (Chevy Pickup w. tilt bed, heated battery boxes)"

Burlington, NC

"I want to get engineering work on Evs, 1st by getting reading material and experience. I want to build an Auto-cross racer as a test mule. Also interested in minimal off-road EV i.e., 4-wheel 'bike'." Alansn MI (on renewal) "Purchased components from Oct. 1996 ad of Clyde Unger, Wisc. Hope to complete in 1997. Might upgrade to 120 volt- most likely will purchase some items from Bob Batson."

Portage, MI

(renewal) "Please provide better explanations of terms - voltage, clamp, and better labeling of the axis of graphs. Nov. 96 page 9, Peukert curve, no label on the X axis."

[Ok, we'll try to do better on defining terms and labeling graphs — CB]

Needham, MA

(renewal) "My vehicle has been driven 35,000 miles in 4 years - has never failed me."

Port Townsend, WA

(renewal) "Port Townsend High School Electric Racing Team is the National Student Div. Champions at the Phoenix EVTC Event."

Murfreesboro, NC

Jerry Asher submitted an application from Murfreesboro, NC with the comment, "This is Harold Miller of Northampton H.S. fame, especially APS Electrics winner in 1995 with Shocker I and APS Electric 3rd and 4th places in '96 with Shocker I and Shocker II."

[Congratulations — CB]

Rockville, MD

Keep up the Good Work. Emphasize societal benefit—environmental—trade deficit—national security (oil independence."

Rexford, NY

"Would like to see - 1. Assistance in getting registered. Documentation for state DOTs and insurance agents 2. How do I access your Web Site 'members only' area?"

Hengelo, Netherlands

"My greatest compliments for your efforts making such an up-to-date magazine. It's very helpful for me making a start in selling EVs in Holland and every time I'm looking forward to seeing C. EVents!! Thanks."

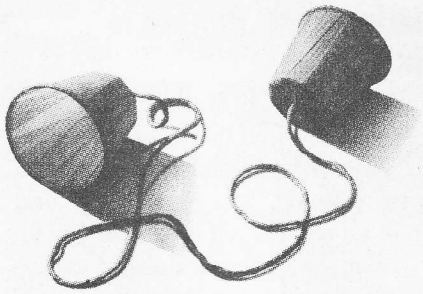
Vashon, WA

"I have an E. motorcycle and am converting VW Bug. Am driving '74 Mazda conversion."

Santa Cruz, CA

(new member): I'm interested in learning about where other EV owners are - and where to go to get repair work.

[A number of EV parts and conversion companies do repair work. See the ads in this issue. The closest one to you is ElectroAutomotive in Felton. — CB]



Bridgeport, CT

" In Conn., they look at you like you're nuts when you say you drive an electric car!"

Torrance, CA

(New member) "I am a student currently doing a research paper on electric vehicles. Any info and help is much appreciated. Part of the project is converting an EV."

June adds

"I receive numerous comments regarding CE, mostly "keep up the good work", "Enjoy newsletter very much" and similar remarks.

[Thanks June — CB]

Vancouver Chapter suggest including specific information on how to join you, such as send a check for $35, US, Canada $40 US dollars, foreign $45 US for 1 year membership and subscription.

[OK, thanks, Vancouver — CB]

MEMBER WANT ADS

For Sale

Dual shaft ADC 9: Motor, $1365. 1221-B Curtis Controller with manual, $695, GE TDQ-200 Circuit Breaker, $95, Bycan Offboard 120V Charger, $875; very few hours, excellent condition/OBO--may separate. Call Nick (512) 472-4953 after midnight O.K. E-mail: nick@eden.com. (Texas)

1975 Near-original CitiCar. Running find, battery poor. New tires. Only mod is lightweight, 12V charger. In Macom, GA. Call (912) 477-8718. E-mail: schaefer_jf@mercer.peachnet.edu (Georgia)

1987 Ford Escort--For Sale due to illness. No engine, Russco Motor and Controls and Adapter Plate, Lester Charger and other controls and instructions. You just put it together. $3000. Call Jack (707) 263-3319. (California)

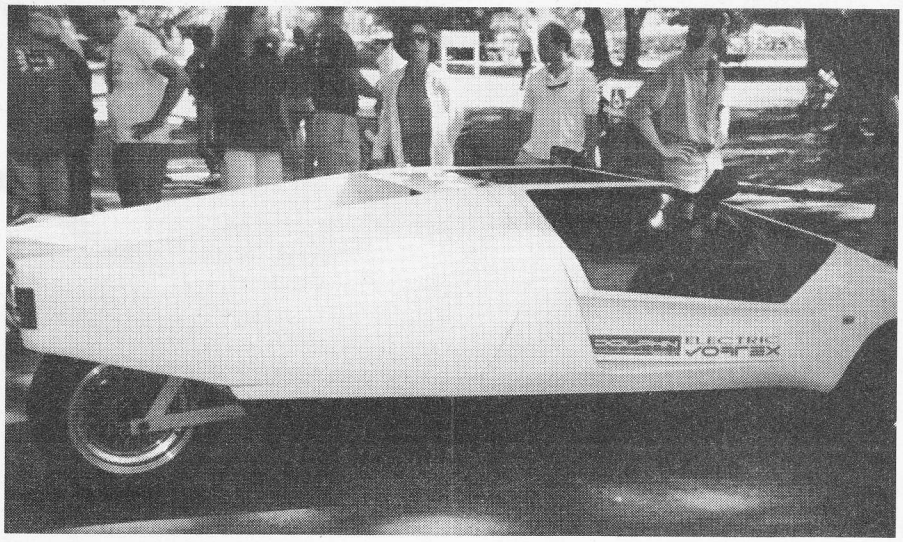
8-inch Advanced DC Motor Model 203-06-4001. $650. (Used but good condition.) Call Dale at (408) 378-0883 or FAX: (408) 378-0879. (California)

Jet 4-spd Hatchback. A/C, gas heater, upgraded controller, demo car, 12K miles, top condition, $8500/obo. Call (301) 587-6841. (Maryland)

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 VORTEX by Dolphin

AD RATES

Full pg color	7.25" x 9.25"
1 ad	$300 ea

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 (evchdlr@primenet.com)

June 7

2nd Annual VEVA Show-n-Ride, Burnaby, B.C., Canada. The Vancouver Electric Vehicle Association invites all EV owners to participate in the 2nd Annual VEVA Show-n-Ride. Last year's event included electric bicycles, tractors, go carts, drag cars, formula racers, Electrathon racers, trucks, 'boom-cars', vans, and 1912 classics. Possible help with travel expenses. Time of event: To Be Determined. Contact: Gary Blidook E-mail:74670.2647@compuserve.com. tel: 604.464.3361

June 19-28

Sunrayce 97, Indianapolis, IN to Colorado Springs, CO. Sunrayce is a biennial intercollegiate solar car race across America; sponsored by General Motors, EDS, and the Department of Energy. Colleges, universities and other post-secondary institutions compete to build and race cars powered only by sunlight. Sunrayce 97 will take place from June 19-28, 1997 and follow a route from Indianapolis, IN to Colorado Springs, CO. SR97 Headquarters, 1-800-606-8881, fax: 810.620.1547 http://www.sunrayce.com/sunrayce/sunrayce.html

June 21-22

SolFest 97, Hopland, CA. You're invited to bring your car, truck, bicycle, or alternative whatever to Hopland, California, for our SolFest 97 celebration and parade. We're calling it the SolFest Electric Vehicle Parade, because last year almost all of our parade participants did drive EVs. Bicycles and alternate fuel vehicles are also welcome (anything other than gas or diesel), as the whole point of this weekend is to explore healthy alternatives to the unfortunate usual. There is no charge to be in our parade. SolFest 97 is shaping up to be a great weekend, similar in style and spirit to our Real Goods Grand Opening of 1996. The dates for this year are June 21 and 22, with the Electric Vehicle Parade taking place on Saturday morning, the 21st. For those of you who were with us last year, the parade logistics will be much the same. We will rendezvous at 9:00 am at the Alex Thomas Plaza in downtown Ukiah to meet the public and press. At 9:30 we head out for the fifteen-mile drive south on city streets and highway 101 to Hopland, where parade participants will enjoy reserved parking in the lot at Real Goods Solar Living Center. Solar-powered EV charging will be available (within reasonable limits). Be prepared for lots of enthusiastic and knowledgeable people with plenty of questions for you about your vehicle! Signs or info sheets are a good idea. This is a highly EV-friendly crowd. The SolFest celebration will be complete with renewable energy product booths, food and drink booths, free workshops, guest musicians and speakers and a big sale in our store as well. We received lots of great comments from people who were with us last year and we hope it will be at least as much fun for this June! It looks likely that Ralph Nader is going to speak on Saturday afternoon and we are in the process of planning a big concert with our neighbors at Fetzer Vineyards to also be going on that weekend. Hopland should be hopping and we hope you'll be with us. Please feel free to share this information with any friends who might be interested in the parade or SolFest events. For general SolFest information call 707-468-9292, ext. 2550. To register for the parade, contact Mark Winkler: tel: 707-744-2107, fax: 707-744-1342, e-mail: mark@realgoods.com

June 22-28

Sun Sprint of the Rockies, Moab, Utah to Aspen, Colorado. The Sun Sprint of the Rockies is an electric vehicle, alternative-fuel race that travels through beautiful and scenic eastern Utah and western Colorado. The Sprint is a challenging race with uphill climbs and endurance tests. Visit our website at http://www.dcipress.com/schools/HHS/sunsprint/suncover for more information. Contact: Carolyn Alvey - Organizer or Curt Grinnell - Advisor. E-mail Address: hhs@wic.net, fax: 970.872.2390, tel: 970.872.3882.

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.

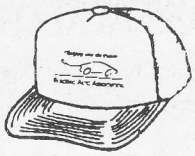
August 23-24

EVN-Cup 1997, Austria, Central Europe. Last year we had 5000 visitors and about 80 participants. There are different races, EV-cars, prototypes, bikes, and also carts. Everyone who completes the whole race independent of their result gets a specified amount of money. For further information contact: Claus Drennig via e-mail: c.drennig@magnet.at. Fax: +43/1/7147463, tel: +43/1/7147463

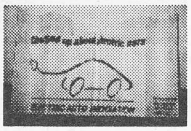
Sept. 22-25

Fifth Grove Fuel Cell Symposium, London, UK. This symposium will provide you with an up-to-date review of fuel cells and their use, focusing on the following themes: business development and investment opportunities, key technological advances and system demonstrations, leading edge research results. International speakers are supplemented by a technical poster session. Contact: Sharron Emsley, Conference Organizer, Email s.emsley@elsevier.co.uk, fax: +44 1865 843958, tel: +44 1865 843721

EAA **Reprint** Order Form



100% Cotton Cap
Forest Green
'Charging into the Future' EAA Logo
CAP001.....$8.00



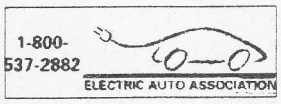
Auto SunShade
SS001.....$8.00

T w/EAA Logo
TS001...$14.50

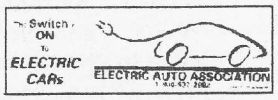
Thermal Mug
MUG02...$6.50

Porcelain Mug with
'Charging into....Future'
MUG003.....$5.50

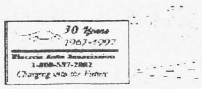
Window decal 'The Switch is on to Electric Cars' Black and Red printing. 3 x 9 inches
DC001.....$3.50



Bumper sticker 3.75 x 15 inches
BS800.....$3.00



Bumper sticker 3.75 x 15 inches
BS002.....$3.00



EAA Key Chain , w/LED light
KC001.....$2.50

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
BG1997	1997 Buyer's Guide to Electric Vehicles (Apr 97 issue CE)	$ 6.00
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)	$ 4.00
TT001	Team Tucson Land Speed Record Plans	$ 5.00
IDX001	EAA Current Events Index - 10 Years!	$ 4.00
XA100	EAA XA-100 Hybrid	$ 5.00

Other EV Items

PN001	Ball point writing pen with EAA and 800 number	$1.00
CS001	Current Solutions/Motor Show Video Tape (14 minute runtime)	$15.00
WL001	Window Literature Holder (fits pages 8.5 x 11 inch)	$25.00
PARK01	'EV Parking Only' Sign (18"x12") green icon on white background	$25.00

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

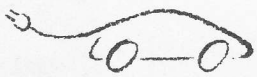
Name_____Phone_____
Address_____
City,St,Zip_____

Item#	Size	Quantity	Item Description	Unit Cost	Amount

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

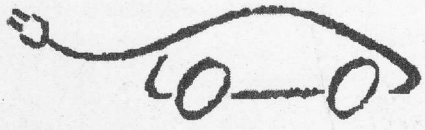
* for Canada add 15% or for other foreign destination add 25%

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



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

• Time Dated Material - Please Do Not Hold •