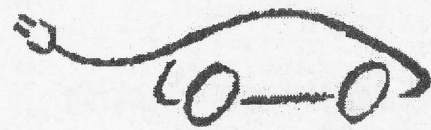


CURRENT EVENTS



January '96

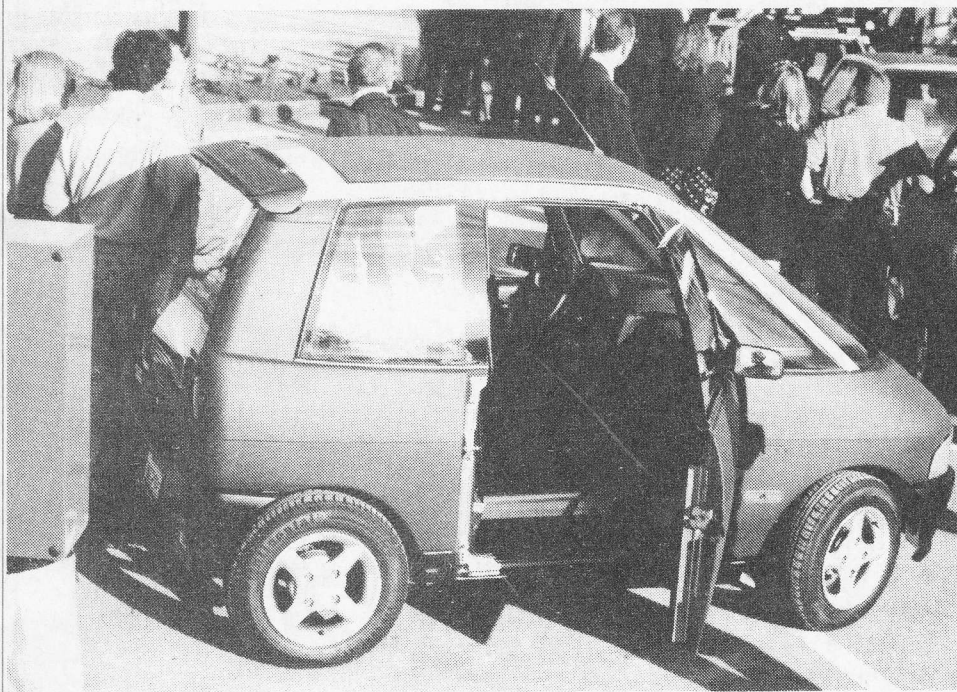
Promoting the use of electric vehicles since 1967

Vol 28 No. 1

CARB'S REVISION

Don't Slam the Door on EVs

by Clare Bell



The mainstream press and automotive presses claimed that CARB Chair John Dunlap's modification of ZEV was a victory for Detroit. Environmental and pro-EV media emphasized the fact that the new "market-based" approach would bring in commercial electric cars earlier than 1998. They also pointed to statements by Cal EPA head, James Strock, who said that for the automakers' alternative to be considered, it must provide a "technology-based premium of pollution reductions significantly greater than those provided by current regulation.

ZEV is NOT Dead

Those who have gleefully claimed ZEV a casualty of the auto and oil company media steamroller are premature and

mistaken. At the same time, pro-EV and environmental groups have a right to feel disappointed - The pull-back from an across-the-board 2% is less of an actual capitulation than it is a signal of something in the wind. As Veronica Kuhn of the National Resources Defense Council put it, "I can't tell whether it smells like a skunk or a rose."

ZEV activists and EV supporters can take some heart from these points:

The Air Board remains committed to "mobile source" (auto) emission reduction. Dunlap said "...no change should give up even a pound of emission reductions."

Federal law, in the form of the 1990 Clean Air Act, is on the side of ZEV. California has submitted a State Implementation Plan for compliance (it

is presently in violation) and must achieve it or face substantial EPA fines and /or losses in Federal funding.

To achieve the emissions reductions set forth in the SIP, "will require the widespread introduction of zero emitting vehicles" (Dunlap)

The auto companies must provide "clear, enforceable commitments . . . beginning immediately" (Strock)

Any proposed alteration of the ZEV program..."must meet the same legal requirements of enforceability"

CARB's Battery Evaluation panel states that ZEV has accelerated development of EV battery technology. ZEV did its job in that respect.

As part of any agreement, automakers would have to support the advanced battery developers, by providing EVs as testbeds and an early market source for these batteries.

CARB believes that once nickel-metal-hydride, lithium ion and advanced lead-acid technologies are in production and wide-scale evaluation, they will be ready by the mid-term date of 2001.

The Battery Panel has identified the steps necessary to do so.

CARB recognized and credited California and other companies that have invested in EV technology.

Automakers state that they can and will bring in EVs in advance of the 1998 requirement; 5-6,000 in 1996 and more in 1997-98. This amounts to 19,000 Evs, possibly more when the Japanese announce their production plans. The 2% requirement was 22,000 EVs.

continued on page 4

by Clare Bell

Accomplishments - Looking back at '95

CE grew and changed throughout 1995. There were a few soaring flights, a few stumbles and splats. We continued as a 16-page monthly, on time and on-schedule. In the latter half of the year, CE went on a schedule of alternating issues, 16 pages one month, 24 the next. Though the shrink and stretch routine was difficult, we mastered it well enough to see that the 24-pager was viable and that we could probably do it on a monthly basis. This experience has served as the basis for the decision to go for 24 pages each month in '96.

One of the most significant developments in the latter half of the year was that EIN, the Environmental Information Network (from which Ruth Shipley compiles the News in Briefs) started to pick up CE's editorials and articles. That means EIN considers CE a noteworthy publication in the EV field, deserving to stand right alongside the other sources from which EIN draws its EV news-briefs. EIN briefs go out to many other environmental and other publications, so any CE material that they include gets spread all around (with credit of course).

Several of CE's op-ed pieces have been reprinted with permission in publications including the EV Buyers' Guide (Spirit) and Electrifying Times (Bruce Meeland). Quotes from CE continue to pop up in chapter and affiliate newsletters. Though CE has taken criticism from some quarters, the praise has outweighed it. Some of the criticism has been constructive, or has had a gadfly quality to it that deserves response and/or implementation.

CE also streamlined and reduced its mailing and handling costs. Bruce Brooks now handles the logistics of mailing; he prints the mailing labels and gets the bundled issues to the De Anza Senior Center, whose members apply the labels, sort issues by zipcode and mail them.

Changes - Looking Ahead

Many publications have an end-of-the-year "wrap-up" issue. I intended to do that with CE, but didn't, due to the recent fight over the ZEV program and other things. Anyway, I thought we'd do a "beginning of year wrap-up and look-ahead".

Firstly and most obviously, CE is going to be larger — 24 pages every month (except of course, for February, when EAA will be sending out the EV Buyer's Guide in place of a CE issue.) Secondly, CE in '96 is going to be even better than CE in '95. We'll be including more technical and hands-on articles — at least 4 pages in each issue and more. Scott Cornell is coming on-board as Tech Guru (Tech Editor), ably assisted by Anna Cornell. A more "hands-on" person than Scott would be hard to find — he and Anna are recognized pioneers in the EV field. So welcome the Cornells as CE's new Tech Team. And look forward to the latest, greatest and most useful technical information on both conversions and newly manufactured Evs.

Several CE issues will be Tech Focus issues, discussing one EV component, such as chargers or controllers in depth that month. Articles in the Tech Focus Issues will range from "What is a controller and what does it do" (beginner level) to comparisons of recent designs and capabilities, such as regen (advanced level). I'll be working closely with Scott and Anna on the Tech Focus issues.

Another increasingly important tech and other news source is the EV Discussion List. CE plans to bring our readers the cream of these Internet postings and discussions with a new column, "The Best of the Internet EV Discussion List." So, for all those who aren't yet Net-drivers, you will still be able to get a sampling of what's whizzing along the Information Highway. To all EV Discussion List members — CE will contact you and ask for reprint permission if we wish to use an entire piece or posting. That is only reasonable.

For EV newbies and neophytes, CE offers a new beginners' column. "Evs for Dummies" by the irrepressible Sparkz. It is as educational as it is irreverent and best of all, it begins in this issue!



PRESENTED BY
ARIZONA PUBLIC SERVICE

The world's premier electric vehicle race

**March 1-3
in Phoenix, Arizona**



Electric Vehicle Technology Competitions, Ltd.
Organizer of America's Electric Challenge

For more information, call (602) 256-2599

1 Controversy and confusion surround the recent announcement by CARB chair John Dunlap. CE tries to sort it all out with analysis and commentary.

8 Behind the proposed CARB revision — what were the forces influencing the California Air Resource's Board's recent action?

8 If you run an Auxillary Power Unit on your EV, keep it clean and quiet.

10 A solar car getting the jump on a 300HP Corvette? Yep, on the Pike's Peak Solar Challenge. You heard it here first.

12 CE's new beginners' column takes EVs in hand with EVs for (Not So) Dummies.

14 Tech Focus: Power Trailers looks at two range-extending hybrid trailers; one by Fisher and one by Alan Cocconi.

15 Cars AREN'T That Clean — A recent MIT study claims that Federal emissions tests procedures don't reflect actual driving conditions.

CURRENT EVENTS STAFF

Managing Editor

Clare Bell
271 Molina Drive
Santa Cruz, CA 95060
Tele: (408) 469-9185
Fax: (408) 469-3714

Contributing Authors

Alan Cocconi
Ken Koch
Richard R. Rahders
Sparkz

News In Brief

Ruth Shipley

Calendar of Events

Anna Cornell

Photography Credits

Scott Cornell
Fisher

Advertising & Production

Susan A. Hollis (PCTEK)
(408) 374-8605
Fax: (408) 374-8750
18297 Baylor Avenue
Saratoga, CA 95070

Article Submissions

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

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

Advertisements

Please refer to Advertising Rate Sheet on back page of CE or contact contact Susan Hollis, Advertising Mgr.

Membership/Address Changes

For information on new membership or change of address, please send your requests to:

EAA Membership
2710 St. Giles Lane
Mountain View, CA 94040

PHOTO CREDIT - PAGE 1

"Will CARB'S proposed policy slam the door on EVs such as this PIVCO station car?" Photo by Scott Cornell.

COPYRIGHT 1993© Current EVents is a publication of the Electric Auto Association. All rights reserved. While Current EVents and Electric Auto Association strives for clarity and accuracy, we assume no responsibility for liability for usage of this information. Permission to copy for other than commercial use is given, provided that full credit is given to originator of material copied. This permission does not extend to reprinted articles.

CARB's Revision

continued from page 1

CARB also understands the pitfalls of a voluntary approach. Although they have so far, accepted the auto manufacturers' proposals in good faith, they know the track record of who they have been dealing with. "...the auto companies lack credibility" on ZEV, admitted Chrysler's Eaton and Strock reiterated that in his speech.

On the Skunk Side

Enforcement is the main issue. Strock and Dunlap both stress enforceability in their speeches, but HOW will any legal agreement be enforced? The present ZEV program uses fines. Although its "buy-out provision" gives automakers a loophole (See below, "A Closer Look at Numbers", p. 6), the \$5K fine per ZEV not supplied is a pretty good incentive.

"They want to end up with something that looks and sounds and feels like a mandate", commented John White, Sierra Club's lobbyist in Sacramento, who viewed Strock's speech as a possible pretext for selling out ZEV.

Whether the revision would bite like a mandate remains to be seen.

Credibility is another issue. The auto companies have just about zip where ZEV is concerned.

What could appear to be a true market launch could instead turn into a demonstration program deliberately designed to fizzle.

As far as consumer acceptance is concerned, everyone seems to be speaking for EV consumers except the consumers themselves. People want EVs. People want EVs enough that they have put their own on the road, to the tune of 2-3,000 of them. People want them enough to keep the EV industry alive for decades through heavy resistance, discouragement, hassles and attacks. If EVs were offered at reasonable prices, if they were FINANCED as real cars, people would buy them. They already do, as we EAA folks know well.

The capability of small companies to fill in the market gap was unfairly discounted. Given the energy, dedication and expertise of companies such as Solectria, EcoElectric, Electrosorce, Ovonic, AC Propulsion, the new Norwegian company PIVCO, Optima, Electric Vehicles of America, KTA, Electro Automotive, MendoMotive, EVI, EVCL and many others, the EVs would be there.

Secrecy also comes into play here. CARB, at the request of the auto companies, has declined to reveal exact details of proposals on the grounds that the information is considered a trade secret. When people or companies start hiding things, one wonders if they are up to something. Trade secrets have their validity, but too often dirty doings have been hidden by the cloak of trade of proprietary rights.

The definition of a ZEV has already been stretched to accommodate EV hybrids that have a 30 mile range on batteries alone. Automakers obviously will stretch it as far as possible, claiming that their LEV and ULEV ICE cars qualify. Technically, they may well qualify, however, studies at MIT have shown that cars that pass smog are much dirtier when in operation and that applies to LEVs and ULEVs as well. (See "Cars AREN'T That Clean", p. 8).

A Closer Look at Numbers

CARB and Cal EPA both realized that they had a "you can lead a horse to water, but..." problem. In this case they had a mule — in the form of an auto industry that refused to build and market an environmentally desirable product. They envisioned an scenario in which auto companies paid the \$5K per non-existent ZEV and continued to dirty up the state's air. After all, \$5K times 22,000 cars (2% of the California annual new car market) equals \$110 M. This is not a small chunk of change, but for the

more expensive models, (40K to 60K and up) it becomes bearable. Plus, because new cars are financed, the impact of the purchase price is softened, so price resistance goes down

The estimated California new car sales market is 1.1 million (from which the 2% figure is derived.). If one assumes an average price of \$28,000 per new car (low, actually), over 1,100,000 new cars, you get \$3,080 M. Percentage-wise, $\$110M/\$3,080M = 0.0357$ or 3.57 percent. If the auto manufacturers spread this expense over all their models equally, you'd get an average price rise of \$999.6 per car. If Detroit dropped some its economy lines (with they have been tending to do anyway), the average price per new car would go up, the overall intake would rise and the percentage spent on paying ZEV fines would decrease. From 1998 to 2001, when the 5% requirement kicks in, the auto manufacturers could, conceivably, stonewall on EVs and just pay the fines (while spending even more on figuring out how to knock down the 5% requirement or dismantle the Federal Clean Air Act than developing EVs!).

California could then use the ZEV fines levied on the auto industry to pay the yearly Federal EPA penalties or fill in for Federal funding that had been cut off. That would meet the letter of the law, yet the air would stay just as dirty. Since most of that is for highways, the auto industry would basically be paying for California freeways. That is onerous in their view, but would have the saving grace in that the better the highways, the more cars would be encouraged onto them and thus the more cars they would sell in California!

That is James Strock meant by saying "...while the ZEV rule is fully enforceable in terms of civil penalties...it holds the risk of legally sufficient but inadequate compliance."

continued on page 6

COST-EFFECTIVE TRAINING FOR DEMAND OCCUPATIONS IN ADVANCED TRANSPORTATION TECHNOLOGIES AT CALIFORNIA STATE UNIVERSITY, LONG BEACH

At University College and Extension Services, we'll help you take advantage of the latest developments and most lucrative job opportunities in the transportation industry.

With our state-of-the-art, practical hands-on training, you'll be ready to tap into some of the hottest employment growth areas, including:

- Systems engineering
- Program and project management
- Fiber optics
- Computer graphics, animation, and 3D modeling
- High performance workplace skills (Total Quality)
- Fast-LAN technologies
- Wireless communications
- Industrial telecommunications



CSULB
UNIVERSITY
COLLEGE &
EXTENSION
SERVICES

We also offer the following courses:

- Electric Vehicle Conversions
- The Alameda Corridor: An Overview
- GPS and GIS Applications in Surface Navigation
- Closed Circuit TV: Security Systems and Applications
- Telecommuting: Methodology and Practice
- Transportation Demand Management
- The Challenges of Intermodal Transportation
- Port of Long Beach: A Heritage of Trade and Technology Development

For more information, please call Catherine at (310) 985-8297.

UCES is pleased to be a partner in the Center for the Commercial Deployment of Transportation Technologies, a progressive coalition comprised of professionals from both education and industry dedicated to finding commercial applications for existing military high-tech transportation/communication systems.

UNIVERSITY COLLEGE AND EXTENSION SERVICES • CALIFORNIA STATE UNIVERSITY, LONG BEACH
The Choice for Continuing Education

current events 7.25x9.25: Ads: Graphics: Dolphin Data

CARB's Revision

continued from page 4

The SIP and the 1990 Federal Clean Air Act

In order to understand what has really happened, one must examine the legal background of the original 1990 ZEV action. The 1990 Federal Clean Air Act required each state to implement a program to bring its air quality into compliance with certain standards. At that time, California was not in compliance (even though the Federal standards were based on pioneering California programs) and is still not in compliance, especially in regard to ozone level control. For each year that a state remains in violation, it is punished by fines or denial of Federal funds.

To comply with the Clean Air Act, California submitted a State Implementation Plan (SIP), of which ZEV was an essential part. California has still not achieved the air quality levels set forth in the SIP, and will continue to pay fines and lose Federal funds until it does.

Enforcement of ZEV also was based on fines — \$5000 per Zero Emission Vehicle not supplied. This is what is called "the buy-out" provision — meaning that auto industries could continue to sell cars in California if they paid an amount equal to \$5000 times 2% of the number of cars they sell in the state each year. The Air Board expected that these fines would be sufficient incentive, although one notes that the CAFE fuel efficiency requirements, which work similarly, have been blithely ignored by the auto industry for years — they count the CAFE fines as part of the cost of doing business. It is possible that Detroit might eventually take a similar attitude to ZEV and jack up the price of their cars to cover the expense.

AAMA - Late for the Gate

First of all, the infamous radio and mail campaign by the American Automobile Manufacturer's Association did NOT have the overwhelming effect that one might have assumed. People might have

sat in their cars and nodded yes to the radio ad, but how many of that audience actually got off

their duffs and wrote letters? AAMA knew that, and so provided an easy out in the form of a mail-in postcard, but the piece went out too late for letters from that source to have influenced Dunlap's decision. The postcards in that piece were to be returned to AAMA and then submitted in bulk to the Governor and CARB. It is doubtful that a significant number were returned in time. In addition, CARB is very much aware of this campaign, has publicly condemned it and will probably throw all those red-backed postcards into the nearest recycle bin. The money that went into that piece was mostly thrown away, though there might be some influence on the Governor's office. Too bad. It would have paid for quite a few EVs.

That is not to say that it had no effect on the public. Clearly it did, and pro-EV forces will have to spend time and energy countering the misinformation that was put out. But in some ways the campaign shot itself in the foot through arrogance and over-confidence. It galvanized pro-EV forces against it and was so annoying and obnoxious that it backfired. Supervisors in Santa Cruz, Marin County and elsewhere issued statements against it and in support of ZEV.

Letters Help

CARB DID take notice of all the individual letters sent, and for a while, the pro-ZEV letters were outnumbering the others by nearly five to one. The CARB staff also took notice of individuals and organizations who attended and spoke at the workshops, including members from EAA chapters and the National Board. When I went down to testify at the October workshop in LA, staffers thanked me for coming and said they were glad I was there.

So if you care about ZEV, WRITE!

Letters that are clearly individual expressions of concern about the fate of ZEV DO COUNT with the Air Board and the Governor's office. Every individual letter that comes in, they count as equivalent to a thousand people represented. Perhaps because the ability and the willingness to write is becoming rarer in this increasingly illiterate age; but in any case, individual letters are increasingly important. And most of the people with the skill and the willingness seem to be on the ZEV side. So if you care about ZEV, WRITE! Write passionately, write creatively, write with your own unique style in your own words. And keep writing. Don't worry about sounding clumsy or awkward, just say your piece in the best way you can. And send it in a letter. Fax the letter if you want a sense of instant gratification, or mail it. Pre-paid postcards that you just sign don't have the effectiveness as letters that are insightful communications from one mind to another. The Air Board values and respects this.

CAHT Shot Fizzles

The anti-EV safety campaign funded by the Western States Petroleum Association through Californians Against Hidden Taxes (CAHT) raised a lot of fuss and furor in the papers, but it didn't fool the Air Board either. At a recent Sacramento CARB meeting, where CAHT presented several retired fire chiefs who criticized EV safety, it became increasingly obvious that none of them had any EV experience whatsoever. The Board and staffers dismissed their protests, saying that they obviously hadn't done their homework and were basically being used as mouthpieces by CAHT. What this campaign did do was to raise awareness of safety issues within the EV community itself, which can only help us in the long run. — CB



ECOELECTRIC NEWS !!

INTERNET PARTS SALES

Effective December 1, 1995, EcoElectric is no longer selling parts by mail and telephone, or doing conversion consulting by telephone. Jeremy Phillips is now manager of EcoElectric On-line Component Sales. Please address EV parts information requests and orders to him at:

EcoElectric Components Sales
Email: ecoparts@primenet.com
Visit our GREAT new On-line Catalog Web Site at
<http://www.primenet.com/~ecoparts>

ELECTRIC VEHICLE SALES

Announcing the start of production for the 1996 EcoElectric Desert Lightning™ pickup, using proven, reliable DC technology and designed to satisfy the requirements of the most demanding fleet operator or consumer! Please address vehicle information requests and orders to:

EcoElectric Corporation
P.O. Box 85247 • Tucson AZ 85754
602-770-9444 • Fax 602-770-9908
Email: ecoelec@primenet.com

INTERNET

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

*Experience Desert Lightning performance
Dec. 12-14 at the EPRI EV Infrastructure Conference (Atlanta GA)*

Q: Should I Solder Lugs To Cables?

Contrary to popular opinion, no. If you could use industrial soldering equipment, you could get a connection that would be a little bit better at conducting electricity. The equipment heats both lug and cable uniformly to achieve a good joint. However, with equipment available in your home shop, you can't get this level of quality. If the lug and cable aren't evenly heated, a "cold joint" can result. This can cause resistance and heat, leading to damaged insulation, and—possibly—melted battery terminals.

In addition, solder can wick up the

copper strands, making them stiff and brittle. Finally, the solder drain hole in the lug can let in moisture to cause corrosion. I have seen these things happen, even in professionally soldered lugs.

The better alternative is a properly crimped connection. This includes: an anti-corrosion compound inside the lug; the stripped copper cable end inserted deep inside the lug; a deep crimp made by a proper crimping tool; and a section of heatshrink tube over the joint. I have never had a failure from this type of crimp, and they show

no corrosion, even years later.

One type of crimper looks like a big set of bolt cutters, but it is awkward to use. I prefer a small tool with a cradle for the lug and a spring-loaded punch in a guide sleeve. It works.

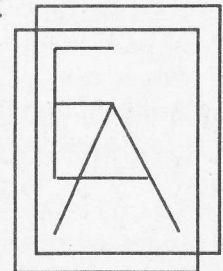
Send your questions to Mike Brown's EV Q&A, POB 1113, Felton, CA 95018 or fax (408) 429-1907. Include address for reply. Mike Brown has 28 years of professional automotive experience, & 16 years of professional conversion experience. His book, "Convert It", is available for \$30.00 postpaid in the U.S. & Canada.

MIKE BROWN'S EV Q&A

**Brought To You By
ELECTRO AUTOMOTIVE
POB 1113-EAA
FELTON, CA 95018
(408) 429-1989**

Kits * Books * Videos * Training * Consulting * Design * Catalog \$6.00

**Conversion
Expertise
Since
1979**



OP-ED: Behind the CARB Revision

by Clare Bell

Although the retreat from 2% didn't surprise the public, the auto industry's offer to supply EVs in 1996 and 1997 did. Why would they fight the mandate tooth and nail, then turn around and offer early, if partial, compliance? Certainly part of it is autonomy — the automakers never like anyone telling them what to do. But ZEV watchers and analysts suspect that other factors may be playing a part. GM's Impact, for one. This is the car that gave EVs credibility, and a reason that justified the mandate. In the public's eyes, if GM could build EVs, then EVs were real.

The Catbird Seat

GM's enthusiasm and support started in as high-powered a way as the car itself, but gradually turned into balkiness. Even though their EV gave CARB's ZEV program credibility, they criticized the mandate, saying that it legislated competition. GM is clearly positioned in the catbird seat. They have a good technology, they've made fifty of the cars and can hardly get them back from rapturous PreView drivers. If the other companies stayed out of the California EV market, GM could probably pick up the sportscar end of it in a snap and soon follow with a family sedan and pickup. These EVs would become essentially just another model in their lines of short-production-run specialty cars, such as the Viper. The cars wouldn't even be built in Detroit — they'd be farmed out to short-run houses or Japanese manufacturers. Small-volume specialty cars are a great market — how do you think Porsche survived all these years (they did have a struggle, it was true, but now they're in the black).

Here's a possible smoke-filled room scenario. This is still speculation, since CARB hasn't released the contents of the various auto manufacturers' offers, but it's probably close.

GM Wants It All

GM feels that the EV market is small enough that it doesn't want to share with anyone else, even if its competitors were being forced to enter. It also doesn't like the mandate on grounds of principle. If the across-the-board two percent in 1998 rule were to go away, GM may have whispered in CARB's ear, "maybe we could spring loose a few Impacts in 1996. No skin off our nose, especially since we've got a head start. We'll just have Delco do the power trains and one of our short-run houses can put the works together. And with the Ovonic NiMH battery in our pockets, we can give the cars performance that justifies a BMW or Porsche or Viper-type 50-60K price. In that bracket, wheels are status and identity, not transport. If the hottest car on the block is an Impact, the movers and shakers will buy one without even caring that it's an EV. We make the bucks, you get a few thousand ZEVs, so how about it?"

To an Air Board faced with intransigence all around, even from the Japanese, such an offer from the biggest kid in the gang would be tempting beyond belief. One would scarcely blame CARB if they did — or do — accept it.

No Big Stick

The surprising reluctance of the Japanese automakers to enter the EV market has also contributed to the ZEV revision. If CARB had the threat of a Japanese EV tsunami as a big stick to intimidate the domestic producers, we might have seen more alacrity on the part of the Big Three and less of an effort to topple ZEV. But the big stick refused to co-operate. Toyota, Nissan, Mazda and their clan sided with their balky US brothers. Why exactly, one isn't sure. Perhaps these companies are acquiring some of the illnesses of

gigantism have plague the big three. If it isn't a multi-million-yen market, don't even bother with it. Or perhaps they, like their US counterparts, are under hidden but heavy pressure from oil interests in their own country.

At any rate, we won't know more until the December 6th and following CARB workshops. *Hang in, don't lose heart and Keep EV-ING.*

Comments on APUs

If you are going to run an APU, PLEASE retrofit it with a catalytic converter so that it doesn't make any more smog than a gas car's engine. Remember what the point of all this electric stuff is — cleaner air. And put a good muffler on it so that it doesn't bust the eardrums of the folks around you.

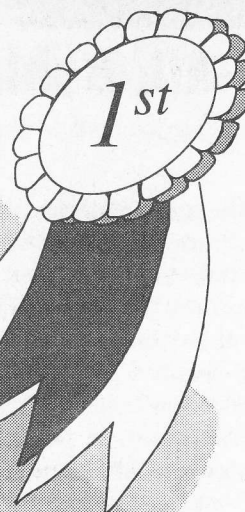
APUs have to run at constant high RPMs (that's how they get their efficiency) and some of them can be LOUD. In the LA Clean Air Road Rally, I parked overnight near one of the hybrids and that thing was just plain obnoxious. — I couldn't talk to anyone through all that roaring and blating. Hybrids don't have to be that way. Cats and mufflers are available through mail-order catalogs such as Northern Hydraulics.

If you are going to build your own APU from a commercial genset, note that the larger Honda engines come with catalytic converters and meet the California Air Resources Board emission requirements for small engines.

Some areas also require spark arresters, which are not a bad idea either. — CB

THE CUSTOMER COMES FIRST!

EVA is the First Choice for Electric Vehicle Components and Services.



The Best Components

- Advanced D.C. Motors
- Curtis PMC Controllers
- Curtis DC/DC Converters
- Lester & K&W Chargers
- Trojan Batteries
- EVAmerica® Member Discounts

The Best Service

- EV Calculations
- Installation Book
- Wiring Schematics
- Video Rental
- Tool Rental
- Mastercard/Visa/Discover

When you need components and service call EVA.

We are the first choice!

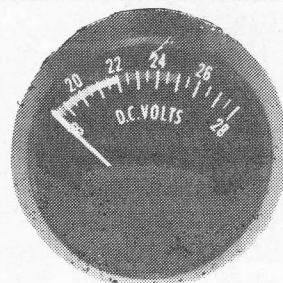
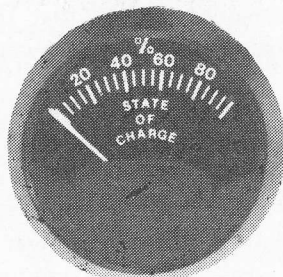
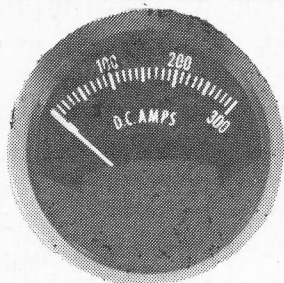
Electric Vehicles of America, Inc.

48 Acton Street PO Box 59 Maynard, MA 01754-0059
(508) 897-9393 Fax (508) 897-6740

Committed to Quality and Safety

**Chevy S10
conversion
by EVA**

ELECTRIC VEHICLE INSTRUMENTS



Analog Instruments to Monitor

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

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

WESTBERG MFG. INC.

3400 Westach Way, Sonoma, CA 95476 U.S.A. Phone (707) 938-2121/Fax (707) 938-4968



Solar Car Beats Corvette Off the Line

by Richard R. Rahders

The day after a rainy finish to Sunrayce '95, three solar cars braved fog and sleet to run in the Pike's Peak Solar Challenge up 6.2 miles of twisting asphalt through 2,000 feet of elevation gain. But the story was not Northern Essex College's comfortable victory over Mankato/Winona and Montana State and establishment of a 37-mph speed record; the story was the start, where NECC would have outrun the '96 Corvette pace car that started with a 40-yard uphill advantage if NECC driver Olaf Bleck had not braked when even with the pacer.

Most teams were too exhausted after Sunrayce, or too apprehensive about weather and road conditions, to make the trek to Pike's Peak, but those that did had an unforgettable experience. "The vehicles coming down the mountain from morning practice for the July 4th Pike's Peak race were pretty exotic, 800-hp. Porsches and trucks and specialty racers," said Jim Troyer, Arizona State U. Solar Car Team Captain, who was helping out with NECC. "But those teams thought WE dropped in from outer space."

Once the mountain was clear it was decided to run the asphalt instead of taking the regular route higher up, which had become a mire of mud and snow. Teams had to run in Sunrayce configuration but could use any batteries, so NECC sponsor Jesse James found hot light wheelchair 12-v lead-acid gel-cells for NECC at BENTLEY ONE in Denver.

Teams stayed up all night the night before the race at Manitou Springs High School, charging and heating batteries and adjusting running gear. NECC went off with a 120-lb., 98-

degree F., 120-v. battery pack trickle-charged at milliamps at the top end. "We were pretty hot, even though the day was in the high 30's at the start", said team co-captain Bleck.

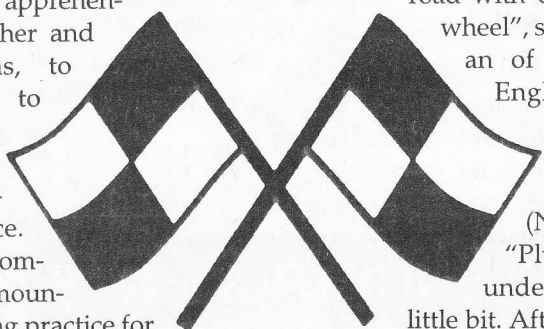
NECC was given starting position, 40 yards downhill from the pace car and the video van, and Mankato/Winona and Montana started at one-minute intervals. When the green flag waved, Bleck jumped off the line, passed the video van, and was alongside the roaring Corvette before he had to hit the brakes to stay behind the pace car.

"The 'Vette was slowed up by the altitude, and we stuck better to the wet road with our narrow drive wheel", said Bleck, a veteran of the Team New England record-breaking performance at the '94 Mt. Washington (N.H.) Hill Climb. "Plus, I think they underestimated us a little bit. After all, a 15-horsepower-peak motor just doesn't sound that impressive to most gearheads."

Race officials were stunned and excited by the start, and the pace car driver was chagrined. They all were clearly working on stories for their grandchildren, but apparently no one was working on stories for the media. The Sunrayce '95 information service carried not one article about the race after it happened, although it had been promoting it beforehand, and even local papers and television had no coverage.

The event was sponsored by Chevrolet. — RRR

Well, YOU covered it, Mr. Rahders. And CE printed it. We look forward to more on the Essex College- Team New England car and they're building a brand-new one for the Australian Solar Challenge! — CB



Letters to CE

by CE Staff

Dear Editor:

I enjoyed reading the article, "Plant Trees to Offset EV's Gases" on the creation and mitigation of carbon dioxide associated with the use of EVs.

However we should be careful whenever showing any EV downsides to compare them with the usually worse conditions caused by ICEVs.

A report by the Union of Concerned Scientists ("Emission Benefits of Electric Vehicles") states that, taking into account power plant emissions, there are enormous emission reduction benefits resulting from the use of electric vehicles.

It states that carbon dioxide is reduced by 60% when using EVs. It goes on to state that reductions for carbon monoxide, volatile organic hydrocarbons, and nitrogen oxides were found to be 99.8%, 90% and 80% respectively.

Any opportunity that we have to show off the many environmental and other societal benefits associated with the use of EVs should not be wasted.

Sincerely,

Morris Altschuler, 311 Lorrain Drive,
Rockville, MD. 20852

Dear Morris,

And the opportunity is not being wasted, thanks to your letter. By the way, the Union of Concerned Scientists is doing a magnificent job in this regard. EAA will be trying to work more closely with them. — CB

Dear Editor,

Got a question. Have you ever seen statistics on the number of Evs registered in such countries as France, Italy, Germany, Switzerland, Denmark and Mexico? If so, would you share them?

And if not, would you be willing to run a query in the Current EVents? Something like this:

continued on page 11

Announcements

By Clare Bell

ALERT, ALERT: CHANGE IN CE SCHEDULE

Another change in the offing is CE's schedule. We're asking that contributions, letters, op-ed pieces or any other material be on the editor's desk by the 25th of each month. That gives aforesaid editor sufficient time to review and edit the piece and eases the "end-of month" crunch (read "outright screaming panic"). So, folks, if it ain't here by the 25th, it gets bumped to next issue. Okay?

Regional and chapter coverage

CE is also continuing and expanding its efforts to cover the entire US rather than just Northern California. We now receive (and print) stories from all over the US, however, when the crunch is on, it is too easy to slip back into the old local newsletter mode. What I'd like to do is set up several regular CE correspondents in various regions of the US and overseas. Several folks have indeed volunteered to do this and I am responding to them (hopefully not too belatedly). Perhaps EAA and CE can develop, through the chapters, several regional news organizations in various areas of the country (you know, like the ones the BIG newspapers and magazines have).

In addition, CE is offering a free page or more per issue to any EAA chapter to reprint items from chapter newsletters (or entire pages from chapter newsletters) or chapter reports. We'll probably do this on a rotating regional basis, i.e. one month we'll feature a chapter from the Midwest, the next month, a chapter from the Southeast, and so on. Eventually we'll bring on an additional editor to coordinate this, but while it gets going, I'll be the one.

Another CE feature that has been a bit neglected of late is the letters column. Under Paul Brasch, the letter column served as a vital forum for EAA members to share information, opinions, controversy and encouragement. Although the Internet EV Discussion List has taken over much of that (and expanded it tremendously), there is a role for such a forum in print media, and CE is the proper place. Recognizing the importance of

the lettercol to EAA's vitality as an organization, CE will dedicate at least a page per issue to letters from members and look around for a volunteer letters editor.

Ruth Shipley will continue to do her wonderful job on News In Brief, we'll have a larger and more complete calendar, we'll do more DIYs, and yes, we will run the backlogged material that folks have so generously sent.

Other Ventures

CE will also begin experimenting with newsstand sales. With the 24-pager, we have more of a "real magazine" feel. With improved production standards in 1996, CE will also take on more of a "real magazine" feel, although we will do this slowly and try to avoid becoming just another slick publication.

CE has a unique quality to it that we want to keep even as we grow and develop.

As part of EAA's entry into Internet and the World-Wide Web, back issues of CE will start going on-line in mid 1996, possibly earlier.

Neat, hey? (Now if ye olde editor could just clone herself....) — CB

Photography Contest

Get those great EV photos out. CE will be announcing a Photography Contest in the next March '96 issue of CE. There will be many categories and prizes for your best EV photo.

New Want Ad Section

A new section for commercial want ads will be available. Look for details in the March '96 issue of CE.

Letters to CE

continued from page 10

I am looking for figures on the number of cars and trucks registered in such countries as France, Italy, Germany, Switzerland, Denmark and Mexico." If you have any, I'd be grateful to hear them.

Noel Perrin, RR 1, Box 8, Thetford Cntr, Vt. 05075

Dear Noel,

I don't have these figures, but I imagine some of our CE readers do, or know where to get them. How about it, folks? Can we get Noel Perrin data on overseas EVs? For Mexico a good source might be Steve Van Ronk, of Global Light and Power. He's been doing some good work with student EV projects down there. — CB

Dear Editor;

I have just read the March 1995 (vol. 27, #3) CE. I Like It! There are no chapters of the Electric Auto Association near me; Key Largo, FL. The nearest is in Titusville, FL, about 300 miles north of Key Largo.

Is there some way our Library could receive the CEV Newsletter monthly so myself and all others (who come into the library), can READ the current newsletter? We all just might LEARN something about electric autos.

John R. Hagstrom, 215 W. 2 Ct., K.L.
T.V., Key Largo FL, 33037

Dear John:

You can become a member of EAA without having to be in a chapter (though it's more fun being in a chapter!) CE comes as part of an EAA membership, so you could ask for your copies to go to the library. There's a membership application blank in this issue. There's also a chapter listing — you might check it again. Or maybe you and your friends want to start a chapter in the Florida Keys. Nice place for EVs, I would think! — CB

An EV in the Hand . . .

by Sparkz

So you are standing eyeball to headlight with an EV for the first time. An encounter with this critter can feel a bit daunting, especially if you weren't born with a wrench in your fist. Many EAA members or EV advocates are "gee, I've never even changed the oil before" types (this applies to both men and women). And, despite the title, you aren't dummies; your expertise lies in areas other than electric power systems and automotive mechanics.

Well, Silicon Valley software mavens, New England engineers, Arizona artisans, Pennsylvania poets, Texas tornadoes and Georgia geniuses, in the words of the beer commercial, this one's for you.

I was once where you are now. Yes I did have some engineering background, but it wasn't that applicable. High power scared me. I didn't know doodily-squat about batteries and only enough about motors to be dangerous. As far as automotive expertise went, I once put the lugnuts on backwards after my first brake job on a Datsun B210 and nearly lost the rear wheels while tootling along in San Jose (they were splayed out at the most amazing angle by the time I stopped).

Anyway, such are my qualifications or lack thereof. Onward into the innards of an EV.

Most EVs come in two flavors, conversions and built-from-the-ground-up-ers. The most numerous at this point are conversions — gas cars that have had the gas guts replaced with things electric. So, you ask, what are these things and what do they do?

(At this point, I go into some really basic stuff for those who know zip about electricity. If you feel in danger of having your intelligence insulted, skip to part B.)

The REALLY Basic Stuff

Let's start with a mini-EV. If you've got kids, you've probably tripping over little EVs all around your house — toy cars

and trucks that run on flashlight batteries. You turn them on, put them on the floor and they run under a chair or into a corner and get stuck. No matter. Fish one out from behind the cat's litterbox or the coffee table and take a look at it.

Leonardo Did It Too

All EVs, from the turn of the century Bakers to today's GM Impact, are basically scaled-up versions of these little Radio Shack runabouts. Not that full-scale EVs are toys, oh no. The GM Impact can blow the doors off a Mazda Miata and an Italian EV just recently topped the 190 mph mark. We're just using the toys as models. So did Leonardo da Vinci.

Incidentally, toys run on electric drives because they are simple, cheap, easy to manufacture and safe enough for kids to use. Think about that.

OK, so you've got your son's/or daughter's mobile rugrat entertained mobile up on the desk. It probably has a switch thingy on the bottom. Turn it on, it runs. Turn it off, it stops. Dump out the batteries. It'll probably have at least two, perhaps as many as six.

You have in your hands the bare-bones basics of a full-size EV. The batteries that store this mysterious thing called electricity, the wires that hook the batteries up to the motor and a switch that starts and stops the motor. Put the batteries back and turn it on. It runs, right? (unless you stuck in a battery backwards.) So what is going on here?

Racehorses

The show starts with the batteries. One end is marked plus, the other, minus. When you tape a wire to each end and connect up a light or motor, the bulb lights or the motor runs. If you play around with batteries, wires, lights and motors, you soon discover that electricity (like a bunch of little racehorses) likes to run around in closed tracks from start to finish. These tracks are called circuits. For physical and chemical reasons, the

track must be made of a metal such as copper, steel or aluminum.

These metals let electricity run through them easily; they are called conductors. Rubber, plastic and wood block electricity; they are called insulators. Wires have a conductive metal center (the track for the electricity to run in) and an insulating coat (to keep the electrical racehorses on the track)

What Goes Around Comes Around...

To change analogies, a battery is like a pump that pushes water out into a pipe. If you run your pipe back around to the pump's intake, you have a circuit ("cir" is a Latin root, meaning around, as in circle.) The same with the electricity in a battery. If you run a metal wire (don't actually do this, just imagine it) from the plus terminal to the minus terminal of a battery, the electricity will happily run around from plus to minus. That is a closed circuit. (The electricity will be so happy, in fact, that it will run like a bunch of demented little racehorses from plus to minus, drain the battery and burn or melt the wire. This is called a short circuit. It results in dead batteries, burned or melted wires, rapid heartbeats, and possibly the release of a certain amount of battery contents as steam or smoke. Avoid.)

If you cut the your pipe circuit, the water will all spill out on the ground. If you cut (or "open") your wire circuit, the electricity doesn't spill out, it just stops, like a line of frustrated racehorses facing an obstacle they can't jump. A switch is just something that opens and closes a circuit.

So we've got four really dumb basic things about electricity: 1) it likes to run around in closed tracks made of metal (wires), 2) it runs from the plus side of a battery to the negative side, 3) if you cut the wire or open a switch, it stops, and 4) if you connect a light or motor into the circuit, the light shines and the motor

runs (WHY a motor runs is something this column will go into later— all we have to know is that it does).

Knowing those four things, you can understand what is going on in both mini and maxi EVs.

When you load up the batteries (with the switch off) the mini-EV won't go. The electricity in the batteries is like a bunch of racehorses ready to run, but until the starting gate releases, nothing happens. Slide the switch and you close or complete the circuit. OK, simple. The electricity runs from the battery positive terminal, out the wires, through the motor, making it run, and back to the negative terminal. The motor spins, turns the wheels.

The earliest EVs were exactly that — batteries, switches and motors. Really easy. That's why the first EV was built much earlier than the first gas car — in the 1830s versus the 1880s. The batteries weren't rechargeable, but the thing ran. Rechargeables came along in the 1850s when LaPlante developed the lead plate, dilute sulfuric acid technology that is still going strong today.

The Battery Lineup

Why does your mini-EV need more than one battery? To get the car moving requires a certain amount of oomph out of the motor. The motor power comes from the amount of "push" in the batteries. This "push" is called "voltage". To return to the fluid-circuit model, if you put another pump in-line with the first one, the water would flow much faster. It would also turn a much bigger and heavier paddlewheel, if you stuck one in. Batteries are like pumps in that respect — if you line them up, plus to minus, their individual "push" amounts (or voltages) add up.

The more batteries you have "in series" or lined up with each other, the more push or voltage you get and the bigger or more powerful motor you can drive. Note that the amount of electrical

"Electricity . . . likes to run around in closed tracks from start to finish."

flow ("current") stays the same, but it moves faster. If you prefer the equine analogy, it is the same bunch of racehorses, but their eagerness (voltage) to go from start to finish is increased and they run faster.

So we have all the bits of a very basic EV — batteries connected in series to produce a "push" or voltage that will run the motor, a switch to open or close the circuit and a way to link the motor to the wheels. Close the switch and hi-yo Seabiscuit, off we go!

The Usual Basic Stuff

If you've jumped to this point, you feel you have a good understanding of how a mini-EV, such as a toy truck or car, works. OK, so what happens when you scale the little guy up into something like a Chevy Blazer? Lets look at the basic bits or components in turn.

Motors — Most of the maxi-EV motors are just scaled-up versions of the little guys. The most common ones are called series-wound DC motors. In mini-EVs, the motor is coupled directly to the wheels, or uses a very simple small gearbox (in most cases, just to make the motor shaft turn a corner). In maxi-EVs things get a

bit more complicated. Some built-from-the-ground-up lightweight EVs stay simple (and efficient!) by just connecting the motor directly to the wheel via a shaft or a belt. Most EVs are conversions from gas cars that have more complex gearboxes, or transmissions as well as clutches.

What's a Tranny, Granny?

Gas car engines have to keep running all the time. If they stop, they stall and have to be re-started (by an electric motor!). Gas car engines turn much faster than the

continued on page 18

An invitation to join NESEA's eighth annual

AMERICAN TOUR DE SOL



MAY 10-17 1996

NEW YORK CITY

to

WASHINGTON DC

NORTHEAST SUSTAINABLE ENERGY ASSOCIATION

50 MILES STREET • GREENFIELD, MA 01301 • (413) 774-6051 FAX (413) 774-6053

Please send me more information on:

☐ Entering

☐ Sponsoring

☐ Exhibiting

☐ Volunteering

Name _____

Company name _____

Address _____

City, State, Zip _____

Phone _____ Fax _____

Technicorner: Introducing the Fisher "Ranger"

by Ken Koch, KTA Services, Inc. (reprinted with permission from EVAOSC News)

What would it take to get more of the American car-buying public to make their next car an electric? Certainly economics plays an important role, but almost as important is the "limited" range per charge issue. Many Americans want more range capability. We all know that the average second car in a two-car household seldom goes more than 30 miles per day. Based on that statistic, there should be a lot more onroad EVs than the estimated 2,200 or so on US roads today.

Most transportation studies suggest that the American public begins to have warm fuzzy feelings about EVs when they acquire a guaranteed range of 150 miles. A survey by Design News Magazine projected that market acceptance could be as high as 33.3% for 150 miles—compared to only 25.2% for 100.

Range, of course, is a nebulous thing, affected by how the vehicle is driven (speed and acceleration.), hills, battery factors (capacity, temperature age), vehicle factors (aerodynamics, rolling resistance) and so on. A 50-mile EV can quickly become 20 miles if hotrodded, or 100+ miles if driven conservatively and skillfully. Nevertheless, 40-80 miles seems to be the practical limit for today's lead-acid-powered DC systems. Those who want more still have to wait for newer battery technologies which are still too costly or not yet available. Another alternative is to extend range by using an Auxiliary Power Unit (APU) such as an alternator or generator driven by a small gas, propane or NG-fueled engine.

Hybrid EV Problems

EV purists are quick to point out the elegant simplicity of an EV. Adding an APU only complicates the system while generating the same (or more) pollution and noise than a gas car. Still, an EV with an APU (otherwise known as a series hybrid) serve a practical and useful function until battery technology catches up.

Most attempts at hybridizing EVs have resulted in less than sterling performance. Aside from carrying around an APU which is heavy, noisy and polluting, hybrid shortcomings derive from an undersized APU or a voltage/impedance mismatch between the APU and the battery pack. Since the average subcompact conversion needs 13.5 kW to sustain 55 on level ground, an APU of 6 kW will provide only 35-40 mph without dipping into the battery's energy. The APU must also provide a voltage when loaded that is not too high or too low compared to the battery pack. If it doesn't, the result is a short-range EV, an overworked APU, or both.

Fisher Electric Technology's "Ranger" Hybrid Trailer

The ideal EV is one that can satisfy most of your transportation needs as a pure electric. You only need an APU for trips that exceed the EV's range, so why haul it around when you don't need it? And put all that smog, noise and vibration behind you by putting it into a detachable trailer, attached only when needed.

The hybrid trailer concept itself is not new, but what Fisher has done is. Fisher's APU is based on their patented Neodymium-Iron-Boron Alternator technology, with optimized efficiency and high power-to-weight. The 13.5 kW unit in their APU weighs a scant 28 lb.! Coupled with an industrially-rated 20 HP OVH V-twin engine that weighs 92 lb., Fisher's "Ranger" trailer is aerodynamically packaged and weighs only 250 lb. The engine has its own 12V battery for electric start. Trailer dimensions are 90" L X 37" W x 37" H. Fuel capacity is 6.3 gallons. All "Ranger" components are pro-



tected from weather and road hazards. The trailer is road-legal, fully sprung and comes with brake- and tail-lights.

The "Ranger" unit with all basic and optional features is available for \$10,000 with 10-12 week delivery. The complete unit also includes Fisher's AC to DC converter, and compatibility with a 240 V (+/- 12.5%) battery pack. If you want compatibility with lower voltages, such as 120 or 144, Fisher can vary the stack length of its alternator for an additional \$200. The APU sans trailer is available for \$6,000, with an 8-10 week delivery. Other options are available, including the works in kit form.

In the last 3 years, Fisher alternators have been specified for battery charging hybrid electric vehicles by more than 15 universities in numerous competitions and races. Gene Fisher, VP of research and development, said that the company expects to sell the "Ranger" to EV clubs, fleets and individual EV owners. "A group of EV owners might buy one unit to share." Fisher soon hopes to introduce a powerful new traction motor.

Access:

Fisher Electric Motor Technology, Inc., Jerry Mirsky or Jeff McClellan, 2870 Scherer Drive, St. Petersburg, FL 33716, Tel: (813) 572-9328, Fax (813) 572-8420.

Federal Emissions Testing Doesn't Reflect Real Driving

By Clare Bell

Despite all the pollution-control measures instituted in recent years, auto emissions remain 5 to 10 times above permitted levels.

Why?

The reason for the disparity is the subject of an analysis in the Feb/March '95 issue of the MIT Review. The article comes up with some interesting insights which strengthen the argument for replacing internal combustion with electric.

Emissions from old cars still on the road are part of the problem, but greatly exaggerated, said the MIT Review. Ten percent of more recent models have developed engine or exhaust problems and this appears to be the largest source of excess pollution. But there is another significant contributor; the fact that "the official method of measuring automotive emissions is grossly misleading."

"Each second of driving with the pedal down corresponds roughly to 30 minutes of carbon monoxide emissions and 1 minute of hydrocarbon emissions..."

The Federal Test Procedure involves dynamometer testing (car on rollers) while following a simulated urban driving cycle. The MIT Review article points out that the FTP cycle "virtually ignores the episodes of driving that contribute disproportionately to overall emissions: the bursts of high power needed to climb hills and accelerate at high speeds."

For today's catalytic converters to work effectively on the exhaust, the engine's fuel/air mix must be controlled. That is done via feedback from an oxy-

gen sensor in the exhaust line. When the driver demands high power, "today's cars override this sensor and inject excess fuel into the cylinders — typically 20-30 percent more..." The resulting exhaust is more than the catalytic converter can handle and emissions go up by orders of magnitude.

"Each second of driving with the pedal down corresponds roughly to 30 minutes of carbon monoxide emissions and 1 minute of hydrocarbon emissions..." with reference to the levels during mod-

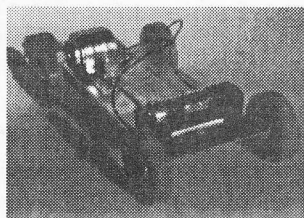
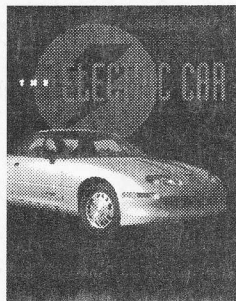
continued on page 19

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

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

Electric Car

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

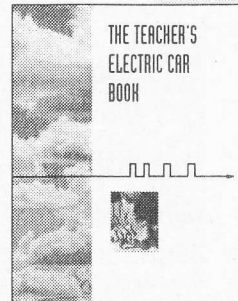


The Electric Flyer model kit

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

The Teacher's Electric Vehicle Book

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



Electric Vehicle Classroom Kit

The materials and suggestions a teacher needs for a super, hands-on unit on electric vehicles: 35 *Electric Car* color booklets, 5 *Electric Flyer* model kits, and 1 *Teacher's Electric Vehicle Book*. \$99.95 (a \$143.95 value) + \$12.50 S&H.

(California residents, please add appropriate sales tax)

EV Media—A resource for community and school-based EV education. 612 Colorado Ave., Suite 111, Santa Monica, CA 90401

Ph: 310.394.3980

Fax: 310.394.3539

News in Brief

Compiled by Ruth Shipley

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

CARB Seeks Advice From Automakers

The California Air Resources Board (CARB) has asked automakers to suggest an alternative to the EV mandate that would be just as effective in reducing auto emissions. The action followed an independent panel's report that advanced batteries will not be available by 1998. According to CARB Chairman John Dunlap, automakers may be willing to propose alternatives to the EV mandate that they have spent much of their time trying to scuttle. One of CARB's ideas is to have automakers launch large test fleets before 1998 to evaluate advanced batteries.

"I don't think that automakers really want to launch a new test fleet before advanced batteries are ready," said one Big Three executive.

(AUTOMOTIVE NEWS: 10/30, p.4)

SoCal Edison on Info Superhiway

Southern California Edison has established an Internet World Wide Web site. The company's home page is <http://www.sce.com>. The site features general information about the company and its products and services for commercial and private customers. It also serves as an information forum on issues related to electric transportation, including the impact of EVs on the state of California and recent news on the development of EVs and the necessary infrastructure. It contains links to other places that contain news related to EVs, such as Calstart, the California Energy Commission, GM's national Impact testing program and the

Green Wheels Electric Vehicle resource list.

(KEEPING CURRENT: FALL 1995)

EPA Undermines Mass. EV Law

Massachusetts Attorney General Scott Harshbarger has accused the EPA of undermining the state's EV mandate by supporting an alternative proposal under which carmakers will sell cleaner gas-burning cars in every state but California. "EPA's apparent endorsement of the automakers' 49-state proposal is misguided," Harshbarger wrote in a recent letter to the agency. An EPA spokesperson says the agency just wants cleaner cars for the entire country. But because the 49-state plan is voluntary, Harshbarger believes automakers could later back out and should not be trusted. Meanwhile, Massachusetts Environmental Affairs Secretary Trudy Coxe has offered to delay the EV requirement from 1998 to 2000.

(BOSTON GLOBE: 11/01, p.42)

Renault Will Supply EVs to Swedish Group

Renault has won a contract to supply 150 EVs to Nutek, a Swedish public sector organization that promotes energy conservation and technology. Swedish authorities and public and private sector companies will test an electric version of Renault's Clio hatchback. Nutek will provide a subsidy of \$2,273 per vehicle. Each car has a top speed of about 95 kph and a range of 85 km.

Currently, EV test programs are under way in Sweden's three largest cities, Stockholm, Gothenburg and Malmo. The French government recently announced it would subsidize EVs to meet its goal of 100,000 EVs in France by the year 2000.

(FINANCIAL TIMES: 11/02)

Physicians Testify at CARB Hearings

Two Southern California physicians testified at the California Air Resources Board (CARB) hearings in November that air pollution in the Los Angeles basin is affecting the health of its residents. Dr. Robert Zweig of Riverside, CA, cited a study published in the American Journal of Public Health which found that 11.4% of hospital admissions for heart failure in LA are due to carbon monoxide poisoning. Dr. Russel Sherwin of USC told CARB that one of every two Los Angeles county youths 14- to 24-years-old has severe bronchitis or severe lung disease because of environmental pollution.

(EIN STAFF: 11/14)

Base Recommissioned for EV Manufacturing

Hanger 20 at San Francisco Bay's Alameda Naval Air Station will be recommissioned from military to civilian use as a development and manufacturing site for electric and other clean-vehicle technologies. Amerigon Inc. has received funding under a partnership with the U.S. Department of Transportation and CALSTART to build a state-of-the-art facility to develop and build a range of EV body and chassis styles off a single assembly line. Other tenants will include Alamo, CA-based Jefferson Programmed Power, which will design digital and programmable controllers, and U.S. Electricar. Green Motorworks, of North Hollywood, CA, will maintain PIVCO "CITI" electric commuter cars at the base.

(BUSINESS WIRE: 11/10)

ZEV Mandate Dead — Or Is It?

It appears that automakers have won the battle to kill California's 1998 ZEV mandate but they must pay a price for their

victory. The California Air Resources Board (CARB) recently decided to drop a rule that 2% of all new vehicles sold in the state in 1998 be zero-emission vehicles. However, CARB has let stand the later requirements of 5% EVs in 2001 and 10% in 2003. And all three US automakers have agreed to produce several thousand EVs for California in 1996 and 1997 and to manufacture large numbers of advanced batteries for cars beginning in 1998. CARB's decision came after a battery audit revealed that advanced batteries would not be ready by 1998.

(REUTER: 11/17)

CPUC Cuts Funding for EVs

The California Public Utilities Commission (CPUC) has unanimously turned down a request by electric utilities to recover \$600 million in EV development costs from ratepayers. Instead, the industry will only be allowed to pass on \$132 million in costs. "This is a big win for energy consumers," said Nettie Hoge, executive director of the utility consumer group Toward Utility Rate Normalization (TURN). "Just as importantly," said California Manufacturers Association President Bill Campbell, "it recognizes the principle that utility shareholders — not ratepayers — should pay for risky electric vehicle programs." For more information, contact Barbara Simpson with Californians Against Utility Company Abuse (CAUCA) at 415-340-0470.

(CAUCA RELEASE: 11/21)

Solectria Sunrise Passes Crash Test

A prototype of the world's first all-composite EV designed for mass production, the Solectria Sunrise, has successfully completed crash-testing, according to Solectria Corp. A company spokesperson said injury levels sustained by the vehicle's two crash-test dummies in the stan-

dard 30 mph frontal impact were well within allowable limits. Slated for introduction in 1998, the full-size, four-passenger sedan uses Ovonic nickel-metal hydride batteries, and the same AC induction drive system presently used in Solectria's Force sedan and E-10 pickup truck. For more information, contact Karl Thidemann at 508-658-2231.

(SOLECTRIA RELEASE: 11/22)

Saft Opens Battery Plant in France

Georgia-based Saft America recently completed a production facility in Bordeaux, France to mass-produce the company's nickel cadmium batteries. The batteries will be used in EVs developed by French automakers Renault, Citroen and Peugeot. The dedication of the plant represents the culmination of a cooperative agreement between Saft, PSA and Renault that began in 1992. A total of \$20 million was invested in the plant, which is expected to have an initial production capacity of 5,000 batteries per year. As demand for EVs increases, the partners expect to upgrade the plant's production capacity. For more information contact Saft America, 711 Industrial Boulevard, Valdosta, GA 31601, 912-247-2331.

(SAFT RELEASE: NOVEMBER 1995)

SoCal Edison to Implement EV Programs

The California Public Utilities Commission (CPUC) has approved funding for Southern California Edison's EV program, which includes supporting EV infrastructure needs, obtaining EVs for the utility fleet, helping educate customers about charging EVs and assessing utility system impacts from EV charging.

ELECTRIC VEHICLE

ONLINE TODAY

Month-In-Review

Executive News Summary Service

- Electric Vehicles
- Hydrogen
- Fuel Cells
- Hybrids

TIMELY • RELIABLE • COMPREHENSIVE

Tracks current legislation, regulations, science & technology, industry initiatives, conference announcements, and more.

For a free fax trial, contact:

ENVIRONMENTAL INFORMATION NETWORKS

119 South Fairfax Street, Alexandria, Virginia 22314

Phone: (703) 683-0774 Fax: (703) 683-3893

The programs cost about \$7 million per year and will be implemented with a 25 percent rate reduction after adjusting for inflation by the year 2000. For more information, contact Paul Klein of Southern California Edison at 818-302-2255.

(PRNEWswire: 11/21)

Emissions Study Supports EVs

An analysis conducted by the Santa Barbara Electric Transportation Institute in California found that the implementation of electric shuttle operations on the Santa Barbara Metropolitan Transit District's Downtown-Waterfront Route has eliminated more than 10 tons of pollution during four years of operation. The institute compared emissions of NOx, ROG, PM10 and CO generated by a diesel-engine Villager and an electric Villager. The diesel Villager produced 34.6 grams of pollutants per mile, while the electric Villager generated only 0.301 grams per mile at the power plant. Over 279,679 miles of operation, the diesel bus emitted 21,300 lbs of pollutants, while the operation of the electric shuttle released 132 lbs of pollutants.

(CURRENTS: FALL 1995, p.14)

Hybrid Power Trailer for Honda CRX

by Alan Cocconi, AC Propulsion

The pure electric CRX is easily converted to a serial hybrid by attaching a hybrid power module to a tow hitch. The hybrid trailers have logged 5,000 test miles including trips from Los Angeles to Phoenix, Las Vegas, Sequoia Canyon and Yosemite. Typical test runs start with the vehicle fully charged and the 5-gallon fuel tank in the hybrid module full. The vehicle is driven in pure electric mode in the urban area and the hybrid is remote-started en route. Fuel economy is based on mileage driven with the hybrid operating and battery state of charge (SOC) is equal at the beginning and end of test. The battery SOC is typically around 80% during operation. It will fall below this level on prolonged high-speed grades, and the hybrid is remotely turned off at high battery SOC.

Two versions were tested in-vehicle:

Module I has a gas-powered, closed-loop emission-controlled 9kW generator. Powerplant and trailer weigh 340 lb.

Module II has a gas-powered 14.5kW generator. Powerplant and trailer weigh 240 lb.

Results

Module I output is sufficient to maintain 60 MPH average speed with no average drawdown of battery pack. Fuel economy for serial hybrid is approximately 42 MPG at 60 MPH with no overall charge in battery SOC.

Module II output is more than sufficient to maintain interstate speeds of 65 MPH and provides a margin for prolonged grades and continuous headwinds often encountered in western deserts. Fuel economy is 45 MPG at 60 MPH with no overall change in battery SOC.

[Combined with the highly efficient AC Propulsion CRX,] the hybrid design allows the pure EV with a limited

range to operate with unlimited range for long distance travel. Packaged as a trailer, its use is discouraged, but quite functional for extended trips. The hybrid's acceleration and hill-climbing exceed that of most internal combustion vehicles. With unlimited cross-country driving at continuous speeds of 65 MPH, the performance and practicality are attractive to the consumer on driveability and convenience alone, regardless of environmental concerns and incentives. — AC

Editor's Note: This hybrid trailer is designed specifically for the AC Propulsion CRX, which runs at 336 V. It has not been tried with any other EV and would have to be adapted to cars with lower voltage packs.

The price is also high (\$20,000) reflecting the quality engineering and construction Cocconi puts into his design.

Excerpted from "Functional Electrics: The Technology is Proven" in "Compilation of Papers — REDI Conference '95 — PVs and EVs — California Leads the Way." For copies, contact REDI, 733 S. Main St., Willits, CA 95490. Tel: (707) 459-1256. The entire compilation is \$30 (repro costs). Maybe they'd be willing to repro the one paper for less.

Access: Alan Cocconi 462 Borrego Court, Unit B, San Dimas, CA 91773. Tel: (909) 592-5399.

No CE in February

Just a reminder!

You will be receiving the EV Buyer's Guide in February '96 instead of Current EVents.

Look for the next issue of Current EVents in March '96.

Emissions cont'd. from page 15

car's wheels, delivering their peak power in a band from 3,000-6,000 revolutions per minute (RPMs). These engines have to run through a mechanical gearbox that translates every ten turns of the motor, for instance, to one turn of the wheels. To go at different speeds, the car has to vary the ratio of motor turns to wheel turns. That is done mechanically — it's what your gearshift lever does.

In order to keep the gas engine running fast enough that it doesn't stall and can deliver sufficient power to move the car, the gearbox also needs a clutch. A clutch is just a mechanical way to temporarily decouple the engine from the gearbox, either while the car is stopped (to avoid stalling the engine) or while changing ("shifting") the ratio of motor turns to wheel turns.

Power from the Get-Go

Series DC motors have high turning capability ("torque") right from the get-go. You don't have to worry that the motor will cough, choke and die on you (though you can stall an electric motor if you force it to work hard enough). They also deliver power in a much wider band, from 0 to 7,000 RPM. So, theoretically, you don't need a clutch and gearbox. Some EVs, even conversions, dispense with all that clutch and gearbox nonsense. Some use a gearbox without a clutch.

However these motors do have their limits, so in order to achieve higher speeds, the car needs to change the ratio of motor turns to wheel turns, so, Fanny, we're back to the ol' tranny. Furthermore, as the series motor spins faster, it loses turning force or torque. Again the most common way to solve this is via the gearbox, i.e. let the motor turn slower so that it can develop more torque. Another is to go to motors that don't have this characteristic, or that can rev super-high while putting out sufficient torque. These exist, but are more expensive and/or require complex drive electronics. GM's Impact EV has such a system.

Look for more of EVs for Dummies in our next issue of CE.

Events Calendar

by Clare Bell

1996

Jan 6

EAA Peninsula Chapter (SF) meets 10AM-12Noon. *Battery Chargers - How they work and what's new.*

Speaker, Stan Skokan. Contact: Peter Barnes, Tel#:(415)592-2099 (pbarnes@octopus.wr.usgs.gov)

EAA Los Angeles Chapter meets 11AM-1PM (1st Saturday) at Winnett Lounge, at Hill Ave & Calif Ave., Cal Tech Institute, Pasadena, CA North on Harbor Fwy, connect to Pasadena Fwy, take Calif. exit, right turn east, left turn to Hill, North 2 Blks to Pasquel. Street parking. Irv L. Wiess Tel#:(818)841-5994 2034 N. Brighton, Apt. C, Burbank, CA 91504 Leni Goldberg (len@wcc.wnsnews.com)

Jan 9

EAA Seattle (SEVA) meeting. Last one was 7PM-9PM (2nd Tues.) 17021 1st Ave S. Call to confirm. Contact: Ray Nadreau (rmnad@eworld.com), Tel#:(206)542-5612 8AM-8PM 19547 23rd N.W. Seattle, WA 98177

Jan 11

Oregon Electric Vehicle Association meeting. Last one was 7:30-9PM (2nd Thurs.) at Two World Trade Center, Plaza Conference Room, 26 SW Salmon Street, Portland, OR. From the center of Portland, 1/2 blk west of Front Ave., at Salmon Street Springs (the big fountain). Call to confirm. Contact: Lon Gillas, Tel#:(503)434-4332, Fax#:(503)434-1519, PO 556, McMinnville, OR 97128 USA, Lou Tauber, Tel#:(503)297-6767 (ecar@europa.com)

Jan 13

New England EAA meets. Last meeting was 1:00 pm at Boston Edison (200 Calvary Street). All are invited. Call to confirm. Bob Batson, Electric Vehicles of America Inc. (508) 897-9393, (508) 897-6740 FAX EVAmerica@aol.com

Jan 22-23

ENV '96, Environmentally Friendly Vehicle Technology, Hyatt Regency, Dearborn, MI 313/995-4440.

Mar 1-3

APS Electrics at Firebird International Raceway. For info, contact EVTC at 602-256-2599

Mar 4-6

12th Annual RENEW '96 - Renewable energy production, transmission and management. Copley Plaza Hotel, Boston, MA. Contact NESEA, 413/774-6051.

May 10-17

8th Annual Tour de Sol. Road rally championship for electric, hybrid electric and solar-assisted vehicles, New York City to Washington, D.C. For more information, contact Northeast Sustainable Energy Association (NESEA) at 413/774-6051

May 25 - June 8

ENER*RUN4. Starts from Hardy, AR and goes all over. Stay tuned for details.

Late June

Pike's Peak Challenge. For solar and electric vehicles. Stay tuned.

Autumn

Sustainable Transportation and S/EV96 (Solar and Electric Vehicle) Symposium. Extensive trade show and workshop sessions. This is the major EV conference in the US.

Date TBA

New York State EAA meeting monthly. For date and location, call Joan, 716/889-9516

Thanks to the Internet EV Discussion List. Please send in calendar items, otherwise Anna and/or ye old editor has to dig them up (and we do enough shoveling all ready!) Contact Anna Cornell, (510) 685-7580. Or fax them to CE at 408/374-8605. You can also e-mail to CB at CBCE@delphi.com.

Emissions

cont'd. from page 15

erate driving as represented by the FTA test. Pedal-down driving is not rare, especially with small cars. In order to keep up with highway traffic or to climb hills, small-car drivers keep it floored for long stretches.

My own experience agrees with the article. When I drive my gas car (a 1984 Nissan Sentra) over the Santa Cruz mountains to get to the Bay Area, I often have to floor it to keep from getting run over on Highway 9. On the steeper climbs, I have to drop into a lower gear, with engine RPMs near 5,000 (by the tach). I just had a new catalytic converter installed and the car is leaned out so much that sometimes it hesitates slightly. I was feeling smug about driving a low-smog car — until I read the MIT Review article. Then I think, well damn, I should have taken the electric!

The MIT Review then goes on to say that engine design revisions could result in lower emissions at high power. Some

European manufacturers, such as Volvo, have implemented such redesigns and have high power emissions that are one-third to one-half of most other cars. US automakers haven't seriously considered such measures, according to the MIT Review.

If the FTP tests do not reflect actual emissions during driving, then is it any wonder that LA can't get rid of its brown cloud and that the Bay Area had 20 consecutive "spare the air" days! If these tests were indeed revised, the results would point up even more strongly the need for electrics. If manufacturers had to meet not only the present moderate-driving emission requirements but the high-power requirements, then perhaps the increased costs of complying would cause them to take a less jaundiced view of electrics.

And we EAA members who have an EV as well as a gasmobile; maybe for more trips we'll say, "This time I'm taking the electric!" — CB

EAA Chapters Roster (11/95)

ARIZONA

Phoenix (PHNX)
Contact: David Bender (Pres.) (602) 250-2131
POBox 40153, Phoenix, AZ 85067-0153
Meetings: 4th Sat 8:30 AM - 11 AM APS Public
Service Center 400 N. 5th St., Phoenix, AZ

CALIFORNIA

East Bay (EBAY)
Contact: Scott Cornell (Pres.) (510) 685-7580
60 Alan Dr. Pleasant Hill, CA 94523-1902
Meetings: 2nd Sat. 10 AM, Pacific Bell, 2600
Camino Ramon, San Ramon, CA (off 680 N.)

Los Angeles (LAEA)
Contact: Irving L. Weiss (818) 841-5994
2034 N. Brighton "C", Burbank, CA 91504
Meetings: 1st Sat. 11-1 PM, Cal Tech Campus,
Winnett Lounge

North Bay (NBAY)
Contact: Preston McCoy (415) 499-0601
750 Pine Lane, San Rafael, CA 94903
Meetings: 3rd Sat, 9:45-12 noon, Santa Rosa, CA
Call for meeting location.

Riverside (REA)
Contact: Dr. Jea Park (Pres.) (909) 309-3060
25998 Reynolds St., Loma Linda, CA 92354
Meetings: Call for meeting information.

San Francisco Peninsula (PEN)
Contact: Ben Compton (Pres.) (415) 2421881
1277 15th Ave. San Francisco, CA 94122
Meetings: 1st Sat 10 AM San Bruno Public Library
El Camino Real and Angus St., San Bruno, CA
Downstairs meeting room

San Jose (SNJ)
Contact: Don Gillis (Sec/Tres.) (408) 225-5446
5820 Herma St. San Jose, CA 95123
Meetings: 2nd Sat. 10 AM-Noon, San Jose, CA
Call for meeting location.

Sacramento (SAC)
Contact: Mark Bahlke (nm) (916) 356-6767
Meetings: 2nd Sat. SMUD, 6201 S St.
Sacramento, CA

San Diego EVA (SDGO)
Contact: Ron Larrea (Pres.) (619) 443-3017
9011 Los Coches Rd., Lakeside, CA 92040
Meetings: 4th Tues, 7 PM, San Diego Auto
Museum, 2080 Pan American Plaza, San Diego, CA

Silicon Valley (SVLY)
Contact: Chuck Olson (Pres.) (408) 296-6944
3087 Taper Ave., Santa Clara, CA 95051
Meetings: 3rd Sat. 10 AM-1PM
Call for meeting location.

FLORIDA

Florida EAA (FLA)
Contact: Bill Young (407) 269-4609
P.O. Box 156, Titusville, FL 32781-0156
Meetings: Call for information.

MASSACHUSETTS

New England EAA (NENG)
Contact: Bob Batson (Tres.) (508) 897-8828
1 Fletcher St., PO Box 59, Maynard, MA 01754
Meetings: 1st Sat, 1 PM in March, June, Sept, Dec.
Call for location.

Pioneer Valley (PVEA)
Contact: Karen Jones (Pres.) (413) 549-4999
P.O. Box 153, Amherst, MA 01004
Meetings: 3rd Sat @ 2 PM, Amherst Room of
Jones Library @ Amherst, Massachusetts

NEVADA

Las Vegas (LVGS)
Contact: Gail Lucas (Bd. Mem.) (702) 736-1910
P.O. Box 19040, Las Vegas NV 89132-0040
Meetings: 3rd Thurs. 7:30 PM, Desert Research Inst.
Flamingo @ Swenson, Las Vegas

NEW JERSEY

TriState EAA (NJTS)
Contact: Kasmir Wysocki (201) 343-1252
293 Hudson St. Hackensack, NJ 07601
Meetings: Meets quarterly. Call for information.

NEW MEXICO

Albuquerque (ALBQ)
Contact: Dale Riddle (Pres.) (505) 260-0070
603 Florida St SE, Albuquerque, NM 87105
Meetings: 1st Wed., 7-8:30 pm, International
House of Pancakes, Gibson just East of San Mateo,
Albuquerque, NM

NORTH CAROLINA

Southeastern EVA (SEEV)
Contact: Lawson Huntley (704) 283-1025
P.O. Box 1025, Monroe, NC 28111
Meetings: Call for time and location.

TEXAS

Houston (HOUS)
Contact: Ken Bancroft (713) 729-8668
4301 Kingfisher St., Houston, TX 77035
Meetings: 3rd Sat. 12-5 PM, at above address.

North Texas (NTEX)
Contact: Charles Wilson (214) 393-0719
158 Edgewood, Coppell, TX 75019
Meetings: 3rd Thurs. Odd months
Call for information.

UTAH

West Valley City (WVC)
Contact: Harry VanSoolen (Pres.) (801) 969-1130
3622 South 4840 West, West Valley City, UT 84120
Meetings: Call for information.

VIRGINIA

Central Virginia (CEVA)
Contact: Jim Robb (Pres.) (804) 342-0925
3106 Porter St, Richmond, VA 23225
Meetings: 3rd Wed. Science Museum, 2500 W.
Broad St. Richmond, VA

WASHINGTON

Seattle EAA (SEVA)
Contact: Ray Nadreau (206) 542-5612
19547 23rd N.W., Seattle, WA 98177
Meetings: 2nd Tues, call for information.

North Olympic Peninsula (NOPEC)
Contact: Karl E Schreiber (360) 385-3532
11 Kanu Dr. Port Townsend, WA 98368
Meetings: Call for information.

Washington DC
EVA of Greater Washington DC (EVDC)
Contact: David Goldstein (301) 231-3990
(301) 869-4954
9140 Centerway Rd. Gaithersburg, MD. 20879
Meetings: 2nd Tues, 7 PM, call for location.
British Columbia, Canada

BRITISH COLUMBIA

Vancouver (VEVA)
Contact: Bill Glazier (Tres.) (604) 980-5819
1402 Charlotte Rd., North Vancouver
B.C. Canada V7J 1H2
Meetings: Call for information.

HEADQUARTERS

Electric Auto Association
2710 St. Giles Lane
Mountain View, California 94040
Phone (800) 537-2882
Fax (415) 306-0137

For other chapter information call Anna Cornell,
EAA Board Member (415) 685-7580 or (800)
537-2882.

EAA Application Form

All information and statistics in this application are for the exclusive use of the EAA.

Electric Auto Association -- Membership Application

New member: ☐

Renewal: ☐

Date: ____ / ____ / ____

US ☐ \$35

Canada ☐ \$40

Other country ☐ \$45

Note: EAA membership dues are tax deductible as allowed by the IRS.

USD

USD

Name: _____

Company: _____
(If applicable)

Street: _____

Phone: (____) ____ - ____ x ____

City: _____

E-Mail: _____

State: _____ Zip: _____

Country: _____ Country Code: _____

(Please use 9-digit code.)

EAA Chapter you attend or support: _____

I need chapter information! ☐

Member/Vehicle Information -- Please complete if new or changed.

Professional Background: _____ Age: _____ Sex: M / F

Please identify your primary areas of interest relating to the Electric Auto Association.

(Please rank choices with "1" being the most important, "2" second, etc.)

- 1 ☐ Hobby / Builder
- 2 ☐ Professional (EVs are a source of income for you.)
- 3 ☐ Competition (Rallies, Races and Records)
- 4 ☐ Environmental and Government Regulations for EVs.
- 5 ☐ Social (Rallies, Shows, Dinners, other)
- 6 ☐ New Technology and Research
- 7 ☐ Promotion and Public Awareness of EVs
- 8 ☐ Student or general interest
- 9 ☐ Electrathon / Bicycle / Off-road vehicles
- 10 ☐ Owner/Driver of electric commute vehicle
- 11 ☐ Other: Please specify. _____

Number of Electric Vehicles you have ever owned? _____ Number of EVs you now own: _____

Please describe any Electric Vehicle you now own or are building: _____ Veh. Lic.: _____ State: _____
(If more than one, please attach information for each.)

Veh. Type: _____ Make: _____ Model Yr: _____ Build/Conversion Yr: _____

No. Wheels: _____ Motor: _____ Controller: _____ % Complete: _____

Batteries: No./Type _____ / _____ Pack Volts: _____ Avg. EV Mi./Week: _____

Other Features: _____ Avg. EV Trips/Week: _____

If new member, where did you hear about EAA? _____

Comments: _____

Please fasten your check or money order to this form and mail to:

Ver. (10/1/95)

EAA Membership 2710 St. Giles Lane, Mountain View, CA 94040

EV Want Ads

For Sale

For Sale: Cushman "Meter-Maid" 3-wheeler converted to electric. Was 22 HP gas. Now runs faster, with no fumes, heat, noise or vibration. Tops 40 mph. 30-mile range. 72 volt Trojan 5SHPs, Advanced DC K-91, Curtis controller, Sevcon DC-DC. \$5995/OBO. Call (714) 956-3016. (Anaheim, CA)

For Sale: Surplus EcoScoot motors and controllers. 1 HP continuous, 3 HP peak, 24 volt. Ideal for motorscooters or winning Electrathons. \$260/ea. Call (714) 956-3016.

For Sale: '83 Chevy S-10 Blazer. 120 V, 9" DC motor, 50-60 MPC, US 2300 batteries, Curtis controller, heavy duty suspension, power steering, seats 5. \$18,000. Call Terry at (407) 382-9598. (Florida)

For Sale: '84 Escort. 2300 miles on chassis, PCM Controller, on-board K&W charger, only 1200 miles on 120 V Trojan 5SH(P)'s. Runs great. \$7500/OBO. Will arrange delivery (205) 650-3225. (Alabama)

WANTED: 24 Volt DC Electric Motor's. 7" long x 4 3/4" with 5/8" shaft, by American Bosch or other's. Need 5 to 25 or more. Call Carlo @ (702) 361-1933. (Nevada)

Want Ad information

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

\$7 for the first 25 words. Each additional word, 25 cents. Want Ads are available to EAA members for the sale of electric vehicles, equipment and parts only. Please see advertising rates on next page for commercial products.

If you want to run your ad in more than one issue, please specify and include payment for each issue requested. **Send check payable to: EAA Want Ads, 18297 Baylor Avenue, Saratoga, CA 95070.**

d B Associates

Electric Vehicle Consultants

Serving Since 1969

Tony B. de Bellis, Founder

231 Kuss Road

Danville, CA 94526

Phone & Fax (510) 837-7086

ADVERTISING RATES

Full page 7.25" x 9.25"

1 ad \$400 ea
3 ads \$300 ea
12 ads \$250 ea

1/2 page 7.25" x 4.50"

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

1/4 page 3.50" x 4.50"

1 ad \$150 ea
3 ads \$100 ea
12 ads \$75 ea

1/8 page 2.0" x 3.5"

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

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

Ad Deadline

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

Advertising Manager

Susan Hollis, Advertising Manager

Office: (408) 374-8605

FAX (408) 374-8750

Address

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

Electric Auto

Association

18297 Baylor Avenue

Saratoga, CA 95070

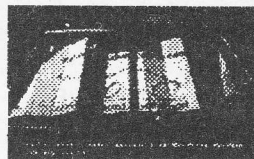
CE ADVERTISERS

APS	2
Cal State U, Long Beach	5
d B Associates	22
EcoElectric	7
EIN, Inc.	17
Electro Automotive	7
EV of America, Inc	9
EV Media	18
KTA Services	24
NESEA	13

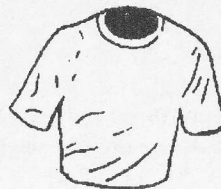
EAA Reprints Order Form



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



Auto SunShade
SS001\$8.00



T-Shirt with EAA Logo
TS001\$14.50



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



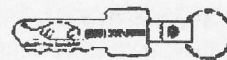
Window decal "The Switch is on
to Electric Cars" Black and Red
printing. 3 x 9 inches
DC001\$3.00



Bumper sticker 3.75 x 15 inches
BS800\$2.50



Bumper sticker 3.75 x 15 inches
BS002\$2.50



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

Printed materials

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

Other EV Items

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

Electric Auto Association **Reprint** Order Form

Send order to: EAA Reprints

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

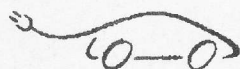
Name _____

Address _____

City, St, Zip _____

Item#	Size	Quantity	Item Description	Unit Cost	Amount

Make check payable
to: EAA (US dollars)



Subtotal

Postage +10% for USA*

Handling

\$2.00

Total

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

KTA Services Inc.

944 West 21st Street - Upland, CA 91784

Tel: (909) 949-7914 - FAX: (909) 949-7916

Established in 1984, KTA SERVICES caters to electric vehicle hobbyists and manufacturers by supplying EV components, kits, publications, and design/consulting services. We are a complete supplier of EV components and certified kits...everything you need except for the batteries. All components we recommend and sell have been selected with safety and reliability foremost in mind. All components have been proof-tested in electric vehicles. All components are new, competitively-priced, and come with full manufacturer's warranties. We stock and sell the largest variety of the very best:

- ◆ ADVANCED DC Motors in 8 variations from 3.8 HP to 22 HP
- ◆ CURTIS-PMC Motor Controllers from 24 V/175 A to 144 V/500 A
- ◆ CURTIS-PMC Throttle Potboxes & Footpedals
- ◆ CURTIS INSTRUMENTS Battery Fuel Gauges in 6 models
- ◆ K & W ENG. Onboard Chargers in 4 models from 48 to 216 V
- ◆ ALBRIGHT ENGINEERING Main & Reversing Contactors in 5 models
- ◆ BUSSMAN Safety Fuses in 3 models from 200 to 500 A
- ◆ GENERAL ELECTRIC & HEINEMANN Circuit Breakers
- ◆ SEVCON & CURTIS DC-DC Converters from 48 to 160 V input/14 V/25 A out
- ◆ K & W ENG. AH-100 Amp-Hr. Meter & TD-100 Tachometer Drive/Rev Limiter
- ◆ Electric Vehicle Solid-State Heating Components
- ◆ The latest in EV publications with a growing lineup of videos
- ◆ EVCC Adapter Plates, Couplings, Clamps, & Brackets
- ◆ PRESTOFLEX Welding Cable in 3 sizes from #6 to #2/0
- ◆ MAGNA Welding Cable Lugs in 3 sizes from #6 to #2/0
- ◆ Battery Cable Assembly Tools
- ◆ KTA SERVICES Expanded-Scale & Dual-Scale Meters
- ◆ WESTBERG Automotive Style Gauges in 5 configurations
- ◆ DELTEC Meter Shunts in 4 models from 50 to 1000 A
- ◆ Watt-Hour Electric Meters
- ◆ 6 Conversion Kits certified for California \$1000 Tax Credit
- ◆ "VOLTZVOGON" bolt-in kits for VW Bug or Super Beetle
- ◆ Electric Vehicle Air Conditioning Components
- ◆ Complete ELECTRATHON Drive & Instrument. Pkg.

You can purchase your components from us with the confidence of knowing that we specialize in user-friendly customer service. With years of hands-on EV experience and engineering expertise, we can answer just about any EV question you can come up with. We also offer engineering services:

- ◆ Complete System Quotations (free)
- ◆ Project Consulting/Engineering Design
- ◆ Project Overview with Schematic & Recommendations
- ◆ Computer-Based EV Performance Predictions

Call or write us with your EV needs!

For a COMPONENTS & PUBLICATIONS CATALOG, send \$5.00

ELECTRIC AUTO ASSOCIATION

2710 St. Giles Lane, Mountain View, CA 94040

- Address Correction Requested ●

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

EBAY
996