

CURRENT EVENTS

Promoting the use of electric vehicles since 1967

October '97 Vol. 29 No. 9

AGGRESSIVE TESTING

Nissan "Altra" EV for U.S.

TORRANCE, Calif., (August 25, 1997) — Nissan North America, Inc. (NNA) announced today that it has named its production electric vehicle (EV) for the U.S. The name for the new vehicle will be the Altra EV.

The four-passenger compact van is equipped with leading-edge lithium-ion (Li-ion) battery technology, which offers a driving range of approximately 120 miles and acceleration performance comparable to similar-sized gasoline-powered vehicles.

The Altra EV name reflects the concept behind Nissan's EV — a friendly high-tech vehicle for everyday life. The name, which invoked high recognition levels in consumer focus groups, projects a sophisticated, stylish image while conveying the EV's distinctive alternative energy theme.

Nissan also announced today that it has initiated a comprehensive EV testing program in the United States, including hot-weather, urban driving and marketability testing in California and Arizona. The U.S. testing program, which will utilize three Altra EVs, is a collaboration between NNA, Nissan Research and Development (NRD) and Southern California Edison.

"This is a significant step forward for Nissan in bringing the Altra EV to the U.S. market," said John Schutz, Nissan Research and Development, Inc. "Our EV testing in the U.S. is critical to delivering a responsible transportation solution that accommodates the tastes and expectations of American drivers."



The Altra EV, which will be manufactured on an all-new platform at Nissan's high-quality Tochigi assembly plant in Japan, will undergo hot-weather, performance and durability testing at the Arizona Test Center in Phoenix. The Altra EV will be exposed to a broad range of performance measures, including high-speed and multi-surface trials.

In Los Angeles and San Francisco, NRD and NMC will be observing the vehicles in real-world urban driving conditions and tracking consumer perceptions of the Altra EV in a series of driver clinics and focus groups planned for this fall. Southern California Edison will be evaluating the Altra EV from a fleet management perspective with particular focus on commercial and consumer battery charging solutions.

"The Altra EV has tremendous promise," said Wendy James, manager, electric transportation division, Southern California Edison. "Nissan's energy-charged battery technology is a

win-win-win solution for consumers, commercial fleets and the environment."

The Altra EV will make its North American debut at the 1998 Los Angeles Auto Show in January. Complete product, performance and design specifications will be available later this year.

Based on an agreement with the California Air Resources Board, Nissan will provide a demonstration fleet of 30 Altra EVs to a select number of California fleet users in 1998. An additional 90 demonstration units will be available to fleet users in 1999 and 2000, with retail sales beginning shortly thereafter.

Battery Technology

The Altra EV is powered by Li-ion batteries which were jointly developed by Nissan and Sony Corporation. Li-ion battery technology, which is also used in high-end notebook computers, video cameras and other consumer electronic

continued on page 11

- 1** Nissan Li-ion Roars - The one Japanese auto company that has been conspicuous by its absence has finally stepped into the ring. In a CE exclusive, Nissan announces its Lithium-ion-powered Altra EV.
- 3** It's not surprising that the US appetite for oil has reached an all-time high. What is surprising is that people aren't more worried about the possible destabilizing effects of any small drop in the supply. They (of course) should be preparing by switching to alternate forms of transport such as Evs. CE's editor comments.
- 6** Inside the Optima E-drags! The National Electric Drag Racing Association (NEDRA) held their first and fiery Event at Portland's (OR) Woodburn drag strip. CE features reports from InnEVation's Gary Flo and Wabbit Wacer Bill Dube'. (More complete report and full fix next issue).
- 7** Election time for the EAA is here and we are looking for interested individuals to join the EAA National Board and help drive us into the future. See article for more details.
- 12** This one is for you, EV Builders. Bob Batson's instructive conversion series continues with the second installment, "Selecting a Vehicle for Conversion".

PHOTO CREDIT — COVER

Artist's concept of Nissan Altra EV.

Photo credit - Nissan of North America

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

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US Oil-Thirst Highest Ever

By CLARE BELL

US drivers are guzzling record amounts of gasoline, half of which is refined from imported oil, reports Matthew L. Wald in the 8/11/97 New York Times. Our dependency on imported petroleum is also soaring as domestic oil production has slowly declined. The reason? It is easier to get oil from other countries than to squeeze it out of the dwindling reserves in the United States. Consumption of imported oil has risen from 36% of the supply in 1973 to 50% of the supply in 1997.

Cars Getting Less than Half the Gas?

With the rise of sport-utilities and light trucks (now constituting 40% of the new market), vehicles entering the US car population are now contributing to the decline of fuel efficiency. The average fuel consumption of light trucks is 20.7 miles per gallon, lowering the average for the total 1996 car population to 24.6 mpg. Automakers have lobbied to prevent the Transportation Department from raising the minimum fuel efficiency standards on light trucks. Passenger cars made up only 60% of the 1996 model year. EPA has estimated that over the lifetime of the 1996 model year vehicles, minivans, sport-utilities and pickups together will use more gasoline than the cars. If that continues, says EPA, all the cars on the nation's roads will be consuming less than half the gasoline sold.

Vehicles now leaving the US fleet after an average lifetime of 12 years or so are the hatchbacks and econo-boxes from the mid to late 1980s, which had the highest fuel efficiency (27.5 mpg average in 1986 and 27.9 mpg in 1987-88.) Since then the fleet average has fallen to 24.6 mpg, far below the 27.5 mpg CAFE requirement that Congress set two decades ago.

Destabilizing Effect

Such heavy consumption is setting the US economy up for a major shock from any increase in oil prices or any disruption in supply. There have already been reactions to fairly small gas price rises on the West Coast. Experts claim that because its oil comes from so many countries, the US is not vulnerable to any single nation cutting off its supply. However the need is so critical now that any decrease in the massive influx, even if small, could set off a rising price spiral that could, in turn, cause major hardship. It could also result in this nation employing its military once again in a blood-for-oil exchange such as the Gulf War.

No Reserve

The Strategic Petroleum Reserve, established after the first oil crisis to buffer future shortages is now shrinking due to the higher percentage of imported oil and the fact that Congress has repeatedly sold oil to help balance the budget. The result? Any disturbance in price or supply of oil will cause a disproportionate disruption in the US economy and society. Our petro-addiction has made us frighteningly vulnerable and our vulnerability increases 2-3 percent per year — at the same rate that our cars and trucks increase their consumption of gasoline.

Source: Matthew Wald, "US Guzzling Record Amount of Imported Oil", San Francisco Chronicle, 8/11/97, p.1

PRODUCT ANNOUNCEMENT

Green Motorworks Alameda to Carry PowerPulse

The sulfation-busting and preventing PowerPulse units described in previous Current EVents (Aug. 97 issue) will be available through Green Motorworks, Hangar 20, Alameda Naval Air Station. After concluding an agreement with PulseTech Corporation of Texas, Green will be stocking PowerPulse units at the prices listed below:

The variation in available voltages allows cars with different pack voltages and layouts to PowerPulse all the batteries. The unit works best if permanently installed in the EV.

The range information on the different PowerPulse models is courtesy of Bob Wheeler, Silicon Valley EAA member.

PowerPulse Voltage Ranges and Prices

Unit	Working range	Price
12V	9.5 V- 25V	\$69.95
24V	18 V- 35 V	\$119.95
36V	27 V- 50 V	\$144.95
48V	36 V- 64V	\$179.95
72V (HV)	60 V- 84 V	\$219.95

For more information or to order, contact Bob Reese at Green Motorworks, (510) 521-4300.

ICE Anti-Smog Measures Backfire

BY CLARE BELL

Not only can't the infernal combustion engine be made breathing-compatible but the measures taken to make it so are themselves harmful. New devices and fuel formulations have backfired, in some cases quite literally, creating new hazards for motorists. On-board refueling vapor recovery (ORVR) canisters, already required on 40% of 1998 cars are suspected of causing fires in collisions, the gasoline additive MTBE is feared to be seeping into underground drinking water aquifers and catalytic converters in sport utility vehicles driven off-road in dry grass routinely spark wildfires that blacken California's summer-gold hillsides.

Fume-catchers

The ORVR canisters are a larger, more thorough version of the evaporative emissions canisters that have been installed on cars for two decades. During refueling, the coffee-can-sized devices capture gasoline vapors that would otherwise escape up the tank's filler neck to generate more hydrocarbon smog. The ORVR canisters catch and hold twice as much vapor as do the evaporative canisters. These older smaller devices have themselves been linked to a rise in vehicle fires. A 1991 NHTSA crash study found 27% more fires in cars equipped with evaporative canisters than those without.

In 1991 NHTSA warned EPA that the new ORVR canisters would further increase fire risks. The ORVR devices also worry safety experts since they do not have to pass crash testing as do other portions of the fuel system. Former head of safety assurance at NHTSA Michael Brownlee said, "You can clearly expect more problems to arise in future.

ORVR designs, feels that the present devices are safe. However NHTSA spokesman Phil Frame points out that ORVR canisters are not covered by safety standards. NHTSA could only order a recall if the devices create real-world safety problems, not just if they break in crash tests. This implies that there will be more fires and fire-associated deaths before the agency can act.

When asked if the ORVR canisters could result in more fires, General Motors' safety director Robert Lange admitted, "There could be some and we ought to monitor that."

EPA requires 40% of 1998 cars and light trucks to have ORVR, increasing to 100% by 2006. The agency, having rejected two proposed ORVR designs, feels that the present devices are safe. However NHTSA spokesman Phil Frame points out that ORVR canisters are not covered by safety standards. NHTSA could only order a recall if the devices create real-world safety problems, not just if they break in crash tests. This implies that there will be more fires and fire-associated deaths before the agency can act.

An Outdoor Arsonist's Delight

Catalytic converters continue to be an outdoor arsonist's delight. Without even leaving the comfort of their sport utilities or 4X4 pickups, young off-roaders were able to blacken a good section of the Los Gatos hills recently by driving happily amid the high tinder-dry hay, which had a lower flashpoint than the intelligence or responsibility quotient of the macho youngsters or the mpg of their urban assault vehicles. Blistering-hot catalytics regularly ignite thousands of acres, turning grassland into wasteland, fouling the air with particulate pollutants, forcing people to evacuate their homes (as many did during the Los Gatos fire) and burdening the community with the costs of firefighting, emergency rescue and recovery.

Gasoline additive fouls drinking water

MTBE or methyl tert-butyl ether is made from methanol and natural gas. Added to gasoline, it provides additional oxygen, encouraging more complete combustion and cleaner burning. For 20 years it has been used in small amounts as an octane booster; however in 1992, the Federal Clean Air Act required that cities with heavy carbon monoxide pollution use a clean-fuel gas during winter months. Soon areas with the highest ground-level ozone pollution had to use reformulated gasoline year-round and by 1996, California's Clean Air Act required oil companies to sell only reformulated fuel. Scientists predict that by the year 2000 such oxygenating agents will be added to 70 percent of the nation's gas supply.

The oil industry likes MTBE — its refineries put up to 15% MTBE in their reformulated gas. There is an alternative, namely ethanol, which is the second most common additive. A spokesman for the Western States Petroleum Association states that the industry prefers MTBE because it is the most-studied, in ready supply and is believed to be the most effective in lowering carbon monoxide. WSPA also discounts the threat to drinking water wells.

The city of Santa Monica lost its largest drinking water source to MTBE when the fast-moving, environmentally persistent solvent leaked from two well fields from gas stations, shutting down 71% of the town's water supply. "You've got a hell of a problem here, which should have been anticipated, but was not," said former Santa Monica Democrat Tom Hayden. "MTBE is up

there with the bigger headaches in environmental history."

The additive has seeped into other supply aquifers as well, including South Tahoe. Leaks from 250 underground fuel tank sites imperil Santa Clara County's fresh drinking water. MTBE hasn't shown up in measurable quantities yet, but water managers agree that it is only a matter of time. Southern and eastern Alameda County residents have to deal with such hazards as a gas station that has a leak 1,200 feet from a public drinking water well. In March of this year, Alameda Flood and Water Conservation District sent a resolution to Governor Wilson — halt MTBE use and search for a safer alternative, such as ethanol. Ethanol or ethyl alcohol is environmentally friendlier since it is made from corn, breaks down in the environment and has fewer health effects.

Doesn't Degrade

MTBE is even more of a problem than benzene and other petroleum-based solvents because it dissolves in water and percolates through aquifer soils and

gravel at the same speed as water. In a contaminated well field in Livermore, MTBE is moving at the rate of 300 feet per year. Even worse, it does not degrade in ground water, according to the US Geological Survey, because it resists natural bacteria.

Politicians as liberal as Tom Hayden and as conservative as Richard Mounjoy (R- Monrovia), have bills that provide strict penalties for MTBE polluters, direct the state to set maximal permissible levels of MTBE in drinking water, establish a \$5 M cleanup fund and/or require the state Health Services Department to study MTBE, with the intent of banning the additive by 1999 if it poses health problems.

One of Hayden's quotes on the subject is bound to increase the discomfort level of gas car drivers. Referring to the fact that nobody knows how to prevent MTBE from migrating into drinking water, Hayden said somberly, "We're at the beginning of finding how big a mess this is going to be. With thanks to John Newell. — CB

STOP THE PRESSES

Salt Flat EV Speed Jumps to 237 MPH

As CE was in preparation, we learned that Pat Runnerfield, O'Fallon, IL, turned 237 MPH at the Bonneville Salt Flats in an unofficial pass. The car is owned and prepared by World Record Performance Associates, Santa Ana, CA. The former record was 183mph. More info next issue — CB

Source: Bill Maloney — The Auto Channel
<http://www.theautochannel.com/>

Sources: Jane Kay, "Chemical Threat to State's Water Wells" San Francisco Examiner, Aug. 10, 1997, p. 1

Jayne O'Donnell and James R. Healy, "Gas Device Raises Car Fire Fears", USA Today, Friday, Aug 29th.

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Wilde EVolutions wants to be your source for Electric Vehicle components. We stock hundreds of items and most orders are filled and on their way within 24 hours.

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Woodburn Tire-burn Notes

BY GARY FLO, INNEVATIONS

I arrived at the Oregon Drags in the morning to see a few time trials of Berube's dragster, Cloud's dragster, Don Crabtree's drag-bike, Bill Dube's Wabbit, Lou Tauber's Yellow Zonker Renault, etc.

Met some old friends and put some new faces with names on the EV Discussion List: Rich Brown, Jonathon Dodge, Lee Hart, and a few others. This helped, since I'm bad with names.

The highlight for me was turning the tables on Electrifying Times Editor Bruce Meland. At every other race, he is walking around relaxed taking pictures and I am on my back under the car. This time I was relaxed and he was frantically tightening the bolts of the controller on his three wheeler.

Dave Cloud said he built his 144V dragster for \$250. The 48V Prestolite motor he had. He added 12 Genesis batteries, two contactors (72V and 144V I think), a chopped rear axle from a Chevette or something. He used direct chain drive and borrowed rear slicks. Electrathon wheels for front I would guess. Orange-board body, of course.

The only mishap was a sheared brake linkage leading to a ride off the end of the track into the dust at 90 mph. A few tie-wraps and the pedal was good for the rest of the day....Cloud changed out his primary drive gear once, altering it from 15 to 20 teeth. The performance remained about the same: 13+ seconds.

Excellent for the first outing. Dave said he was going to keep raising the voltage until the motor blew up. I think he thought the better of it because he stayed at 144V. Now if Roderick Wilde had been in charge it would have been different.

Speaking of Roderick: The Wilde guys did their usual last minute assembly and SHOULD have gotten a run in down the track, but the tranny wouldn't

The pollution from Lou's smoke compensated for all the zero emission vehicles at the track by creating a smog cloud as big as 50 IC engines.

catch. OH, SO CLOSE!!!! We will be hearing more from the MAZDA: 500+ volts. Excellent job of engineering by Roderick on the dual 9" motors. Custom armature by Roderick with 1.125" tail-shaft in order to couple them end to end. In defense of Roderick, the parts he needed were delayed by a week in transit. At least they TRIED to finish ahead of time....

It was entertaining watching the sparks fly out of the motor in daylight at the starting line. Would have been a good show at night....

Melting Tires

I saw some great matchups between Lou Tauber's Yellow Renault and Bill Dube's (pronounced "Doobay's") Wabbit. Both are clean conversions and hot. Burnout contests every run with both Dube's front wheels spinning. On the Renault only the front right tire spins. The other one just sits there. Nevertheless, Tauber won the burnout contest (as he predicted) by melting the right tire into a huge cloud of smoke that drifted down over the seats behind the start where we were all sitting.

The pollution from Lou's smoke compensated for all the zero emission vehicles at the track by creating a smog cloud as big as 50 IC engines. We were all choking for several minutes. Great job LOU! Our lungs will never be the same.

Both competitors are light 192V cars with XP-1227. On the track, Lou managed in the 19+ range and Wabbit 20+. Very disappointing for the new micro Auburn. Apparently some problems have cropped up in the transition to production. Keep in mind Wayland ran 17.1 at Phoenix with 180V and a knife-switch with a 9", and the Innevation's yellow Porsche Spyder runs 17+ with Energy Unlimited controller at 192V and XP-1227. Pack voltage is currently

at 216V... Motor current limit will kill you every time....

Rich Rudman/Damon Crockett's controller was impressive in Rich Rudman's Goldie at 132V/600A. No motor limit here!. Goldie ran 20+ seconds consistently. Very good for 132V and she didn't blow up.

John Wayland was a hero for even getting to the race with the White Datsun fitted with Kostov and Godzilla. Axle and controller problems limited him to 18+ seconds, but there's lots more potential. He said in 4th gear he could feel the pull was more than the 9" at 180V. I am dying to see how the Kostov runs at 240V. With 20 Optimas you can actually get some range. I wouldn't want to use less. Wayland spent all his time getting the long-range truck ready and didn't have much time left for prepping the Datsun.

Much appreciation to the Optima folks for their great support.

I'm sure I left out a lot, but that's what I remember. There was a great tribute to Ed Rannberg, with Dennis Kilowatt getting the first annual Rannberg cup for the greatest contribution to EV drag racing this year. Dennis runs EVERY weekend at the track in Phoenix and is still offering \$1000 prize to anyone who beats him. His best quarter-mile time is around 11.55 sec.-GF

Sources: InnEvaluations, High Performance Electric Vehicles and Components, P.O. Box 1270, 707-462-9705, Ukiah, CA 95482, 707-462-9706 fax, innevale@pacific.net, www.mcn.org/a/innevaluations, new shop address: 2185 South State St., Ukiah, CA 95482

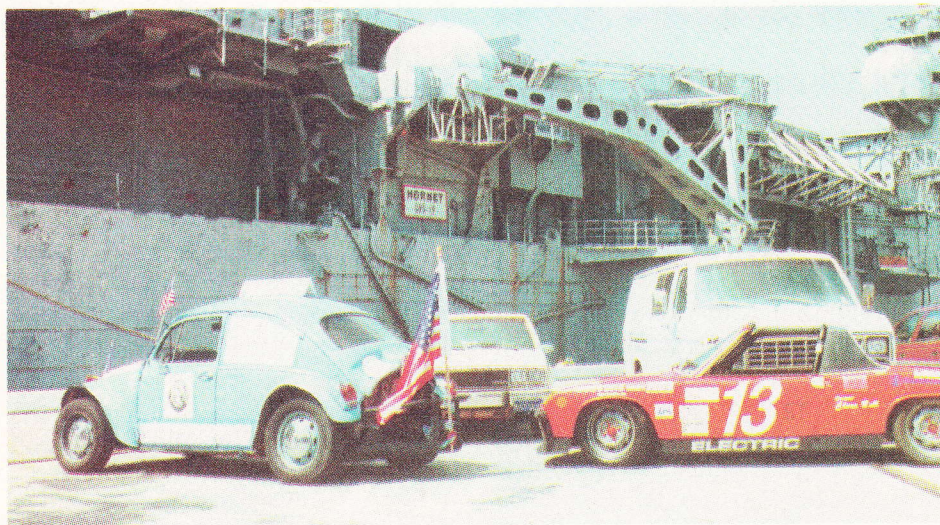
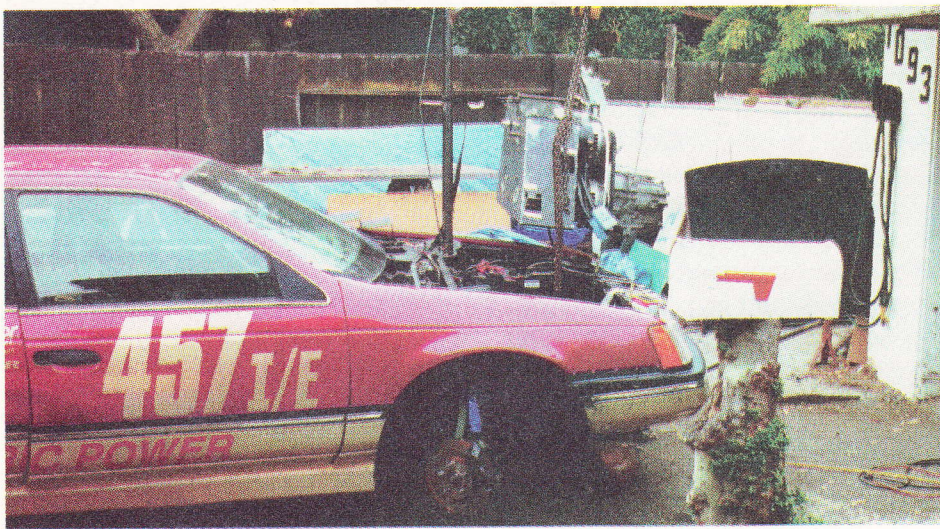
Call for Candidates for EAA Board Positions

Election time for the EAA is here and we are looking for interested individuals to join the EAA National Board and help drive us into the future.

Interested individuals should submit their name and a brief synopsis of why they are running for the board position. This synopsis will be printed in the next issue of Current Events magazine and will provide the general EAA membership an opportunity to learn about the candidate. A picture is recommended.

The deadline for submission is Monday, October 20th. Interested individuals should act promptly. Late applications will not be taken into considerations, but may be eligible for a write-in position on the EAA ballot. Elections will be held in December.

Send your candidate submissions to the EAA Elections Chair, Tony Cygan at 1749 9th Avenue, Sacramento, CA. You may also email your submittal to tonyc@144volts.com.



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Optima Drags at Woodburn

By BILL DUBE'

Even though my wimpy controller was a major disappointment, and the drive home was a near-disaster, I had a terrific time at the drags on several levels.

As I said to several folks during the event, this was a gathering of the EV "gearheads" and "wrench swingers." I was surrounded by folks that were actually "doing it" instead of the usual "planners" and "dreamers." At least half the folks that I talked with owned or were building an EV. There weren't very many of the "Theoretically, if we use platinum contacts, we can gain 0.231% efficiency." types in attendance. Mostly, it was the "Slap some Glyptal on the brush holders and I'll bet she'll take another 48 volts." types at the drags. NOT ONE SINGLE PERSON asked me the "alternator on the wheel" question. These are my kind of people. This is my kind of event.

Viping Out a Viper

I really loved seeing Berube pull the rug out from under the Viper club. I know that when the Viper club guys looked at Dennis' electric dragster, they thought "Ha! No problem. We'll put this chump on the trailer after the first race." while Dennis was thinking, "Heh, heh, heh... Fresh meat." It was fun having the Vipers at the event, but I wonder if they'll show next year, given the pasting they took this time around. I hope so, most of them seemed to be good sports about the whole thing and enjoyed the event completely.

Having the opportunity to race several different EVs down the strip was truly unique. When you consider that the Wabbit (and Sparky from Manitue Springs) were the first EVs to drag race at Bandimere Speedway EVER only a month ago. This same race was the first time the Wabbit got an official time slip (It's the only speeding ticket that you enjoy getting.) Dragging repeatedly against other EVs was hog heaven.

This same race was the first time the Wabbit got an official time slip (It's the only speeding ticket that you enjoy getting.)

"Dueling burn-outs" with Lou Tauber in the Yellow Renault and "dueling stereos" with John Bryan in his Ghia Monster was great. Rich, "Madman" Rudman and I were taunting each other during the entire length of our race. This couldn't have happened at an ICE race. The silence of the EVs was truly golden.

Look Ma, No Tailpipe!

The event also served, in a way, as the EV-Discussion list convention. I met a ton of folks that I had grown to know quite well, but had never met face to face. Neil Wicai and I spent quite a bit of time together. He made up these nifty "Look Ma, no tailpipe! It's Electric!" T-shirts. I wore one proudly all day. We talked about some battery monitoring concepts and the ins and outs of our respective conversions.

I had the great pleasure of meeting Lee Hart in person. What a great guy. It's too bad that we didn't get more time to hang around together. I think that at the next NEDRA event, Lee should judge a "Best Traveling Science Project" contest. He would be perfect for this. I suspect that if they had included this category, Bruce Meland would have taken it hands down. His three-wheeler had all the key elements; PV array, mysterious wires running here and there, liberal electrician's tape, uncomfortable looking seat and a unique color scheme.

I met Bob Wing, Rich Tietjens, Stephanie and Dean Grannes, and a host of other folks. It was terrific.

This event was also an EV car show. There were a lot of cars to look at and to talk with the owners about. There were Electrathon cars, daily drivers like John Bryan's Ghia, show cars like the Wilde EVolution Roadster, Lou Tauber's Renault, the Blue Meanie, and the White Zombie. John Wayland's Outlaw HI FI garden tractor was there. The record holding Taurus was there. Ed Rannberg's Kawashocky was there. John Bryan even made a run down the strip with his Zap bicycle. (Complete

with burn-out!) He personally looked somewhat "burned out" after the race too.

It was great to see Dave Cloud's drag rail (with the required orange-board, of course.) This was the maiden voyage for this car but Dave and crew managed to get some pretty fast runs out of it. Also, Rich Rudman brought Goldie, complete with his latest electronic joy, a monster controller. Goldie trounced the Wabbit although I had a TV reporter in the back seat at the time and a wimpy controller. (Wait 'til next race Rich. You won't have it so easy.) I think that Rich may be battery limited as he wasn't running Optimas or Hawkers, but a brand I didn't recognize. His new controller looked mean, gray, and very businesslike.

Don Crabtree's drag bike was something to see. It carried the full theme of boat racing over to land sports. He basically removed the hull and prop and put wheels on his hydro rig. I think he has been bitten by the drag race bug. We'll see him at all the races now that he has smelled the rubber and faced the timing tree.

After the race, we all gathered at Abby's Pizza. This communal feast and discussion of the days events was the perfect end to a great day at the races.

Near-disaster on the way home

All went smoothly until we crossed the border into Colorado on Rt 287 at about dusk. Jenelle, my daughter, said, "Do you hear that chirp when we go over a bump?" I noticed that the Wabbit, being towed behind on a towbar, was not behaving quite right. When I looked back in the side mirror, a small, but brightly flaming meteor rocketed out of the wheel well of the Wabbit. "Oh geez!" I said and pulled over quickly. Smoke was pouring out from under the Wabbit. Black-greenish grease was everywhere.

It turned out that the inner CV joint on the driver's side had come loose. The axle, free at last, whipped around like a medieval mace and thrashed itself to shreds as I towed along blissfully. I imagine that the flaming meteor was the last of the balls to escape from the outer CV joint.

Jenelle drove the Cherokee home to fetch a 30 mm socket while I napped in the Wabbit by the side of the road. When she got back, we removed the remains of the axle and towed the Wabbit the rest of the way home, arriving at 2:00 AM. Pulling the Wabbit up the driveway with a come-a-long was the icing on the cake.

I was surprised the next day when the parts store accepted the axle

as a core. It was barely identifiable as an axle at all. "Where's the rest of it?" asked the parts guy. I shrugged my shoulders and said, "That's all that was left of it when I took it out." He shrugged his shoulders and put the "core" in the box and closed it up. All together it cost me about \$200 in parts to repair the damage. Considering what could have happened had Jenelle not noticed or not spoken up, I consider myself quite lucky.

Hopefully, the next NEDRA event will be in Phoenix in March. See you there! — BD

<hdube@BOULDER.NIST.GOV> —>

EVD Praise for Optima E-Drags!

On Fri, 5 Sep 1997, Rich Brown wrote:

>Hi everyone,

>Is it just me, or have I not seen much written about the Optima National Electric Drag Race Championships? I would like to thank NEDRA, Optima, Electrifying Times and Woodburn Drag Strip for putting on a >first class event. I say "EVENT" because it was more than just a drag race. It was an EV experience that I will probably never forget.

There hasn't been much written, and I'm just as guilty as everyone else. I promise to try to make amends later this weekend (I expect to be busy tonight putting a computer together for Gerhard Wagner - we're gonna get him on this list if it kills me!).

>The weather was perfect, and for Oregon that's saying a lot. I received my first ever Oregon sunburn too (slight as it was).

Me, too! And mine wasn't "slight!" I slept sitting up for two nights, and it was worth it!

>This really wasn't intended to be a detailed report of the drags, but what a great day, what a great event. Please let's do it again next year and maybe in March at the Phoenix races. Next year MY car will be there!

Thanks for the nudge, Rich. I'll add your comments to the EV Chronicles if you don't mind. —RT

<atari@TELEPORT.COM> —>

Charter Member, National Electric Drag Racing Association

Visit the Oregon Electric Vehicle Association on the Web at

<http://www.GeoCities.com/MotorCity/Downs/6058> or <http://www.SPAM-BUSTERS.dyn.ml.org/OEVA>



Free ZapRides at Union Square

Zap Power Systems, a Sebastapol-based maker of electric-powered bikes, gave away free spins Tuesday in downtown San Francisco, trying to accelerate a market boom that company officials are sure is coming: The era of the motor-assisted bicycle.

So there they were at Union Square, bike riders cruising back and forth, back and forth - and zipping uphill.

"They put me on a scooter, and they couldn't get me off," said Matthew Bronson. "I feel like I'll be superbiker. Now, I can take the more aggressive rides."

Bronson pedals 25 miles every day - for exercise - on his 21-speed Trek mountain bike through the rolling hills of Sonoma County near his Forestville home. He thinks that with the help of a motor - which he plans to get as soon as possible - he can ride 35 or 40 miles and conquer a steep trail he once thought too daunting: Coleman Valley Road from Occidental to the Pacific Ocean.

"I'll probably use my car less too; people will buy it for the environment and for the economics," said Bronson, a linguistics professor at Cal State Hayward.

Zap staged the event to announce a joint venture with the Italian firm Motivity, a scooter maker. The companies have joined forces to form ZAP EUROPA, a firm that will try to market electric-powered bikes worldwide. Company officials are confident that electric bikes will roll in great numbers. Only about 5,000 ZAP EUROPA bikes and scooters have been sold so far, but sales have doubled every year since 1994, and 2,000 have sold this year.

Selling to a bicycle town

This is San Francisco - a bicycle town, as has been so painfully obvious of late. Bikers here prefer to be their own power source, so it was no surprise that Zap's odd product wasn't met with unanimous praise.

"I would recommend it to my grandmother, but I wouldn't to a bike

They were at Union Square to meet girls, but then noticed the ZAP EUROPA booth.

enthusiast," said Danny Edge, 17, who rides 60 miles a day as a Boston bike messenger.

He was visiting his friend and fellow bike messenger Mark Connor in The City Tuesday. They were at Union Square to meet girls, but then noticed the ZAP EUROPA booth.

Certainly, the bikes take some getting used to. The ZapFlash model, for example, is built like any 21-speed mountain bike, but with a 22-pound motor attached to the frame underneath the bike seat near the rear brake. The cyclist has the option of using one of two motors energized by a recyclable lead battery attached to the frame, usually where a water bottle might attach.

This is a heavy bike - nearly 50 pounds for all two-wheeled models - but it does well going up hills, even the grade on California Street from Grant Street to Powell Street. The cyclist's legs still feel like they are pedaling up a hill, but it feels good to see yourself keeping pace with a cable car.

Connor said you'd never find him on an electric bike - partly because it's too heavy for the kind of riding he does - but others might dig the ride.

"The positive thing is it could encourage more people, who wouldn't want to ride a bike, and get more cars off the road," said Connor, who was part of the most recent Critical Mass. "Maybe it might come in handy if you have to run away from a cop up a hill," said Edge.

Zapped Cops

Funny he said that, because U.S. police departments have fallen hard for Zap bikes. The firm estimates about 700 departments have the bikes already. Sgt. Matthew Stapleton of the Petaluma police bike detail, one of the first police departments to put cops on bicycles, said he welcomed the introduction of electric motors to the squad.

"I find it enjoyable to use," he said. "It certainly has its applications in police work, particularly if it allows the police officer to conserve some of his energy to

apply to whatever he or she needs to do once he gets to the scene. It also expands an officer's range."

The ZAP EUROPA line comes in three categories: three two-wheeled electric bicycles; three scooters - Zappy, Zapino II, and Zapino III - and a ZapTricycle. Top speed is about 15 mph, and one battery charge is good for about 15 miles.

The ZapForce, meanwhile, is the two-wheeled Cadillac of the firm's line. First-class suspension, 21-speed Trek aluminum frame, dual halogen lights for high pursuit, even a screaming police siren - most ZapForces are shipped to police departments.

The bikes aren't cheap. Prices range from \$600 to \$1,700, or \$450 gets you a Zap power system: a Hummer fan motor that attaches to your own bike.

Zap co-founder Gary Starr said the bikes would prove to have great appeal here and abroad. Concerns about cleaner air, fitness and traffic will put more people on bikes, he said, and the ease of power-assisted cycling will win many converts.

"How are you going to get people out of cars? Electric cars and bikes," he said. "In order to get people out of their cars, you have to get people comfortable. The biggest reason people don't want to ride to work is they don't want to get hot and sweaty."

Sources: Electric bikes zoom into S.F. —Motors can give cyclists an assist on City's killer hills. Michael Joe OF THE EXAMINER STAFF. Wednesday, Aug. 13, 1997 Page A 1 1997 San Francisco Examiner. EVLN(Interbike's ZAPPY about WORLDBIKE, free spins on SF's killer hills)

\$499 Zap "Worldbike" Unveiled at Interbike

ANAHEIM, Calif.—(BUSINESS WIRE)— Competition in the world electric bicycle market is heating up with today's unveiling of a complete electric power-assisted bicycle for \$499 at Interbike, the nation's largest bicycle show.

ZAP Power Systems said its new low-cost WORLDBIKE(TM) targets cost-conscious commuters worldwide. At \$499, ZAP says the WORLDBIKE is hundreds of dollars less than electric bikes currently on the market, which range between \$900 and \$2000. "Until now, electric bikes were priced out of reach of the average consumer," said ZAP's managing director Gary Starr. "The key to expanding the consumer electric vehicle market is cost; industry estimates show that two percent of the 15 million bikes sold annually in the US could be electric if the price became more affordable. Thanks to our partners in Southeast Asia, we can offer this aggressive new pricing."

"This is the most energy efficient powered transportation available today," said ZAP chief engineer Jim McGreen. "This bike was designed for commuters worldwide." The WORLDBIKE incorporates several comfort features for commuters, step-through frame, padded seat, upright handlebars, fenders, wide, all-terrain tires, and six gear settings. ZAP's patented electric motor system features a new, low-cost, single motor design and portable, lockable battery case with integrated charger. The WORLDBIKE retails for \$499.

The Sebastopol, Calif. manufacturer also unveiled an electric powered skateboard. The ZAPPY(TM) is a stand-up push scooter with a retractable steering column for storage in places as small as a school locker. Handles are built into the body for carrying. The rider can kick for power and/or engage the throttle for electric power up to 12 MPH. The electric drive system uses an electric motor, 12-volt battery and built-in automatic charger. ZAPPY retails for \$649.99.

The WORLDBIKE and ZAPPY will be distributed through planned ZAP EV Stores as well as the company's growing dealer network in the United States, Asia and Europe. Incorporated in 1994, ZAP has sold over 5,000 electric bikes and power-assist kits, half of those this past year. The company sells several two and three wheeled electric bikes and scooters. For further information, contact ZAP at 800/251-4555 or access the company's web site at <http://zapbikes.com>.

CONTACT: ZAP Power Systems | Alex Campbell, 707/824-4150

[09-04-97 at 12:37 EDT, Business Wire]

Nissan

continued from page 1

products, achieve the high level of 90 watt-hours per kilogram as adopted for EV use; about three times the energy density of conventional lead acid batteries and more than 150 percent that of nickel-metal hydride. In addition, the batteries have an exceptionally long life of approximately 1,200 charge / discharge cycles.

The battery charger will use an inductive charging system. The vehicles will have a permanent magnet synchronous motor and a new 32-bit high-speed RISC (Reduced Instruction Set Computing) motor controller processor. The motor features a compact design, yet, it generates maximum power of 62 kilowatts, and maximum torque of 17 kilogram-meters.

In 1996, the Nissan / Sony Li-ion battery received Popular Science magazine's "Best of What's New" Award. The editors of Popular Science select 100 out of the thousands of new products, technology developments and scientific achievements they review annually for distinction.

In North America, Nissan's operations include styling, engineering, manufacturing, sales, consumer and corporate financing, and industrial and textile equipment. Nissan in North America employs more than 20,000 people in the United States, Canada and Mexico, and generates more than 70,000 jobs through more than 1,500 Nissan and Infiniti dealerships across the continent. More information on Nissan in North America and the complete line of Nissan and Infiniti vehicles can be found online at www.nissan-na.com.

Source: Nissan North America Press Release
Contact: Gina Pasco, Nissan Product & Technology PR, 310/771-3416. Bill Garlin, Nissan Product & Technology PR, 310/771-5351. Jim Olson, Lost Dog Communications, 310/338-0793. Paul Klein, SCE Corporate Communications, 818/302-7935, or visit the Nissan Online News Bureau: www.nissannews.com

(with thanks to Bruce (EVAngel) Parmenter

Selecting a Vehicle for Conversion

BY BOB BATSON, ELECTRIC VEHICLES OF AMERICA

The decision to convert my first EV in 1987 was very simple. It was a 1973 VW which was already in the process of being converted to electric. I helped its owner complete the conversion, and then I purchased the vehicle from him. After I bought it, I invested \$1500-\$2000 in the vehicle for new brakes, tires, PMC controller, and paint job. My purpose for the VW was to demonstrate the feasibility of EVs and to learn from the experience.

Later, I found the VW limiting because of the cramped space available for batteries and the location of batteries within the passenger compartment. Consequently, after a couple of years of driving it, I was itching to try another car. And this time I was going to select the vehicle based on an engineering evaluation.

1, 2, 3, EV

After proceeding through the selection process, I determined that selecting a vehicle to convert to an EV can be as simple as 1, 2, 3:

1. Define your requirements for the vehicle.
2. Evaluate the classes of vehicles that meet your requirements.
3. Select one or two specific vehicle models.

Step 1—Define the Vehicle's Purpose

This is the major decision. Ask yourself the following important questions:

1. Why do you want an EV?
2. Where will you drive it?
3. Who else will drive it?
4. How many miles do you require on a daily basis?

5. How often will you drive the vehicle?
6. With or without passengers?
7. Will your employer allow me to charge at work?
8. How much do you want to spend?
9. How much time do you have for the conversion?

My purpose for my second conversion was to demonstrate that EVs can be larger vehicles which serve a useful function. My EV had to be/have:

1a. Designed for the extra battery weight. Battery weight represents fuel weight; the more fuel you carry, the greater your range.

1b. All batteries located outside the passenger compartment. This made it easier to restrain the batteries in designing for an accident. I felt it was a safer design.

1c. Parts that could be easily replaced for testing new EV components. I did not want to bury components in inaccessible places.

1d. A small passenger compartment to limit the heating requirements in the New England winter.

STEP 2—Evaluate Types of Manufactured Vehicles

Once you start to evaluate the different vehicles you find there are three classes:

1. Sports cars, such as the Honda CRX, Pontiac Fiero, Toyota MR2, Porsche 914, Fiat X-19, Nissan Pulsar, MGB or MG Midget. Sports cars have limited space and minimal payload capacity.

2. Passenger cars and vans, such as the Ford Escort, VW Rabbit, VW Beetle, Saturn, Honda Civic, Geo Metro, VW Vanagon, and Dodge Caravan. Vans are considered herein as a passenger car because they require the batteries to be inside the passenger compartment. The payload capacity within this class varies considerably from Geo Metros with a payload of 600 lb. to the VW Vanagon with a payload capacity of almost 2000 lb.

3. Trucks, such as the Chevrolet S-10, GMC S-15, Ford Ranger, Dodge Ram and Rampage, and VW Rabbit Truck. Trucks have the advantage of locating batteries outside the passenger compartment and typically have a frame which permits a higher payload capacity.

Each of these classes have their own characteristics with respect to aerodynamic drag, curb weight, Gross Vehicle Weight Rating (GVWR), passenger compartment, and available space for batteries.

Table 1 lists typical vehicles under each of these classes and their range using various lead acid battery packs (6V and 12V). Range is a function of battery weight because the battery represents the fuel. Typically it takes 15-20 lb. of lead to achieve 1 mile in range. A Rule of Thumb is that 1/3 of the EV's weight should be batteries; the other 2/3 represents dead weight (i.e. frame, suspension, body, motor, etc). If you decrease this dead weight to 1/2, leaving 1/2 for fuel, you have superior performance.

Other Factors

Of course, there are other considerations, including:

Front Wheel Drive(FWD) vs. Rear Wheel Drive (RWD)

A FWD vehicle has the advantage of being more efficient; which improves range. However, FWDs typically have smaller engine compartments, which limit the location of batteries. Also, the FWD requires more weight (typically 60 percent) on the front axle. If you locate batteries in the trunk, the tail can wag the dog in rain or snow. This is a problem with many Geo Metros with batteries in the trunk.

In addition, the high-voltage, high-amperage EV controllers and motors can produce greater torque and horsepower than the original engine in the smaller FWD vehicles. This can be a problem. There are two distinct limitations for FWDs. During "launch" (initial take-off from a standing start) all cars tend to pitch up (front rotates up relative to back.) This is because the center

TABLE 1 - VEHICLE CLASSES

Vehicle	Curb Weight	Voltage	Battery Modeled	Curb Weight	Avg Range	Max Range
Pontiac Fiero	2530	120	5SHP	3360	44	68
Honda CRX	2175	120	5SHP	3060	47	72
Toyota MR2	2695	144	SCS225	3430	40	62
Nissan Pulsar	2025	144	SCS225	2863	46	68
Passenger Cars/Vans						
Ford Escort	2300	96	T-145	3457	59	91
Geo Metro	1695	120	SCS225	2451	38	53
Honda Civic	2260	144	SCS225	3063	40	59
Saturn	2300	120	5SHP	3165	42	63
VW Rabbit	1930	96	T-105	2967	48	71
VW Vanagon	3460	120	T-145	4731	53	81
Dodge Caravan	3605	120	T-145	4854	52	80
Trucks						
Chev. S-10	2700	120	T-145	4100	61	92
Dodge Ram	2565	96	T-145	3682	51	76
Ford Ranger	2750	120	T-105	3908	44	64
VW Rabbit P/U	2200	96	T-145	3372	60	92

Notes:

1. Calculations based on spreadsheet developed by Electric Vehicles of America, Inc.
2. Typically curb weight increases each model year
3. Average range based on 1 percent grade at 50 mph - representing some traffic.
4. Maximum Range based on 0 percent grade at 50 mph.

of mass is above the force being exerted by the tires against the road. In a RWD, this pitch tends to plant the driven tires more firmly against the road, thus enhancing traction. In a FWD the effect is opposite, because the force pressing the drive wheels against the road is reduced because of the pitch. If power is applied while the car is in a turn, RWD is much more stable. If the rear wheels spin, the car oversteers. If the front wheels spin, the car understeers and may easily spin out.

Availability of Spare Parts / Age of Vehicle

Spare parts should be available. This availability is related to the production of that specific vehicle and which part of the country in which you live. Also the availability of aftermarket parts for suspension upgrades can be important.

Manual Vs. Automatic Transmission

Most EV conversions use manual transmissions because they are more efficient than automatic transmissions and provide greater range, require less motor torque, require no transmission cooler, and are easier to convert. The problem with an automatic transmission is that it shifts at about 2000 rpm; the electric motor is usually designed to operate efficiently between 4000-5000 rpm. Consequently, the automatic transmission is a poor choice which results in decreased range. If you buy a vehicle with an automatic transmission, you can replace it with a manual transmission. The additional cost is \$150 and up depending on the transmission and used auto parts dealer. Consider trading the automatic transmission.

Power Steering

Power steering is not recommended because of the continuous power required of the battery system. Even on many of the trucks that we converted, we eliminated the power steering. The cost to change from power steering to a manual steering box is under \$100 and less than 1 hour of work. The equal weight distribution allowed reasonable manual steering.

Power Brakes

Power brakes are a definite advantage, since you increase the weight of the vehicle approximately 800-1200 lb. with the EV components. In many cases, this represents an increase of 20 to 25 percent in curb weight. Your goal should always be to have a safe vehicle. Power brakes, unlike power steering, are only an intermittent energy demand. A typical sys-

continued on pg 14

Selecting a Vehicle

continued from page 13

tem requires a vacuum pump and a vacuum switch.

Curb Weight

Curb weight is the weight of the empty vehicle parked at the curb, fueled and ready to take on passengers and payload. If you want 1/3 to 1/2 of the finished weight in fuel; then the initial curb weight of the vehicle should be less than 3000 lb. The Geo Metro is one of the lighter vehicles with a curb weight of 1695 lb. Consequently, an 800 LB battery pack seems ideal, except that GVWR and weight distribution become a major problem.

GVWR and Distribution

This is the most important consideration in any vehicle, because this directly affects the safety of the vehicle (Refer to "Safety First" in the September 1997 issue). As previously stated, converting an existing vehicle to an EV will add 800 - 1400 lb. in curb weight. Check the

Gross Vehicle Weight Rating (GVWR) of the vehicle (including the tires presently on the vehicle) to see if it is designed for this increase. The GVWR and each axle rating are located on the driver's side door jamb. If you exceed the GVWR, then the frame, suspension system, and braking system may be stressed beyond their design value.

Although the Geo Metro can perform with an 800 lb. battery pack, its payload capacity is 600 lb. Payload equals GVWR minus curb weight. With two people in the Geo, the available payload decreases to 300 lb. Consequently, an 800 lb. battery pack can lead to problems in braking and handling (See FWD vs. RWD above) as well as a long term fatigue in the uni-body. Therefore, the lightest vehicle is not always the best.

Component Location

You must also consider where the EV components will be located. Where will the batteries be placed, since they are the bulk of the additional weight. Will the

charger be carried on- or off-board? How will this change in weight distribution affect handling? In the 1973 VW, the majority of weight was on the rear wheels; this was great for snow.

The above selection process further defined my requirements to:

A lightweight truck about 5 years old (because it met my criteria developed in Step 1) with:

- A manual transmission
- No power steering
- Power brakes

If my criteria was different, I would have selected a different type of vehicle. For example, if the most important criteria was acceleration to 50 mph, then, the EV would be based on a vehicle with minimum weight and a low drag coefficient, i.e. a sports car.

Step 3—Select one or two manufacturers

The selection process actually became easier as I made each decision. I searched through the available litera-

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Hewlett Packard
Bolton High School

TABLE 2 - ELECTRIC VEHICLE CALCULATIONS

Vehicle Description

S10 Truck	
INITIAL CURB WEIGHT (LB)	2650
FINISHED VEHICLE WEIGHT (LB)	4103
DRAG COEFFICIENT	0.40
FRONTAL AREA (SQ FT)	20
TIRE SIZE	
RR RADIAL TIRE	0.01
REV/MILE (HIGH GEAR)	915

System Design

1. MOTOR	FB1
2. BATTERY	T-145
3. 20 HR RATE	244 Ahr
75 AMP RATE	145 Ahr
C FACTOR	1.1
4. VOLTAGE	120
5. MOTOR EFF	0.88
6. DRIVE EFF	0.9

Calculations Results

RECOMMENDED MOTOR HP (MIN)	26
TYPICAL RANGE	MILES
MINIMUM	45
AVERAGE	61
MAXIMUM	92

Performance Estimates

SPEED (MPH)	20.0	30.0	40.0	50.0	60.0
DRAG (LBS)	8.18	18.41	32.74	51.15	73.66
(RR) ROLLING RESISTANCE	41.06	41.06	41.06	41.06	41.06
TRACTION FORCE					
GRADE					
0%	49.25	59.48	73.80	92.21	114.72
1%	90.31	100.54	114.86	133.28	155.78
2%	131.37	141.60	155.92	174.34	196.84
5%	254.56	264.79	279.11	297.53	320.03
REQUIRED MOTOR HP					
GRADE					
0%	2.92	5.29	8.75	13.66	20.39
1%	5.35	8.94	13.61	19.74	27.69
2%	7.78	12.59	18.48	25.83	34.99
5%	15.08	23.54	33.08	44.08	56.89
CURRENT REQUIRED (AMPS)					
GRADE					
0%	20.62	37.35	61.79	96.51	144.07
1%	37.81	63.13	96.17	139.48	195.64
2%	54.99	88.92	130.55	182.45	247.21
5%	106.56	166.27	233.68	311.38	401.92
CALCULATED RANGE AT SPEED (MILES)					
GRADE					
0%	186.28	151.80	119.47	92.36	70.65
1%	99.93	87.58	74.17	61.11	49.16
2%	67.56	60.61	52.73	44.58	36.64
5%	33.11	29.88	26.26	22.37	18.35

NOTES

1. Calculations based on spreadsheet developed by Electric Vehicles of America, Inc.
2. Typically curb weight increases each model year
3. Average range based on 1 percent grade at 50 mph - representing some traffic.
4. Maximum Range based on 0 percent grade at 50 mph.

continued on pg 16

Selecting a Vehicle

continued from page 15

ture (Consumer Reports, Changing Times, Motor Trend, etc.) for detailed information on the weight and features of the different lightweight trucks available.

These trucks varied in weight from 2555 lb. to 2900 lb. for the standard bed model; the long bed models add another 200 lb. The lowest weight was the Dodge Ram 50 at 2555 lb. and the Toyota at 2565 lb. Both of these trucks had an excellent reputations.

When I considered lightweight trucks, I evaluated the VW Rabbit P/U Truck, an oversize Rabbit. It had the advantage of being lightweight (2200 lb.) as well as front wheel drive to minimize drivetrain losses. It's disadvantage was that it had not been in production for 10 years and body rust was a problem in New England.

By doing this evaluation, I clearly focused my search. This eliminated time wasted in looking at vehicles that did not meet my criteria.

RAM 50 Pickup

My second EV conversion was a 1987 Dodge Ram 50 pickup converted in 1990 to 96V. This truck had a 5-speed overdrive transmission, power brakes, and rear wheel drive. The batteries are beneath the bed of the vehicle and the weight is over the drive wheels. This significantly improves their handling in snow. Its maximum range is 50 - 70 miles; maximum speed is about 65 mph.

Bradley GT II

My third EV was a Bradley GT II originally built as an EV. Surprisingly, this vehicle met my requirements as developed in Step 1. This EV has been upgraded to the FB1-4001A Advanced DC Motor and Curtis 1231-8601 controller so that it will perform as a sports car.

GMC S-15

My fourth EV was a GMC S-15 truck (same as the Chevrolet S-10). The advantages of the S series are:

1. The frame rails are further apart; this allows the battery box to be located under the bed between the drive shaft and the frame.

2. Both rear shocks are aft-mounted so that you can locate 4-6 batteries forward of the rear axle. The number of batteries depends on the bed length and model year.

3. The front radiator area can easily accommodate 4 batteries.

4. The open channel frame is more resistant to corrosion. Box frames can rust from the inside out.

We have since converted a number of vehicles (Dodge Caravan, Saturn, and more S-10s for electric utilities, U.S. Air Force, and Curtis Instruments.

Consider Long-term Use

In conclusion, consider the long term use of your EV. Here is a vehicle that you are going to invest thousands of dollars and approximately 100-200 hours of your time. Don't buy a vehicle just because it is available at a cheap price. You want to enjoy the vehicle and be proud to show it. Consider value, not just initial cost.—BB

Sources: Bob Batson, Electric Vehicles of America, Inc., Maynard, MA

Thanks to Bill Dube, Ken Koch (KTA Services), Brian Matheny, and David Roden for contributions to the above article

Guidelines for EAA Awards

BY GEORGE GLESS

1. Awards given are: the EAA Fellow Award and the Keith Crock Award.
2. Number of awards presented each year: normally 2-5 Fellow Awards are made while only one Keith Crock Award is given.
3. Nominations may be made by: any EAA member, group of EAA members, an EAA chapter, or chapter representatives.
4. Eligibility: the Keith Crock Award is given for technical excellence and may be made to an individual, a group, or a company or other organization. The technical accomplishment for which the award is given may be in the form of a vehicle, a component, a drive system, supporting infrastructure, etc. The Fellow Award is made to individuals for outstanding activities in areas relating to support of the EAA, advancing the cause of electric vehicles, or other activities of benefit to the EV industry.
5. Each award recipient receives a plaque, which is presented at an appropriate function.
6. Nominations may be submitted in any form that clearly outlines the nominee and other pertinent information, such as the nominee's address, the type of award, etc. Sufficient information, such as text, pictures, etc. should be included to support the nomination.
7. Nominations are to be submitted to the EAA Board of Directors (see the contact address and telephone/fax number listed below) for final action.

George Gless
Awards Committee Chair
EAA Board of Directors
2940 13 Street
Boulder, CO 80304
Tel/Fax: (303) 442-6566

Brush Advance, Commutation and Interpoles

BY NEIL WICAL, EV DISCUSSION LIST

In DC motors, armature reaction causes the ideal commutating point to shift from mechanical neutral as the rotor leads or lags the stator. The amount of the shift is a function of armature current.

In motors that do not have commutating poles (interpoles), such as the Advanced DC motors, at fixed loads and speeds, you can mechanically advance the brushes to the ideal commutating point for that particular load and speed, and commutation is good.

If you now vary the load and speed, the commutation at operating points other than what you advanced for will not be as good. In cases where voltages and armature currents are relatively low and you don't demand full output from the motor, the commutation over the operating load and speed range does not suffer too much and the motor runs OK.

But, when you start to push the motor at higher currents, the fixed mechanical advance has to be more to produce good commutation at the "worst case" point of maximum current and voltage. In such cases, commutation and performance at other operating points suffers. This produces lower torque and lower efficiency at lower current operating points.

When you run a DC series motor with variable speed and variable load, a fixed brush setting is, at best, a compromise. You set for good commutation at the highest current point because that's where it's needed the most, and get OK, but degraded commutation and performance at lower current operating points. And, this is really a problem if you want to electrically reverse, or try to regen with this motor, because then the ideal commutation point reverses and you have to retard the brushes. In this case, the best you can do is compromise and set the brushes to mechanical neutral (0 degrees), and get degraded performance in both operating modes! If you are not too demanding of the motor in either mode, performance is again OK. But try to push the motor in either mode and you get a lot of sparking, if not a downright Bang, Fsst, Poof!

As Lee Hart has discussed in past EVDL posts, in a DC motor with commutating poles (interpoles), the shift due to armature reaction is virtually eliminated. The commutating pole windings are in series with the armature and produce flux that directly cancels out the shift due to armature reaction. The brushes are set at mechanical neutral and enjoy ideal commutation and performance over the entire range of load and speed in either direction and while motoring or generating. What a nice idea!

A motor with commutating poles is virtually a must if you want to electrically reverse or use the motor for regen. I believe that many of the problems that were attributed to Zappi controllers last year that were used in regen and/or reversing applications were really misapplications of a fixed brush angle motor (one without commutating poles).

The cost for commutating (inter)poles is a little extra weight and a little larger motor diameter. For demanding applications, it's worth the price. —NW

E V P R

Regen for Dummies

If you could say to your non-EV nerd passenger, "Kilowatt-hours are like gallons of gas for this car. Right now we're using them up at a heck of a rate", and then when you're in regen down the other side of the hill, say, "Remember those kWh's? Well we're getting some of them back for nothing. This means we can go from this tree to that house for free! Isn't that a cool deal?"

The passenger has to ask: "How on earth d'you manage that?" and you say, "Well the motor has stopped being a motor and eating up kWh's; now it's become a generator and it's filling my batteries. Sure beats gas guzzling, whaddayasay?"

That might rate a paragraph in the local rag.

For a highly regenerative EV, see <http://camdek.com> From Charles du Toit <charl@IHUG.CO.NZ>

How to Catch Fish

by Mitchell L. Oates

Since it looks like it's going to be about 3 weeks before I actually start work, and I don't want to be spending any large sums of money until I actually start work, I decided to experiment around a little bit with the tired old pack in the truck and try Randy Holmquist's method for dealing with sulfated batteries. I didn't really expect to gain anything by it, just an excuse to play with the truck and keep myself occupied.

In reverse of conventional wisdom, I topped off all the batteries with water before I started the process. This drove the gravities on all the cells way down into the red as expected. I figured what the heck, this pack is toast anyway from what I'd seen previously.

I then went through the cycle of putting the batteries on an equalizing charge for 12 hours, letting the truck sit overnight, taking it for a 10 mile drive the next morning, and then repeating the process. I did this over a period of 4 days.

Initially with only 114V of the pack hooked up, I could barely get the pack within 10V of equalizing voltage as specified by Trojan with 5 amps of current. On the second cycle, after 10 hours of equalizing, I checked the voltage and from a couple of hours before we were suddenly within 5V of equalizing voltage. This gap gradually narrowed over the next two days such that the pack was within 1 to 2V of equalizing voltage at 2 to 3 amps. Also, the pack was taking power for a much longer time before voltage starting rising during charging and during the 10 mile run I wasn't experiencing the extreme power dropoff at the end of 10 miles I had previously.

The real shocker came on the morning after the 5th equalizing charge, after the truck had set for 12 hours. I decided to check the voltages and gravities. Previously, some of the voltages on the

batteries still on line had read down to 6.2 and some of the cells had started dropping down into the red on gravity, a couple as low as 1.200. Now, ALL the batteries read 6.35 to 6.40 on voltage, and ALL the cells were 1.270 or higher on gravity!

I redid this a couple of times just to make sure I wasn't seeing things. The reason I was so amazed was that I had done a semblance of this routine back in January in WA state and hadn't achieved any results, some of the cells actually getting worse on gravity.

After this, I checked the three batteries I had initially jumpered out, with cells below 1.200, to see which was in the best shape and try to resurrect one of them. I repeated the above process with an automatic Sears 6/12V 10 amp charger on the best looking battery for 3 days. Initially, this battery read 6.15V and had one cell at 1.160 gravity. After 3 days, this was up to 6.40V and the lowest cell read 1.265. I then placed this battery back on line to be back at 120V, and did another equalizing charge. This time the pack gradually worked its way to less than 1V away from full equalizing voltage (154.8V) over 4 hours at 2 to 3 amps.

Another bit of luck was messing around with the old backup variac charger I have. I had picked up some odd surplus inductor coils and capacitors at Radar in Seattle several months ago with the idea of experimenting to improve the power factor of the beast. Just to experiment, I placed two of the inductor coils and several of the capacitors between the variac and the bridge rectifier to see what would happen. I then hooked it to the truck and measured the current draws to see the effect. Where before I would pull from 15 to 17 amps for 10 amps output, now it was pulling 12.5 amps for 10 amps output! After seeing this, I didn't touch a thing and put the cover back on the beast, leaving well enough alone. Given the above two occurrences, I must have

From: MR MITCHELL L OATES
<RRKR45A@PRODIGY.COM>

Mitch Oates

How to Catch Fish

Date: Wed, 6 Aug 1997 12:39:23 -0500

From: Russell Groves

<rgroves@MIDUSA.NET>

Subject: Re: How to Catch Fish
Mitch's post on using his old battery pack, combined with the title, got me to thinking. Mitch, I think if you'd back that pickup up to the stream bank, take a cable from each end of the battery circuit and throw the bare ends into the stream, you might find yet another way to catch fish.
Russell Groves, Re: How to Catch Fish

been inadvertently following my grandfather's advice. One time when I was six years old, my grandfather took me fishing. After sitting for a couple of hours without catching anything, I commented on this. My grandfather said "You're probably not holding your mouth right." Being young and naive, I asked what was the proper way to hold your mouth. My grandfather replied "You have to hold your mouth like you're going to kiss a mule's a**." He also gave me advice on proper fishing equipment, which he said was a box of epsom salts and a 2 X 4. When I questioned how you caught fish this way, he explained that you poured the epsom salts in the river, ran a few yards downstream, and when the fish crawled out on the bank to take a s*** you hit them over the head with the 2 X 4. My grandfather and Dick Finley would probably have gotten along great. —MO

Gas Hog Lincoln

BY LEE HART

My Daddy said, "Son, you're gonna drive me to drinkin'
If you don't stop driving that gas hog Lincoln."

It was Saturday night, I had time to kill
And decided to give my girl a thrill
Pappy had to work, which got me to thinkin'
So I sorta borrowed my old man's Lincoln.

It was long and low, all chrome and black
Had a special garage for it out in the back
He'd polish it and wax it on sunny weekends
And occasionally show it off to his friends.

It had about the biggest motor left in the nation
For passing everything except a filling station
We headed out a'cruising into the night
Blowing off this modern junk at every light.

An old blue Datsun off of Glisan street
His stereo a thumpin' like he couldn't be beat
I decided it was time to let the Lincoln unwind
With a wink and a nod, I gave him the sign.

When the light turned green we both hit the gas
Well I took the lead, but he took it back fast
My honey said "You brag about this dinosaur"
"But you just got beat by an electric car!"

I tell her, "No way that one could be that fast"
Juice like that has gotta come from gas

But the yellow LeCar sitting at the next light
Has an "EV" sticker; now I'll prove that I'm right.

When the light turned green, no sound, no smoke
Man, that cat was gone, and that ain't no joke
I said, "Now, that's a wonder to me"
By then his tail lights were all we could see.

Now here's somebody I can beat, I know
A grey-haired Grandpa in an old Renault
But at the next stop he yells for all to hear
"What's the matter son, stuck in second gear?"

Then a Citicar tried to leave me behind
Here's a chance to give someone a piece of my mind
I knew I could catch 'em, and thought I could pass
But the engine just died; man, I'm outta gas!

My honey had to push me in to a station
Swearin' she'd warn every girl in the nation
I figured that I'm never seeing her again
So I told her I was broke, and borrowed a ten.

When we hit the road, I'm a goin' for bust
Ain't no golf cart leavin' me in the dust
So when that white Datsun caught my eye
I tell the old Lincoln, man, it's do or die.

We burned up the freeway, and down that hill
Passing cars like they was standing still
The speedometer said that we had hit top end
The last number on it was a hundred and ten.

Steam started coming out from under the hood
The motor's making noises that it never should
I'm worrying the engine isn't gonna last
When suddenly the Datsun just lets us past.

I looked in the mirror; red lights was a'blinkin'
The cops was after my old man's Lincoln
I pulled it on over and things got dire
When the catalytic converter set the grass on fire.

They impounded the car, and threw me in jail
Had to call my pappy to post my bail
My daddy said, "Son, you're gonna drive me to drinkin'
If you don't stop driving that Gas... Hog... Lincoln!"

(I wrote this piece last spring after a trip to Portland to meet John Wayland (Blue Meany, White Zombie), Lou Tauber (Yellow LeCar), Dick Finley (Renault), and others in the OEVA club. —LH)

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

NIST Extends Grant for Sunrise

Solectria Corporation's efforts in manufacturing composite structures will continue to be funded under the National Institute of Science and Technology (NIST) Advanced Technology Program for Research & Development. The Sunrise, with its aerodynamic design, extremely efficient drive system and lightweight all-composite construction, was found to be the most efficient four-passenger electric sedan ever evaluated by the California Air Resources Board. Further, Argonne National Laboratory determined that the Sunrise was capable of achieving an efficiency of about 90 equivalent mpg. In addition, crash testing has shown that the Sunrise could be one of the safest passenger vehicles ever produced, even among gasoline-powered vehicles.

(SOLECTRIA RELEASE: 8/5)

MITI May Subsidize Hybrid Cars

Drivers who purchase so-called environment-friendly vehicles in Japan will still be able to receive a subsidy from the Ministry of International Trade and Industry (MITI), which plans to expand its EV subsidy program. The ministry said it hopes the expanded program will accelerate the spread of cleaner vehicles and help cut fuel emissions. One of the vehicles that would be covered under the subsidy program is a hybrid vehicle now under development by some Japanese automakers that combines a gasoline engine with an electric motor. Toyota has announced that it will introduce hybrid cars by the end of this year. Other automakers are expected to follow suit. MITI also plans to offer subsidies to gas stations that install charging systems for hybrid and electric vehicles.

(KYODO: 8/15)

Unique Hybrid Under Development

Though hybrid electric vehicles (HEVs) are no longer considered a novelty, a HEV under development by Alan Cocconi's AC Propulsion Corp of San Dimas, CA in conjunction with the South Coast Air Quality Management District is a bit unusual. The T-Zero is a lightweight, battery-powered, high-performance sports car that has an optional small trailer which contains a gasoline-burning, computer-operated generator to be used on extended trips. The engine has a 20-kilowatt output and can keep the HEV cruising at 75 to 80 mph for up to 300 miles. The simple, doorless two-seater, which uses 28 Optima lead-acid automotive batteries, reportedly weighs 2,400 pounds and can accelerate much like a Corvette with the handling of a racing car. The T-Zero can accelerate from zero to 60 in 4.9 seconds.

(AUTOWEEK: 8/11)

EPRI, SAE to Choose Charging System

The Electric Power Research Institute (EPRI) and the Society of Automotive Engineers (SAE) are preparing to vote on a final choice for a standard conductive charging connector for EVs. The choice will be made at an EPRI Infrastructure Working Council (IWC)/SAE meeting to be held on October 7. In 1995, EPRI and SAE narrowed their search for a standard EV conductive charging connector to two choices. One of the designs is from Avcon of Milwaukee, while the other comes from Japan's Yazaki. Once IWC participants select the system, SAE will issue a new Recommended Practice, constituting an effective industry standard for conductive charging. The tests included thousands of mating cycles under high- and low-temperature extremes, as well as under jetted direct water and heavy salt solution sprays.

(FLEETS & FUELS: 8/11)

Suzuki Develops Solar Carport

Japan's Suzuki Motor has developed a carport that features solar panels used to recharge a parked EV. The carport can charge an EV with enough power to run for about 40 kilometers (close to 25 miles) in a period of six-and-a-half hours, provided the sun is shining. Suzuki constructed a prototype solar carport at its research center in Hamamatsu City. The solar panels on the carport can generate as much as 1.25 kilowatts. A conventional recharging system is provided as a backup, for use during cloudy weather conditions. Additionally, a control system prevents overcharging. The carport features a selection mechanism that will invoke either the solar or conventional charging system, depending on cloud conditions. No pricing or sales information has been released.

(COMLINE: 8/11)

Mexico City to Start Pilot Program

Officials in Mexico City plan to launch a pilot program aimed at promoting the use of EVs for public transportation and product distribution by private companies. The program will last for a period of eight months and will feature more than 50 different EVs. The pilot is designed to help policymakers decide on the most appropriate EV technology for Mexico. Since initial costs for EVs are high, the project will focus on taxi fleets and private companies with large distribution fleets. The program will be used by Mexico City in its future efforts to implement an EV sales mandate patterned after one in California. No specific numbers have been decided on, but the city could have about 4,500 EVs on its roads within five years.

(KEEPING PACE: AUGUST 1997)

Automakers Challenge NY EV Mandate...

U.S. and Japanese automobile manufacturers recently requested that a federal appeals court overturn a recent decision by a U.S. District Court judge in New York that upheld the state's mandate requiring that 2% of the cars and light trucks sold during the 1998 model year are zero-emission vehicles. A request was filed by the American Automobile Manufacturers Association on behalf of General Motors, Ford and Chrysler, and the Association of International Automobile Manufacturers. Also affected by the ruling are Toyota, Honda, Nissan and Mazda.

The mandate would require the seven automakers to sell about 8,000 EVs next year, but the industry maintains there will be nowhere near that kind of demand. The seven companies currently sell about 400,000 vehicles each year in New York.

(AUTOMOTIVE NEWS: 8/11)

....But Judge Rules in its Favor

A recent ruling by a federal judge in New York could clear the way for the introduction of EVs in New York State. Judge Lawrence Kahn of the Federal District Court in Albany ruled to uphold a state rule requiring that 2% of all vehicles sold in New York in the 1998 model year are electric. That percentage will rise to 10% by 2003. The automotive industry, which brought the suit against the New York mandate, claims the move will force them to sell vehicles that are not ready for colder climates or particularly appealing to the public. But Kahn ruled that the economic concerns of the auto manufacturers "are overborne by Congress' intent that the quality of the air we breathe should continue to improve and benefit from all available technological advances."

(NEW YORK TIMES: 8/6)

Denmark Issues First EV Report

The Association of Danish Electric Utilities (DEU) has established an Electric Vehicles Committee for the purpose of exploring emerging EV technology. The Committee recently released its first report, which includes a discussion of the barriers to widespread implementation of EVs in Denmark and potential action by utility companies to overcome these barriers. The Committee suggests that power companies take an active role in providing EV guidance to citizens, and proposes that companies demonstrate faith in EV technology by incorporating the vehicles into their fleets and establishing charging stations. At present, EVs are tax exempt in Denmark, while all other vehicles are subjected to both a registration tax and a weight tax.

(ELSAM SYSTEM RELEASE: 8/5)

California Parks Adopt Ford Ranger

Service crews in several California parks soon will be driving Ford's electric-powered Ranger pickup truck while on duty. Crews in Coyote Point County Park in San Mateo County test drove the vehicle for a week, claiming that it is ideally suited for park use. The Ranger is powered by lead-acid batteries and has a range between charges of about 50 miles. The truck can accelerate from zero to 60 mph in 12.5 seconds, which is similar to the gasoline-powered Ranger.

Ford plans to target the vehicle primarily to utility, government and key commercial fleets. In addition to Coyote Point Park, the Ranger EVs will be used at other San Mateo County parks, including Crystal Springs Trail and San Pedro Valley Park.

(FORD RELEASE: 7/30)

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Maxwell Unveils Ultracapacitors

San Diego, CA-based Maxwell Technologies, Inc. recently announced that its PowerCache line of ultracapacitors for electric and hybrid vehicles are now available for purchase. The company will sell the ultracapacitors on a nonexclusive basis to companies interested in using the technology in new designs. A major international automaker last year evaluated the ultracapacitors for use in EVs under a \$4.5 million deal. The technology serves as a supercharger that provides power for acceleration and other power-demanding situations. According to Maxwell Technologies, its ultracapacitor line will eliminate range limitations found in current EVs. "The ultracapacitors are ideally suited for hybrid and electric vehicle applications," said Kenneth Potashner, chairman and CEO of Maxwell Technologies.

(AUTOMOTIVEWIRE: 7/31)

For Sale

1992 Geo Metro Conversion. Excellent condition. 120VDC, Advanc 8HP DC motor, Curtis controller, electric heater, 2 KVA on-board charger, 4 KVA off-board charger. 31,000 miles - 60 mile range at 50 mph. \$11,000. Call Jim (7-9pm) at (715) 824-2069. (Wisconsin)

36V Complete Drive System. Save \$600 on 36V complete drive system. Lynch Permanent Magnet Motor, DAX 150A controller, High Frequency Terra Labs 10A charger and contactor. All parts in new condition with value over \$2,500. Must sacrifice, \$1900/obo. Email: Duckfude@aol.com

'80 'Lectric Leopard (factory built on new Renault Le Car platform). 2 door, 4 passenger, 4 speed. Auxilliary heater. Bought new by my father (70, then). About 5000 miles in first years, in storage since. Needs batteries (16 x 6V). Upgraded controller installed. On board 110vac charger about 1:8 time to full charge. Prox 45/45 range. \$3000/obo. Call Terry at (650) 493-4700. (California)

'75 Rabbit, 96 volts, Prestolette, Sevcon DC/DC, K&W charger, heavy duty suspension, custom wheels, 70 mph, needs controller replacement. \$2500. Call (408) 577-3256 wk, (408) 353-2710 hm. (California)

1984 Fiero EV, 9 in. Advanced DC motor, 120 VDC, 20 TrojanT-125 batteries, Curtis 1231C controller, 110 vac K&W on-board charger, 5-speed tranny. Can help with transportation. \$8000. Call (319 643-5650, e-mail laugh@avalon.net. (Iowa)

Porsche 914 conversion, ADC hi-torque XP motor; Auburn Kodiak controller; 5-spd. trans., DC/DC; dual K&W 220vac on-board chargers; dual 144VDC battery packs; lots of extras; 95+mph; \$15,5000. Call (310) 532-4536 (California)

1985 Ford Tempo, 4-dr, 4-psngr, 5-spd. trans., Curtis controller, Sevcon DC/DC, Zivan charger, 120VDC, NEW - 18x6V Trojan T125 batteries, 70mph, 45-50 mi. range, E-Meter; \$5500. Call (310) 532-4536 (California)

1985 VW Super Beetle, 8" Advanced DC motor with "battery blaster" conversion; dual Curtis 1221B controllers; New Toyo tires; 120VDC; Trojan 5SHP batteries, on-board 115vac charger; 80+mph, 28-30 mi. range, \$4000/obo. Call (310) 532-4536 (California)

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

For corrections or updates, please send a written note or fax to EAA Want Ads @ 408.374.8750. Photographs of your vehicles may be submitted with your ad. If room is available, we run one photo each issue. These photos will not be returned. Send your Member Want Ad request and check made payable to: EAA Want Ads, 18297 Baylor Avenue, Saratoga, CA 95070.

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1 ad	\$150 ea
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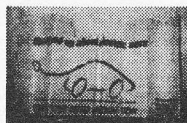
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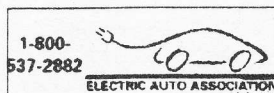
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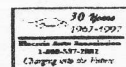
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FW001	Flywheel Energy Storage	\$ 5.00
BG1997	1997 Buyer's Guide to Electric Vehicles (Apr 97 issue CE)	\$ 6.00
BG1996	1996 Buyer's Guide to Electric Vehicles (Feb 96 issue CE)	\$ 5.00
BG1995	1995 Buyer's Guide to Electric Vehicles (Feb 95 issue CE)	\$ 4.00
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IDX001	EAA Current Events Index - 10 Years!	\$ 4.00
XA100	EAA XA-100 Hybrid	\$ 5.00

Other EV Items

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

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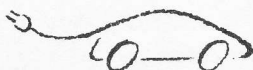
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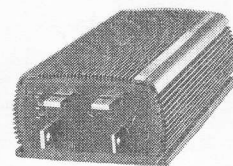
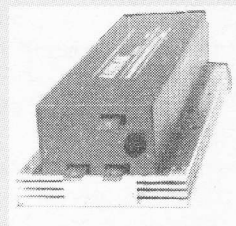
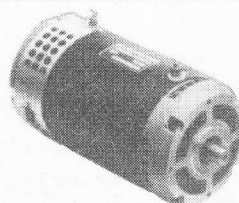
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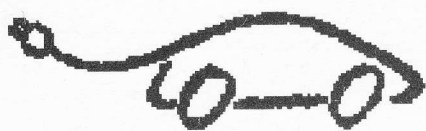
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