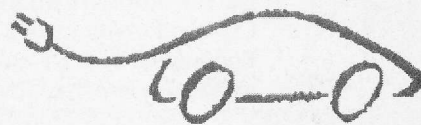


CURRENT EVENTS



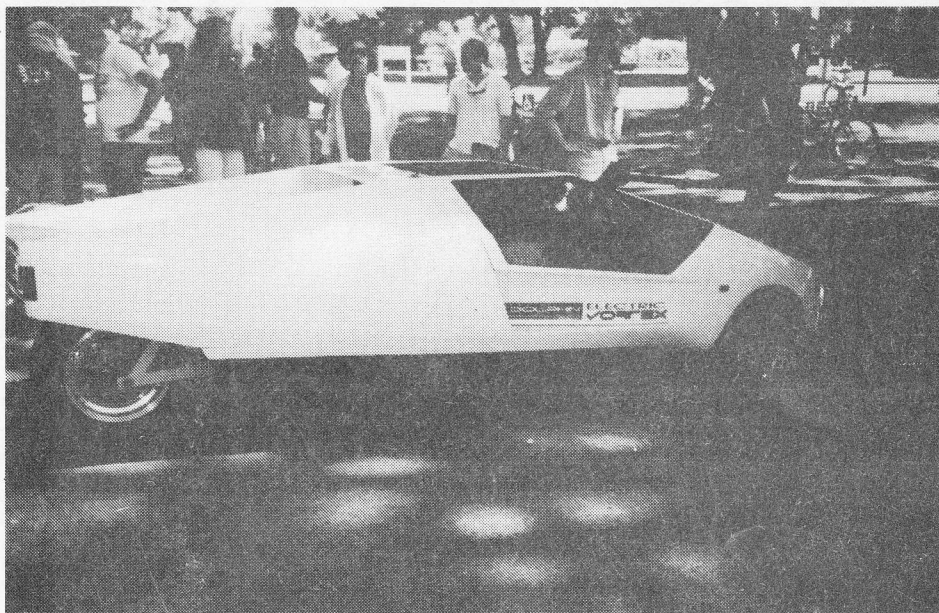
NOVEMBER '96

Promoting the use of electric vehicles since 1967

VOL 28 No. 11

Gas is Dirtier than We Thought—EPA

Even brand-new gasoline vehicles pollute more than emissions tests show, according to the Federal Environmental Protection Agency (EPA). This makes the pollution reduction benefits of electric vehicles even stronger by comparison. EPA stated on Aug. 15th that the 20+-year-old emissions test protocol, used to certify new vehicles for compliance with Clean Air Act standards, does not reflect real-world driving. EPA said that the test doesn't realistically account for the effects of aggressive driving, high acceleration rates, or the use of air conditioners. (Current Events also pointed that out in a summary of conclusions by Technology Review and others, see CE Sept. 1996)



These driver behaviors significantly increase vehicle tailpipe emissions. For example, the maximum speed during the existing test cycle is only 57 (mph) and acceleration rates are very mild. Revisions to the test cycle will measure

emissions during aggressive accelerations and at speeds of up to 80 mph.

Nitrogen oxide (NOx) emissions double with the use of air conditioners. The revised rule will cut these excess emissions in half. Air conditioners are most often used on sunny, hot days which pose the greatest potential for high ozone levels.

EPA must certify new model year vehicles for emissions standard compliance prior to their introduction in the US. The 1990 Clean Air Act requires EPA to "review and revise as necessary" the regulations for the Federal Test Procedure (FTP) to "insure that vehicles are tested under circumstances which reflect the actual current driving conditions."

The final Federal Test Protocol Revision is based on five years of extensive data collection and detailed analysis of urban driving by EPA, the California Air Resources Board (CARB) and auto manufacturers.

HOLD THE PRESSES!

EV Streamliners Bust Record and 200 MPH

BY CLARE BELL

Bonneville, UT - Two electric streamliners slugged it out in the salt flats for two days, battling for the official electric vehicle landspeed record. From 9/26-9/28, Lloyd Healey's Spirit of San Antonio II went up against EV landspeed veteran Ed Rannberg and his Lightning Rod. Both were rewarded with a one-way E ticket through the 200 mph barrier.

Two 200+ MPH One-Way E-Tickets

On 9/26/96 Healey's Spirit of San Antonio II flashed the course at 204.123 mph for the official fastest One Way Flying Mile, briefly ticking a top speed of 206.516 during the run. On 9/28 Lightning Rod peeled out a line to a Flying Mile velocity of 198.898 and 5th mile exit speed of 201.703. The 4th and 5th mile clocks show that Lightning Rod was still accelerating coming out of the 5th mile.

continued on page 6

continued on page 4

- 1** **EV Streamliners Bust Record and 200 MPH.** Hold the presses! Current Events scoops the EV Landspeed Record trials at Bonneville. Two EV streamliners have broken 200 mph one-way and one is less than 2 mph away from the official two-way mark!
- 1** **Gas is Dirtier than we Thought— EPA.** We've known all along —and now EPA has confirmed it —gasoline power is much dirtier than emissions tests show. All the more reason for going electric!
- 3** **Highway 9 Hill-Hop.** Midrange mountain commuting via EV? Yep, you can do it with some sense, some skill, and...a little "Black Magic". An Editorial PorscheEVoyage from Santa Cruz to Palo Alto, CA —Highway 9 Hill-Hop.
- 4** **EAA Silicon Valley Chaper Rally/Show.** It wasn't whiskey that made 'em feel so frisky on the Leland Stanford Junior Farm, Sept. 21st— it was EVs. Stanford University hosted EAA Silicon Valley Chapter's Rally. And the EV1 showed! Article by Will Beckett, with photo essay on p. 12-13. 5.
- 5** **Mazda RX-7 Brake Alert.** EV Safety Alert — if you've converted a late-model Mazda RX7, the braking system may be unsafe. Check it!
- 8** **Optima Batteries.** CE helps EV builders to Optima-ize their creations. Introducing the Optima 800 Deep Cycle Yellow-Tops, plus care and feeding. Would you believe — a Peukert curve?
- 10** **A Field Guide to Optimas.** Red-Tops, Yellow-Tops, Blue-Tops — they're coming in a bewildering array of versions. Cut through the confusion with A Field Guide to Optima Batteries by John Wayland of E-car.
- 15** **Component Failure due to Low RPM Stress.** Running an Advanced DC 9" at too low an RPM can cause controller and other component failures. Or just poor performance. — Bob Batson of Electric Vehicles of America.
- 16** **EcoElectric Teams with RASCO.** A new partnership was announced for marketing electric vehicles.

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

PHOTO CREDIT- PAGE 1

EAA members at the September 21st 1996 Silicon Valley Rally.

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Highway 9 Hill-Hop

BY CLARE BELL

On Thursday, Sept. 19, 1996 I drove my black 914 EV from Santa Cruz (CA) to Palo Alto (CA) for the Sept. 21 EAA Rally. I decided to take Highway 9 to Highway 35, since it would be a good challenge for the EV. Even though I did this on the spur of the moment with no really extensive preparation, the car got me there with minimal fuss. This shows that the 914 EV (and probably others) is capable of handling a one-way across the hill commute to the Bay Area from Santa Cruz.

Pre-trip preparation

Charging - I charged the 20 six-volt US Battery 2300s (120V nominal) with the K and W to 153.1 volts as measured under charge. This was done in two or three intervals, allowing the batteries to rest before the final top-off. The previous day I had "stretched" the batteries by doing my usual 2200 fit climb from Felton up to Bonny Doon.

Tires - I used my usual tire inflation pressures of 45-50 psi. The tires were the Michelin MXV4 Green Tire radials that WE'RE-IT used for the Phoenix race on #13. I had planned to make a stop at Boulder Creek to test tire pressures, but I got impatient and went right through. Later, when I did check tire pressures before the rally, I found that my front passenger-side wheel was down around 40, so the car was not running with optimal tire pressures.

Gear - I carried tools and my 10-speed bike (as backup transport).

Route Notes

From Summit Drive to Empire Grade, then down Alba Road (hot brakes, but no fading) to Highway 9 in Ben Lomond. Pack voltmeter reading 135V (float). Along Highway 9 at speeds between 35 and 40, through Boulder Creek. Climbing Highway 9 past the turnoff to Big Basin drawing 150-200 amps at 30-35 mph in 2nd gear. Doing some rollercoasting on downhills in 3rd and 4th to let batteries rest. Nearly continuous climb from Big Basin turnoff up 9 to the junction of 35 (9 miles). During the climb, voltage

dropped from 125 under load to about 90 under load and I put the car in 1st gear for the last 2 miles before reaching Saratoga Gap.

Turned north on Highway 35, climbed up first grade at 25 mph. Downhill, began rollercoasting technique, using momentum to gain enough speed on downhills to coast up most of the distance up the grades, then using battery energy to climb the remainder. Some of this is made possible on mountain roads by the 914's good handling. By letting batteries rest using this technique, the pack recovered to about 110 V under load and car picked up speed again.

Turned off 35 onto Page Mill Road, a winding downhill where the 914's agility and good brakes made the driving fun (but not reckless). I also chose to do this in the early afternoon when traffic on Page Mill is minimal.

At the bottom I went under the 280 overpass, then up the Page Mill hill (puffing a bit, I will admit), crossed Arastradero, cruised downhill to Hanover in Palo Alto, pulled in to John Schaefer's driveway, put the car on charge and made a triumphant entry in the logbook. The voltage under charge as measured at the beginning was 120.9 V. Car and driver then both flaked out.

Conclusions

It is definitely possible to commute to the Bay Area by EV using a good car and some driving savvy.

Tires and tire pressure is critical. I think if I had put that passenger-side wheel up to 50 psi with the others, the car would not have gotten so low on the uphill climb. I could have raised all tires to 55 psi as well — the Michelins are designed to take that pressure.

The time involved was about 1 hour, maybe a little more. The time lost on climbing was made up on downhills.



Volts Porsche One, 'Black Magic' with GM EV1 during Silicon Valley Rally at Stanford University, Palo Alto, CA. (9/21/96).

Average speed on 35 using the rollercoaster technique was 40-60, which is not unreasonable.

Regen would have been very nice in this situation and would have prevented some wear and tear on the brake pads during the long downhills.

Having the car get slow on the final part of the grade was annoying but not crippling. I handled it by letting other vehicles pass. People on Highway 9 are used to logging trucks, sand trucks and other slow vehicles and there are plenty of turnouts. And I think I could have avoided that had I checked my tire pressures in Boulder Creek.

Black Magic's performance confirms my earlier experiences with the #13 Porsche in crossing the Santa Cruz Mountains via Highway 17 (in 1993-1995). Though the latter car's batteries had been "hotted" up for the 1993 Phoenix race, the intrinsic characteristics of the 914 (low frontal area, low drag and low rolling resistance) made this performance possible.

With a good 220 high-amp charging setup, low rolling resistance tires, an efficient car, some thought and attention to detail, I believe that it is possible to do a round-trip comfortably from Santa Cruz to the Bay Area by 914 EV.

Other EVs are also doing it. I believe there is a fellow who does the hill-hop in a Honda CRX on a regular basis.

The distance as measured on the odometer was 43 miles. The Porsche also came in 2nd in the rally with 75 miles completed.

A good EVenture!—CB

EAA Silicon Valley Chapter Rally/Show

by Will Beckett

This year's rally at Stanford was the biggest ever, with 33 cars registered, including the GM EV-1, Toyota RAV4L-EV, Solectria Force, PIVCO CitiBee, and the Z-model Zebra. EV-1 was the first to arrive since its van was already there when I came at 7 am. Bruce Parmenter, Bob Mueller and Clare Bell arrived shortly after.

Largest Charging Center Ever

We had the largest charging center for one of our events Ever! Bob Wheeler and friends had it in place and ready to go, including Stanford's backup generator at 520 amps and a 300 amp supply from one of Stanford's buildings.

The event was staged around the intersection of Galvez and Serra in a "T" shape. Registration and inspection took place on Serra north of Galvez and the rally staging area was up in front of Encina Hall. Vehicle display area and food booth were south of Galvez and east of Serra.

Good Public Attendance

During the day hundreds of people viewed the cars on display, asking all the usual questions. They lined up to get rides with rally drivers on the 2.7 mile loop on the city streets near Stanford. From 10 am right up to 4 pm people crowded around the cars, bikes, and the yellow school bus. A perfect setting, and a wonderful day.

Winners!

Prizes were awarded for distance and appearance as follows:

Greatest distance in the rally, at 105 miles, Mike Slominski in his VW 1979 Rabbit with 16 Trojan T-125 and Goodyear Invicta GLR 175-70 R13 tires, GE DC series wound motor and Curtis 1221B controller. Mike received a \$100 gift certificate from Palo Alto Hardware.

The course was not very good for distance since there were 9 stop signs and 4 stop lights in the 2.7 mile route.

Last year my Blazer did 78 miles on old batteries and this year I only got 45. However, I carried more people this year taking on two to three passengers on each loop. Next year we will add passenger-miles.

Best Engineered vehicle went to Don Gillis with his 1973 Porsche and 12 brand new yellow top Optima 52A-H pack, Michelin MXV4 195/60R15, Prestolite 4001 DC series-wound with a Curtis 1231C controller. Don received \$50 gift certificate from Beppo in Palo Alto; a great new place to eat.

The following awards were selected by the mayor of Palo Alto, Lanie Wheeler.

For Best Looking Vehicle; the Toyota RAV4-EV. PG&E's Kent Harris brought it to the event, winning a \$25 gift certificate. to Hobee's, another great place to eat.

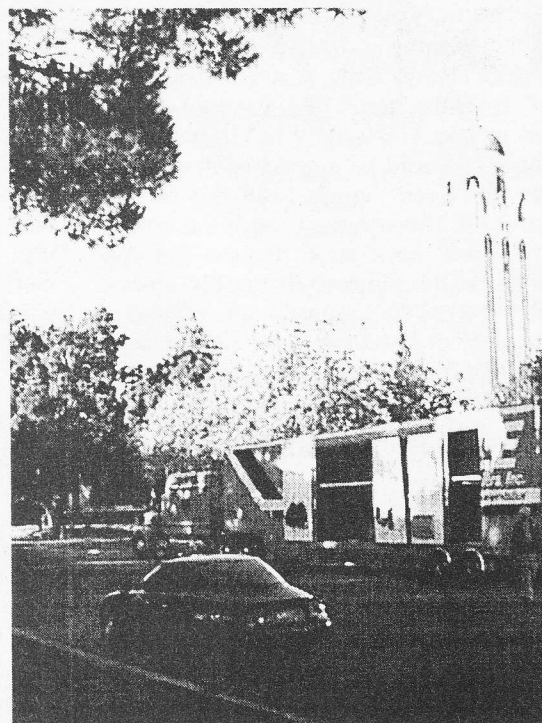
Best Classic Vehicle went to Bob Wing with his Red MGA Roadster 1959, 16-12v Optimas in two strings, Goodyear 165R15, Prestolite 4001 and Zapi H2 400 w/Regen controller. Bob won a \$25 gift certificate. at Just Desserts in Palo Alto. I hope he has a sweet tooth.

CitiBee Drives 55 Miles in From Sausalito

Best Commercial Vehicle was awarded to the EV-1 but Steve Haas could not accept the gift. Instead it went to Jan Herstad who drove the PIVCO CitiBee down from Sausalito about 55 miles. She got four tickets to the Stanford/Washington football game.

Bright Z Coolest Overall

Coolest Overall Vehicle went to Don Bright and the Z-model from Zebra Motors. He won the night-on-the-town package, including a \$25 gift certificate to Mike's Cafe etc.. and two tickets to a Theater Works production this season.



It was a great day and best of all Stanford would be happy to have us back again next year, so mark your calendars for Sept 20, 1997, same place, same time for our silver anniversary event, the 25th annual rally.—WB

(Current EVents extends thanks to Will Beckett, Bruce Parmenter, Bob Wheeler and others in the Silicon Valley Chapter for making it all happen. Also for Peninsula Chapter for doing the food booth in their wonderful style. Will arranged for the Stanford backup generator and it really was clean and quiet. He also scored the coup of getting the EV1 to EAA's rally; definitely a first. All right!—CB)

Posted on EV Discussion List Sat, 28 Sep. 1996
22:29:03 -0700 by Will Beckett
<beckettw@RADIOMAIL.NET>. Edited by Clare Bell

Check out SVEAA's Website at
<http://www.geocities.com/MotorCity/1754/>

Gas

continued from page 1

The fact that emissions certification test results have not reflected actual tailpipe outputs during actual driving may in part explain why air quality in California and elsewhere has failed to improve. EPA's revision of the test protocol is proof that gasoline cars are indeed dirtier than we assume.

Electric vehicle advocates should seize upon this as an additional argument for EVs. Furthermore, making existing and future ICE models meet these new requirements is not going to be easy or cheap. Chrysler already suffered a recall due to a rise in their emissions over the limits during air conditioner operation in new cars. A rise in fuel prices has already made EVs more competitive with gas. Now increased new-car costs due to stringent emissions requirements will spur consumer interest in EVs.

The revised FTP will phase in with 40 percent of the 2000 model year fleet and end with 100 percent of the model year in 2002 (the phase-in for heavier, light-duty trucks is delayed two years).

EPA foresees significant emission reductions due to extended emission control achieved by stricter testing standards. By 2020, EPA projects annual reductions of 435,000 tons of NOx, five million tons of carbon monoxide and 82,000 tons non-methane hydrocarbons (NMHC). NMHC and NOx are primary contributors to ozone formation. Ozone impairs proper lung function, affecting people with existing respiratory problems such as asthma. Elevated levels of carbon monoxide affects the central nervous system, the fetus and can exacerbate cardiovascular stress. The revised FTP will add \$13.00 to \$16.00 per vehicle to the cost of a car. (That does not count the cost of making these vehicles meet the standards, however.)

Revisions to EPA's vehicle certification test, finalized Aug. 15, updates the test for increased exhaust emissions due to driving conditions.

—CB

Source: EV Discussion List Post,
Fri, 16 Aug. 1996

EV SAFETY

Mazda RX-7 Brake Alert

EVs built from late model Mazda RX-7s or using RX-7 braking systems may have brake problems. On Sept. 18, 1996, Mazda recalled 13,900 1993-95 RX-7s for a braking system defect. This problem prevents the brakes from operating properly during the first three braking attempts after the car is started in the morning.

According to Mazda, accumulations of engine-oil mist may prevent the brake vacuum-check valve from opening at the specified pressure. This could prevent the brakes from working during the first through third braking attempts after start-up.

Late-model RX-7 owners are requested to bring their cars to a Mazda dealer for replacement of the brake vacuum hoses. The company issued its recall through its US sales arm in Irvine, CA.



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GOODYEAR



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EV Streamliners

continued from page 1

Spirited 198.487 Resets Two-Way Record

On the way to its double-zero crossing, Spirit of San Antonio obliterated the previous 183 mph official record set by a specially prepped Impact EV. Combining the 204.123 with a 192 in the opposite direction, Spirit posted an official average of 198.487 on 9/26/96. Two days later, Rannberg followed his 201.703 with a 194.501 the other direction to set a two-way average of 196.199. (The Italian Bertone EV landspeed record of over 190, previously reported by CE, was not certified by the Bonneville National Inc./Utah Salt Flats Racing Association, thus GH had the title until Healey took it.)

"Absolutely Wild"

On the telephone, Healey described how it felt approaching 200 in Spirit of San Antonio II. "Absolutely wild." It's a tight fit, he told CE. You are lying on your back about 3 inches of the ground, craning your neck to peer across your belly through a 2 inch strip off forward vision. And the view was hair-raising. "At the 4.5 mile mark, I was watching rubber fly off my front wheels," he said. His front thirteen-inch tires are from a drag kart and rated for 300 mph. However they were intended for a quarter mile at such speeds, not a 5-mile run across the flats.

When the left tire spun off entirely at about 190, it should have been all over. At 16 sec per mile, there's no time for mistakes. "A smart person would have pulled the parachute cord, but no one has ever called me smart," Healey said during the CE telephone interview. Instead he crabbed Spirit to the right to keep its left front wheel up, "skipping the nose" and staying with it until the incredible end of the ride.

Speed Paranoia or Common Sense?

It's not surprising that Lightning Rod's pilot admitted to experiencing some "speed paranoia" (translation - scared spitless - as any normal human being should be). It didn't help his confidence when Lightning Rod broke a drive belt under acceleration at 150 during an earlier run. The ride got scary as the Rod approached the mark, but after 200, Rannberg said, it felt "real nice".

The Only Pothole

Later, as Ed put it, "I managed to find the only pothole in 2000 square miles of salt." A pothole 2 feet across and 8 inches deep can be rough on a streamliner with virtually no suspension and Lightning Rod got smacked in the nose.

Low-Tech Wonder

Spirit of San Antonio II is charged up more by imagination and guts than money. It uses construction techniques more akin to those employed by lightweight torpedo-car builder Dave Cloud of Seattle Wa, than traditional racecar fabrication methods. Sponsored by Quick Cable Co. of Racine, WI, Healey built a low tech but high adrenaline EV. It uses chain-drive, Quick Cable connectors, a 12" GE motor, a diode-and-contact controller, and it has left the sophisticates eating dust. With less than a 2 mph gap between Spirit's current official mark and the double golden ring of a two-way 200. Healey is close enough to drool on it.



How to Whack

So is Rannberg. Ed lives fast EVs. His Lightning Rod has been pounding at 200 like a stake driving toward a vampire's ventricles. With each whack it gets a little closer. At an official average number of 196.199, the stake doesn't have far to go. And Ed and his sponsoring Wilde Evolutions crew how how to whack.

Toward the Double Zero

Since the official record requires a two-way average, Lloyd Healey and Ed Rannberg aren't quite there yet.

Who will bust through first? Healey's ahead now, but Rannberg could snatch it from him when they next meet head-to-head and battery to battery. Ed is going to fix the Rod's nose and revamp the pack. Lloyd plans to rebuild his front suspension with larger wheels and tougher tires. Both feel that their cars could potentially do 210 or 215.

They may have some interesting company when the word gets out. GM certainly won't sit still for this one. Sunny-Side Up (the previous record-holding Impact EV) will probably be

continued on page 16

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Optima Batteries

BY CLARE BELL

A new word has come into the EV builder's vocabulary: Yellow-Top. This is a new deep-cycle from Optima Battery. EV racers and fans know about the Optima 800S, now known as the Red Top. This is a spiral-wound sealed lead-acid advanced recombinant battery with pressurized electrolyte contained in glass mat. Recently it has packed the battery boxes of high-power race and drag EVs. It is also the top-selling battery for high-wattage competition stereo sound systems.

Now EV street users who want more battery life and durability have an Optima of their own, the deep-cycle 12V Yellow-Top. Since at 50 Ah's these are small batteries, EV builders are double- and triple-stringing them to enhance capacity.

In this issue's tech section, CE presents information that helps EV designers and drivers best use this exciting new battery. We include the Peukert curve as well as depth of discharge (DOD) versus cycle life.

Here are some of the features and advantages as described by the manufacturer:

Low cost

Compared to other advanced battery systems, lead-acid batteries offer an economical solution

Fully sealed

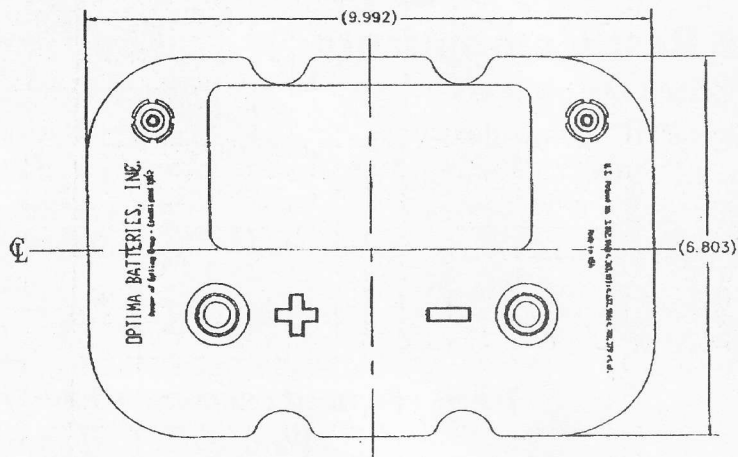
The Optima spiral-wound battery is sealed and maintenance-free. They need no water added and terminals stay corrosion-free.

Minimal acid leakage

The use of special separators results in no free-flowing electrolyte. Acid will not drain out as a result of case rupture.

Shock and vibration resistant

Unlike conventional flat plate batteries, the spiral-wound cell plates are



Weights and Dimensions

The Yellow Top weighs 44 lb. in the standard version, and 44.5 lb. in the universal version. The Red Top is 39 lb. in the standard version, and 39.5 lb. in the universal version. The dimensions for all versions are:

Length.....9-15/16"
Width.....6-3/4"
Height.....7-13/16"
BCI Group 34

Operating Characteristics

	Deep-cycle
OCV	13.1 V
Min. Discharge	10.5V
Nom .Oper. Temp Range.	20-45C
Deep Cycle Performance	50 AHr
Battery Energy	28.7 Wh/kg 65.3 Wh/L
Battery Power	0.45 kW/kg 1.02 kW/L

held by compression, making the batteries resistant to shocks and vibration.

Minimal mounting restrictions.

Can be mounted in any position (real-world experience suggest that completely upside-down mounting be avoided if possible)

Charging Rates and Voltages

Deep Cycle

Conditioning/Cycle-up: - Three cycles, charge at 4 A constant current for 16 hours with no voltage clamp. Discharge at 25 A (C/2) to a cutoff voltage of 10.5 V.

Normal Use: Constant Voltage Charge - 14.7-15.0, Temperature should remain less than 60 degrees C. No current limits, continue until current falls to 1 A then finish with a 2 A constant current for 1 hour.

Constant Current Charge. - A rate no greater than 25 A will replace 100-120 % of charge removed on previous cycle. Temp less than 60 C.

Standard SLI (used for racing)

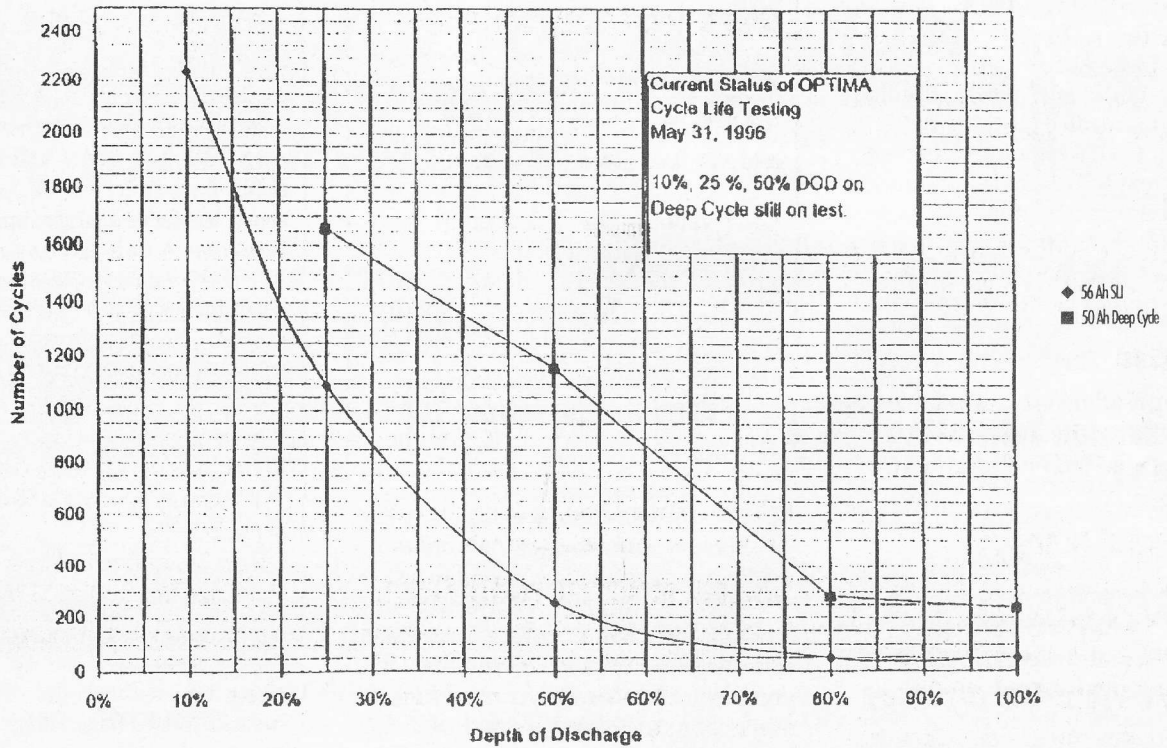
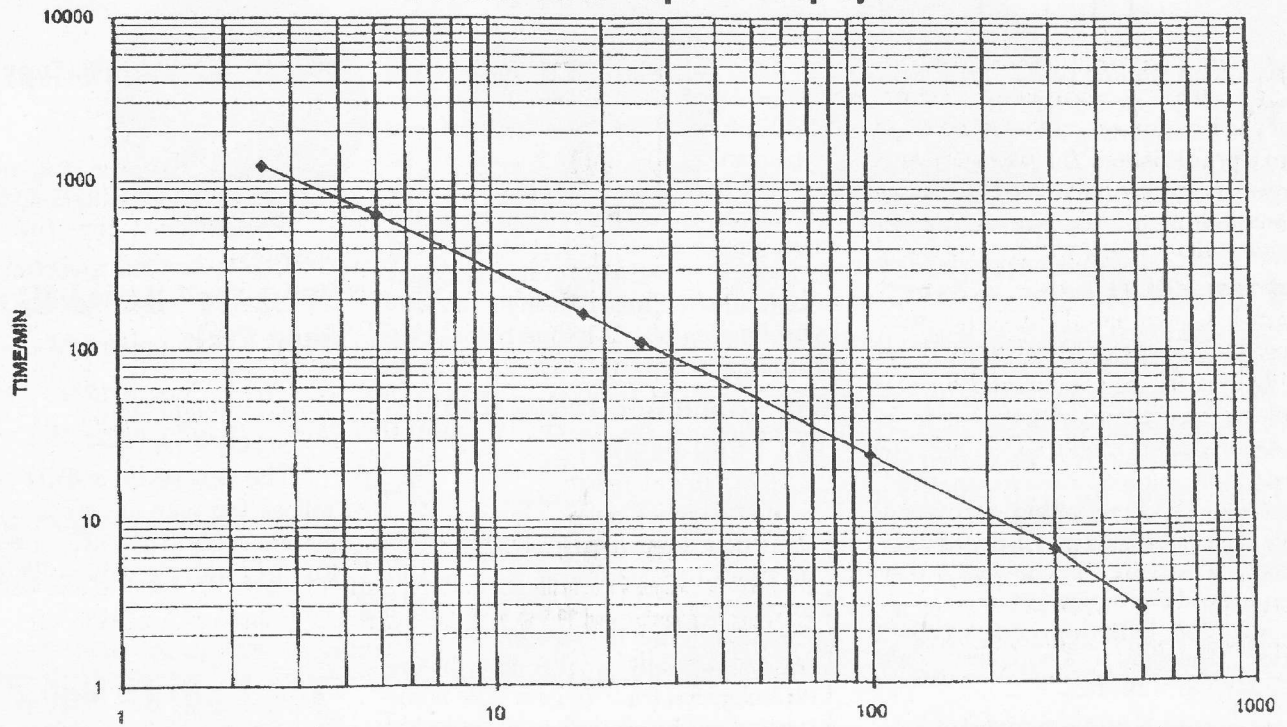
Normal Use: Constant Voltage Charge - 13.8V to 14.8 V, temperature less than 50 degrees C, max. current limit 10 A.

Constant Current Charge - No more than 25 A to 15.6 V max. Temp less than 50 degrees C.

Info provided by Optima Battery Co.
17500 E. 22nd Ave
Aurora, CO.
Fax # 303-340-7474.

continued on page 21

Peukert Curve - Optima Deep Cycle



Depth of Discharge vs. Cycle Life, Room Ambient, C/2 Discharge Rate

A Field Guide to Optimas

BY JOHN WAYLAND AND CLARE BELL

Standard starting battery using spiral plate sealed design, initial market, hard-starting European sports-cars such as Porsche. The 800U has dual universal posts: the GM side-mount style in addition to the universal automotive style.

Red Top 12V SLI

Top - Red

Body - Charcoal

Sticker: The left 1/3 reads in red, 'MODEL: 800S', then below that in black, '12-VOLT, 800 Cold Cranking Amps, 120 minutes reserve capacity'. The center 1/3 in red, black and white, reads, "Optima Batteries.....the ultimate starter". The right 1/3 contains a date calendar and warnings.

"Optima Batteries.....the ultimate starter". The right 1/3 contains a date calendar and warnings.

Deep-cycle Experimental 12V First Production

First deep cycle Optimas tested in AC Propulsion's Honda CRX.

Top - Red

Body - Light Gray

Sticker: Black and white, divided. Left 2/3 text reads "Optima Battery" with "Spiral Cell Technology" beneath. Additional text in rectangles within the left-hand section states that the battery is being sold "as is" with no warranty, and describes safe jump-starting procedures. The right 1/3 has a large black "P" designating prototype and the text "not for resale". There are no specifications or calendars.

Early Production Yellow-Top 12V Deep Cycles.

There were also some 6 V models as well.

Top - Light Yellow

Body - Light Gray

Sticker: Same prototype label as the first experimental deep-cycle 12Vs. No specs or warranty information.

Early Yellow Tops came in three versions; a standard automotive post, the universal dual post model, and a Yellow Top 6 volt model as well.

The automotive top posts were identical to those on the Red Tops. They had lead "fingers" that were supposed to help anchor the terminal in the plastic top. The flame arresters on the two pop-off valves were white, instead of the dark gray ones on the regular Red Top units. A small percentage of these leaked around the terminals during strenuous overcharging tests. Optima halted production to redesign.

Mid-production Yellow-Top 12V Deep Cycles

Top: - Bright Yellow

Body: Light Gray

Sticker: Same prototype label

These had improved sealing and terminals that were 1/8" taller. The plastic that forms the base of the terminals was actually smaller than before and lacked the lead "fingers" The flame arrestors were now dark gray, replacing the white ones.

Regular Production Yellow-Tops

Top: Bright Yellow

Body: Light Gray

Sticker: Same size and shape. Four color design: black, white, red, and gray, divided into three equal rectangles. The outer rectangles are gray, the center, bright yellow. The left section reads, "Optima Batteries...the ultimate starter". the right reads, "DEEP CYCLE....124 minutes reserve capacity", "12-VOLT, 52 Amp-Hour, 750 Cold Cranking Amps".

Early Production Yellow Top "Blems"

Top: Bright Yellow

Body: Light Gray

Sticker: Same four-color label as on the Regular Production Yellow-Tops.

Optima recently started selling these for \$50 each. There is a low chance of leakage around the terminals. Dual universal terminal style only. No warranty. Contact John Wayland of E-Car for more information and availability.

"For Sale" Yellow-Tops

Top: Bright Yellow

Body: Light Gray

Sticker: Tri-color red, black and white label from the standard Red-Tops.

These have the full Optima warranty.

"Blue Top" Marine SLI and Deep Cycle

Top: Blue

Body: Light Gray

Sticker: Unknown

The deep-cycle unit is basically a Yellow Top with automotive posts and marine studs. The SLI is a repackaged Red Top with the same.—JW and CB

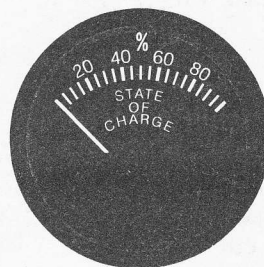
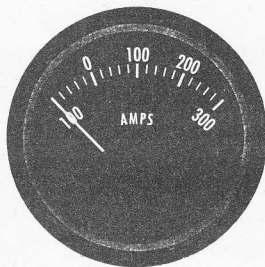
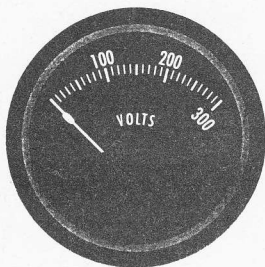
Top Guards Make Optimas Stackable and Safer

Bill Dube, of the EV Discussion List notes that Optima now makes nifty plastic "spacers" that snap into place on top of Optima batteries. These spacers come in red and, of course, yellow. One inch high, they cover the entire battery top, with openings that reveal the label and the tips of the top lugs.

These spacers are strong enough to support stacking batteries and protect the terminals from shorting by a carelessly placed wrench. The tops of the terminals are visible, but recessed, making it easy to check voltage and inspect connections. Bill couldn't find out how much they cost, but he says, "With a slot or two cut in the bottom edge, these might be just the ticket for a slick installation."

Optima also sells "DIN clips", small plastic parts that snap on to the side of the battery at the base. They evenly distribute the force when European-style base clamps are used for hold-downs.

Electric Vehicle Instruments



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- ▼ BATTERY TEMP.
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- ▼ VEHICLE SPEED

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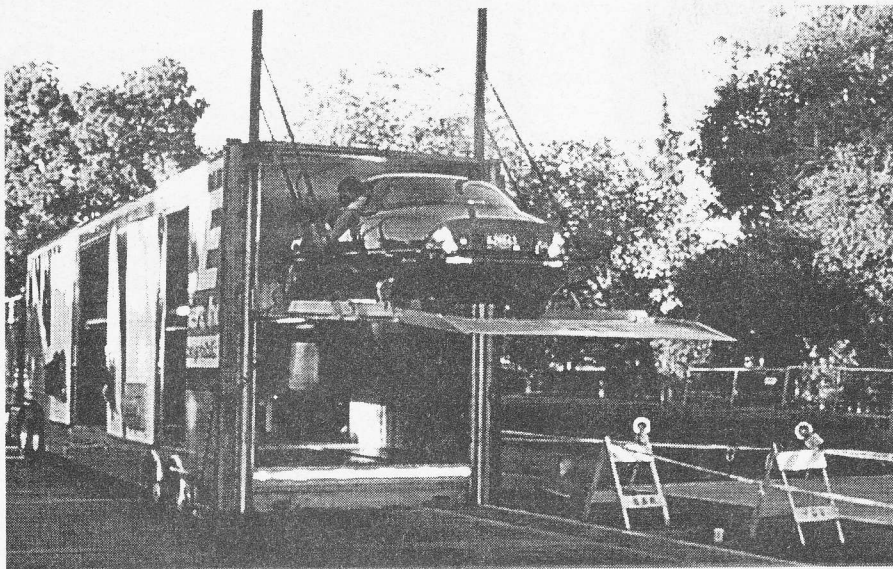
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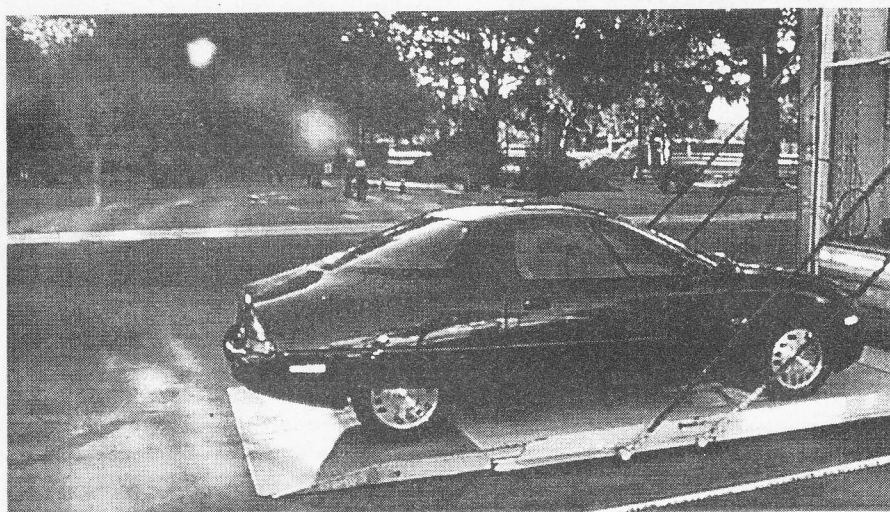
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Silicon Valley Rally at Stanford September 21, 1996



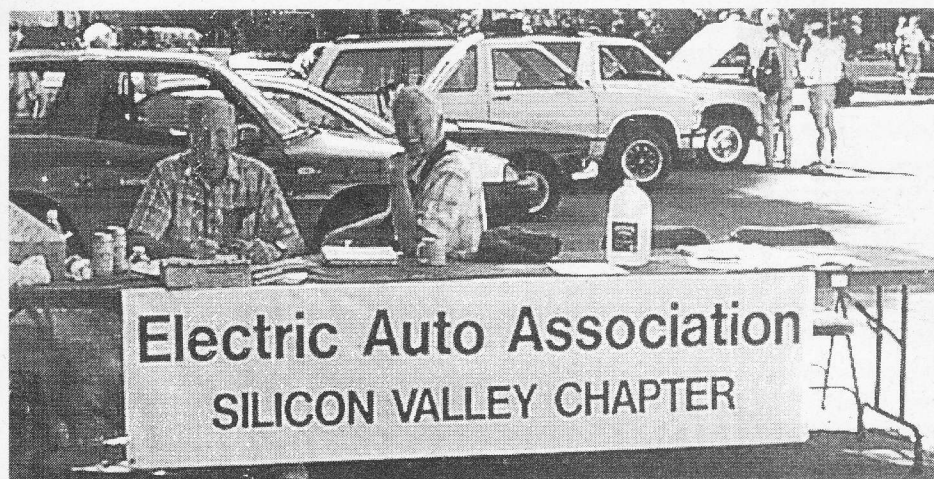
The Queen descending from her carriage. The ramp didn't have any stops and for an instant the EV1 looked as if she was going to glide right off, fly down (backwards) and crash on her cute aero-dynamic tail.



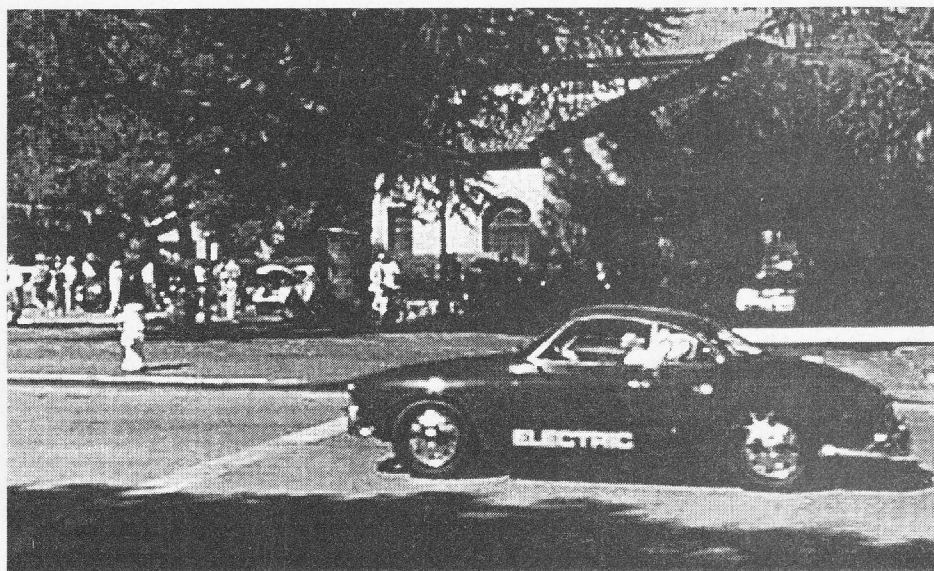
Safe landing.



Free and ready to fly. Later she gave rides as an un-official rally participant.



Toyota RAV4L EV (background) joins EAA table workers in the display area.



Gleaming Ghia. Scott Cornell scoots down the straightaway in his impeccably cherry Karmann Ghia.



Rally EV feeding frenzy. The postal van used the Stokin' Skokan EVI fast-charge system. Others jammed amps through their K and W BC-20s. Bob Wheeler, EV porta-charge wizard extraordinaire, handled the banqueting arrangements.

Dole Tax Cut Would Slash DOE Renewables

Republican Presidential candidate Bob Dole would pay for his proposed tax cut by cutting the US Department of Energy budget by \$32 billion over 6 years. The proposed cut is ten times more than the House of Representatives' Fiscal Year 1997 Budget, which would cut \$2.8 billion over the same period. Such a cut would essentially end all DOE appropriations for energy research and development, including energy efficiency and renewable energy.

These programs currently provide support for electric vehicles. DOE has sponsors or helped fund many EV competitions, such as the LA Clean Air Road Rally and Tour de Sol. DOE support is critical to the college open-wheel racing programs and the very successful Phoenix Electrics High School Stock race. Argonne National Laboratories provided instrumentation that measured the energy efficiency of various high school entries. Such competitions have already contributed significantly to today's EVs and are pushing future EV technology.

Present DOE energy efficiency and renewables programs presently support 45,000 jobs nationwide, including the National Renewable Energy Laboratory (NREL) in Golden, CO.

The proposed budget revisions would cut non-defense funding (\$300 M projected in FY'97) that supports alternative energy and transportation research in national defense labs such as Sandia and Lawrence Livermore.

Ironically, alternative energy advocates may find themselves joining voices with oil industry researchers in protest. Dole's cuts would terminate fossil fuel research, closing such facilities such as the various Energy Technology Centers, and the Strategic Petroleum Reserve.

The nuclear industry and particle physics would also be hit. Cuts would

Ironically, alternative energy advocates may find themselves joining voices with oil industry researchers in protest.

kill DOE's nuclear research, halt non-military nuclear waste cleanup/decontamination and halve spending on the nuclear waste repository, halting that program. Particle physics would lose FermiLab, Oak Ridge, Lawrence Berkeley, and Stanford Linear Accelerator. In fact, Dole's cuts would terminate the entire DOE basic science program, shutting down other national labs including Hanford, Argonne, Ames, and Princeton.

A financial analysis by the Sustainable Energy Coalition indicates that of the 32 billion envisioned by Dole, only \$25M will actually be saved.

Source: Sustainable Energy Coalition, Sept. 19th press release. Contact Ken Bossong, (301)-270-2258

The Sustainable Energy Coalition is made up of over 40 national business, environmental, consumer and energy policy organizations (list available on request). It was founded in 1992 to promote a shift in Federal support from nuclear, coal and oil to improved energy efficiency and renewable energy technologies.

House Renewable Energy Caucus

Nearly one quarter of the members of the US House of Representatives now support renewable energy through the House Renewable Energy Caucus. The addition of Representatives Sue Myrick (R-NC) and Nita Lowey (D-NY) brings the Caucus membership to 100. Launched earlier this year by a handful of members under the leadership of Dan Schaefer (R-CO) the bipartisan Caucus initially served as a non-legislative information clearinghouse. It rapidly grew beyond that service, galvanizing Congressional support for renewables.

With a mission to support those energy sources "which offer the promise of clean, abundant, affordable, and domestically produced energy supplies.", the Caucus has attracted almost equal numbers of Republicans and Democrats (51 Republicans, 47 Democrats and 2 Independents).

The Caucus showed its effectiveness last month when the House voted 279-135 to restore \$42 M to the US Department of Energy's Fiscal year '97 renewables budget. 85 Caucus members joined the vote while only 13 opposed it (two were absent). In contrast, a similar amendment last year barely squeaked by with only 6 votes.

With the assistance of the Sustainable Energy Coalition, the Caucus has sponsored a series of seminars, a trade show and other events to demonstrate the status and potential of renewable energy technologies. The Coalition will encourage the growth of the Caucus by encouraging new members of Congress to join following the November elections

Source: 9/26/96 press release from the Sustainable Energy Coalition. Contact Ken Bossong 310-270-2258.

Component Failure Due to Low-RPM Stress

BY BOB BATSON

We would like to present the following examples of an unacceptable design that decreased component reliability and performance. Consequently, we believe that there is a real benefit in working with a system designer, such as Electric Vehicles of America, Inc. (EVA) or KTA Services.

Anyone can build an EV; it only involves connecting wires. The question is will the EV be designed for optimal performance, reliability, and safety?

(Even the Big Three can learn from EV Users. Scott Isgar's VW Van costing \$7000 beat the Chrysler T-Van costing \$100,000 in the 1994 American Tour de Sol.)

Problem

During the last few weeks, EVA has been questioned about:

No. 1 - A race car designed with 1500 rpm as the optimum motor rpm; the vehicle performed poorly

No. 2 - An electric boat with a direct drive; the motor and controller tended to overheat.

No. 3 - A truck with an automatic transmission; the controller failed. In addition, the range was less than 50 miles.

No. 4 - A truck with manual transmission; the controller failed. Speed limit in the area used was 20 mph.

Discussion

These vehicles used the 9 inch Advanced DC Motor. All have a common problem. The designer dictated that the motor operate at a too low an rpm. The 9 inch motor is most efficient at 4500-5000 rpm when operating at 120V.

If the motor is required to operate at no more than 1500-2000 rpm, then the motor curves change considerably. At this low rpm, the controller acting as a

The motor sees more amperage and more heat. Just draw a rpm curve for the motor at 36 or 48 volts.

speed controller changes the duty cycle. Duty cycle is defined as the ratio of "on" time vs. "off" time of the power transistors. The controller may operate at only a 20-30 percent duty cycle.

The motor sees the low duty cycle as a low voltage. So instead of 120V operation, the motor is seeing an average of only 36-48V. But Hp is Voltage times Current; so the decrease in voltage corresponds to an increase in amperage. Therefore, the motor sees more amperage and more heat. Just draw a rpm curve for the motor at 36 or 48 volts.

Solutions

No. 1 - The race car should be designed to operate at a much higher rpm in order to be efficient. A gear change to increase the rpm or a manual transmission should be added. Weight is not the major consideration in race cars because they are not climbing hills. Low rolling resistance tires will minimize any weight problem. Aerodynamics is the major consideration.

No. 2 - The electric boat needs a gear reduction in order to optimize prop speed vs. motor speed. When EVA designed and converted a parade vehicle for the US Air Force, we selected a maximum speed of 10 mph and designed the gear ratio accordingly.

No. 3 - The truck with an automatic transmission needs to change the shift points. Typically an automatic transmission changes gears whenever the motor speed reaches 2000-2500 rpm. So an electric motor never reaches its most efficient speed. We understand that the springs inside the control valve body of the automatic transmission can be changed to increase the motor rpm. This

change is required to operate the motor and controller efficiently and reliably.

No. 4 - This truck was being operated in 4th gear. Again, the motor was at running an extremely low rpm. At 20 mph, the motor was operating at approximately 1000 rpm. We recommended that the operator stay in 2nd gear which would bring the motor rpm up to about 3000 rpm. Using 1st gear would improve efficiency by operating the motor at 4000 max.

I hope you enjoyed these real-life problems and understand their solutions.— BB

Source: EVDL post, Fri, 27 Sept. 1996 07:05:59 -0400 from Bob Batson
<EVAmerica@AOL.COM>. Tel# 508-897-9393,
Fax# 508-897-6740. 48 Acton Street, Maynard,
MA 01754 USA

Visit our Home Page at
<http://www.inc.com/users/evainc.html>

Electric Vehicles of America, Inc. (EVA)

EcoElectric Teams With RASCO

EcoElectric Corporation and Robert A. Stanley Company (RASCO) of Tucson, AZ, announced a new partnership for marketing electric vehicles and associated infrastructure and sales to fleet operators. RASCO specializes in commercialization and sales of advanced technology products addressing problems related to traffic congestion and air pollution. It is focusing on intelligent transportation system, license plate reader matcher systems, traffic control/enforcement and EV and EV infrastructure products.

EcoElectric's Desert Lightning (TM) electric pickup is RASCO's first product in the electric vehicle market. Introduced at the 1995 Solar/Electric Vehicle Symposium, the truck is in series production at EcoElectric's 5,000 sq. ft facility in Tucson.

"RASCO is excited about its entry into this dynamic market," said RASCO's CEO, Robert E. Walkup. "Many fleet operators are attracted by the reliable technology and excellent design and finish of the Desert Lightning. One look under the hood shows the buyer the high quality and professionalism of the EcoElectric team."

In addition to vehicles and infrastructure, RASCO and EcoElectric offer a complete fleet EV resource including implementation, planning, service training/management and user training and orientation. RASCO's strategic planning and community networking resources are available to assist a fleet operator in getting an EV program initiated.

Mary Ann Chapman, CEO of EcoElectric Corporation, said that RASCO's efforts have already produced several fleet purchases that will be announced shortly. "RASCO's resources enhance EcoElectric's ability to offer a comprehensive, cost-effective EV solution for fleet operators," she said.

Walkup and Chapman indicated that RASCO and EcoElectric are working on a leasing program and several additional vehicle projects to form an expanded product line.

Source: Sept 14 press release sent from EcoElectric Co.

Access: Robert A. Walkup, phone 520-326-1991, fax. 520-326-1975, email: REWalkup@aol.com.

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EV Streamliners

continued from 6

wearing its tailcone and tall gears again. Michael Murphy of Half Moon Bay is also fielding an entry for the next round. Running in the over-3500 lb. weight class, Murphy wants to take Rod Wilde's ex-Phoenix racing Taurus in the fray. Bob Schneeveis is revamping the Taurus with four Advanced DC 8-inches and Otmar Ebbenboech's EVCL, "Godzilla" (240V 1200 Amp) race controller. Though Murphy doubts he'll get near 200, he expects to be substantially within the three-digit zone.

A Fun-Run on the Flats?

Stay tuned for the next skirmish in the EV landspeeder battle. It may come in November, assuming the contestants can pony up enough to rent the track. Maybe they should ask for donations. Contributions might get at least a fun-run on the flats.—CB

Sources:

10/1 Press release from Quick Cable Corp. John Acheson, Media Co-ordinator. 414-637-8363 X370

10/2 fax from "Eddy Current" (Ed Rannberg) of Eyeball Engineering.

Direct email, 26 Sept. 1996 11:18:52 -0700 from Bob Rickard <Bob@WILDE-EVOLUTIONS.COM. <http://www.Wilde-EVOLUTIONS.COM> Thanks to Bob Rickard and Rod Wilde of W

Wonderful telephone interviews with both Ed Rannberg and Lloyd Healey on 10/6/96. Thanks guys!

Access:

For more about Ed Rannberg and Lightning Rod, see "Doing It by Eyeball" Current Events June 1996. Or contact Eric Lubin at (714) 855-2814 fax Eyeball Engineer

For more information about Lloyd Healey and Spirit of San Antonio II, call Quick Cable (his major sponsor) at 1-800 558-8667.



EcoElectric Corporation

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Desert Lightning Information: <http://www.primenet.com/~ecoelec/convnew.html>

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News in Brief

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

AFDC Tracks Introduction of EVs

Anticipating an influx of EVs into the market in the 1998 model year, the Alternative Fuels Data Center is tracking the addition of public charging stations on a refueling site database. For example, the database has recorded the addition of 34 charging stations in California that range from grocery store parking lots to public parking garages. The Electric Vehicle Association of the Americas has published a directory listing 295 public charging stations at 43 sites, chiefly in California, but also in Virginia, Vermont, Washington, and Arizona. For further information on EV charging sites, click on "Refueling Site Database" at <http://www.afdc.doe.gov>. Over the next two years, General Motors, Honda, Toyota, Ford, and Chrysler plan to introduce EV models.

(AFDC UPDATE: SUMMER 1996)

Ballard Expands Fuel Cell Contract

Ballard Power Systems, Inc. recently announced that it has received a \$2.3 million order to provide fuel cells to Daimler-Benz AG, who helped develop the technology in a joint venture with the fuel cell manufacturer. Daimler-Benz will use the zero-emission engine, which converts natural gas, methanol or hydrogen fuel into electricity, to further develop and test EVs powered by fuel cells.

The joint venture is an extension of a program initiated in 1993, through which a fuel cell with a power density suitable for a fuel cell-powered vehicle was developed. For more information, contact Paul Lancaster, Ballard Power

Systems Inc., 9000 Glenlyon Parkway, Burnaby, BC, Canada V5J 5J9, phone 604-454-0900, fax 604-412-4700.

(BALLARD RELEASE: 8/21)

SCAT Announces New Projects

The Southern Coalition for Advanced Transportation (SCAT) will add \$5.2 million in jointly funded projects to its ongoing work in electric and hybrid vehicles under a recently signed agreement with the Pentagon's Defense Advanced Research Projects Agency (DARPA). Under the agreement, DARPA will provide \$2.2 million in funding for the projects, while SCAT members will provide matching funds of nearly \$3 million. Projects include efforts to develop advanced batteries and propulsion systems for buses and trucks, devise new computer tools for vehicle designers and test containment strategies for flywheel batteries. Several projects will develop computer modeling and analysis tools designed for access via the Internet. Browse SCAT's web site at <http://www.advtans.org>.

(SCAT RELEASE: 8/20)

Canadians Not Ready for EVs

General Motors has discovered that houses in Canadian cities do not have the power capability to recharge EVs quickly. British Columbia Hydro and Power Authority had to bring additional power into garages from 220-volt lines of street transformers to support GM's PrEView Program. "Electric cars need a service the same size as an electric clothes dryer," said Vern Krienke, B.C. Hydro's manager of sales and marketing. "In places we thought would be relatively easy to install a recharger, we've had to put poles in to service them." EV owners would need to upgrade their power supplies to recharge the vehicles. Fast rechargers

also pose a problem because they would increase system load. B.C. Hydro predicts it would need 500 megawatts of new energy within a decade to support an increased demand for EVs.

(GLOBE & MAIL: 8/20)

Hypercar May Boost Fuel Cell Industry

According to recent studies on a Ford Taurus-class vehicle equipped with a PEM fuel cell and electric motor, the hypercar envisioned by Rocky Mountain Institute would cost less to build and drive even at costs likely in early, moderate-volume production, according to RMI's research director Amory Lovins. That's because a fuel-cell-powered drivetrain is 3 to 4 times more efficient than a conventional one and requires much less maintenance. Because of this higher efficiency, hypercars could adopt fuel cells as early as the late 1990s. Fuel cells would be produced in higher volumes, which would result in lower cost per fuel cell. A car powered by fuel cells could generate electricity while parked, which could be sold to the power company. The owner could recover about half the financing and depreciation costs of the average American car.

(RMI NEWSLETTER: SUMMER 1996)

Filipinos Threatened by Lead Batteries

A recent Greenpeace study shows that the health and environment of local Filipino communities are being damaged by the trade in recycled lead-acid batteries. At Philippine Recyclers Inc., the country's largest importer of used car batteries, lead contamination in the soil was reported to be 26,000 parts per million (ppm), compared to 140 ppm at a typical lead smelter in Europe. Scrap battery imports have risen to 42 tons a

day. "Countries such as Australia, Canada, Japan, the United Kingdom, Germany and the USA are exporting their environmental problems to poor countries," said Greenpeace campaigner Von Hernandez. Workers at recycling plants in the Philippines use minimal protective gear. They and nearby residents have experienced an increase in health problems such as nausea, burning eyes, sore throats and respiratory problems.

(GREENPEACE RELEASE: 8/22)

Demand for EV1 May Exceed Supply

Saturn Corporation executives expect consumer demand for the General Motors EV1 to outstrip supply. The vehicle will go on sale in Southern California and Arizona in early November. Saturn already has received more than 1,000 inquiries about the EV1 and about 300 are considered firm prospects. "We may have a situation where we will have more demand than supply," said Joe Kennedy, vice president of sales. But GM will not reveal how many EV1s have been built or provide a yearly sales projection for the 1997 model. The EV1 will carry a sticker price of \$35,000, but federal, state and local incentives could reduce that to about \$27,500. Saturn will initially lease the car and the charger for approximately \$450 a month.

(LOS ANGELES TIMES: 8/28)

Horizon Battery Wins Award

The Electric Power Research Institute and Electrosorce, Inc. announced that the HORIZON battery will receive an R&D 100 award, the "Nobel Prize" of applied research, from R&D Magazine, which annually honors inventors and scientists by selecting the 100 most technologically significant new products and processes. The HORIZON technol-

ogy is based on a patented process that creates a lead-coated fiberglass wire woven into lightweight mesh. The mesh is coated with an active material, cut into grids, stacked horizontally, separated by absorptive fiberglass and enclosed in a plastic box. Lightweight EVs powered by these batteries can exceed a 100-mile range. With special charging equipment, the battery pack fully charges in one hour, or 80% in 30 minutes.

(EPRI NEWS: 9/4)

Sammer Ships First Hydrogen Generators

Ringwood, NJ-based A.F. Sammer Corporation has begun shipping prototype versions of portable, hydride-based hydrogen generators. The company claims these are the first commercially-available generators of this type, and says the generator, when coupled with a lightweight fuel cell, could serve as an ideal portable, lightweight power source. The generator consists of a water supply, hydride cartridge (for hydrogen supply) and center piece with hydrogen outlet port. The hydride cartridges are disposable and will cost \$10 to \$20. A combination of the first-generation hydrogen generator and a complementary PEM fuel cell would yield an energy density close to 135 Whrs/kg. The company expects power from the new device to cost around \$.40/Whr.

(HYDROGEN & FUEL CELL LETTER: SEPTEMBER 1996)

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Electrosorce Wins New Projects

Austin, TX-based Electrosorce, Inc. won three new technology development projects as part of the Sacramento Electric Transportation Consortium, which operates one of the largest EV fleets in the U.S. Valued at over \$1.2 million, the projects include: developing a hybrid electric vehicle (HEV) battery; road testing a battery management system; and evaluating battery thermal management.

The program is being funded by the Sacramento Municipal Utility District (SMUD) under a grant from the Defense Advanced Research Projects Agency (DARPA). Using basic components already produced on Electrosorce's production line permits faster development and allows for lower target cost. For further information, contact Robin Roberson at 512-753-6500.

EV Calendar

Oct. 13-16

EVS-13, Osaka, Japan. 13th biennial international EV symposium, including addresses by major figures in industry and government, panels, exhibits, ride'n'drives. Contact: EVS-13, c/o Inter Group Corp., 7-5-17 Akasaka, Minato-ku, Tokyo 107, Japan, tel. +81-3-5570-6176, fax +81-3-5570-6178 or EVS-13 Secretary, c/o Japan Electric Vehicle Association, 2-5-5, Toranomon, Minato-ku, Tokyo, 105 Japan, tel. +81-3-3503-3651, fax +81-3-3503-8493.

Oct. 17-20

Monte Carlo Rendez-Vouz in the Port of Monaco. For more information, call tel. (377) 92 16 03 76 or fax (377) 93 15 03 13, or write to Editions and Promotions Internationales, 11 Blvd., Albert ler MC 98000, Monaco. Email epi@monaco.mc

Oct. 27

World Solar Challenge, Australia. Biggest solar car race in the world. Held every three years across the Australian Outback, from Darwin on the north coast to Adelaide on the south coast, a distance of just over 3000km. Won by the Honda "Dream" entry in 1993 at a record average speed of 84.96km/h. Over 50 entries from 11 countries with four US teams registered. Starts in Darwin Oct. 27. Hans Tholstrup, Energy Promotions, tel. 011-61-2-9988-4255, fax 011-61-2-9449-8767.

Oct. 31

Generalversammlung Asver Bern, Switzerland. Contact: Asver, J. Temperli, tel. +41-21-312-9090, fax +41-21-20-1019.

November 2-3

Coronado Electric Classic, San Diego, CA. Location: Jack Murphy Stadium. Features the High School Challenge Series. Contact Electric Vehicle Technology Competitions, Ltd. (EVTC) in Phoenix, Arizona at tel. (602) 256-2599, fax (602) 256-2606.

Nov. 4-5

World Electric and Solar Vehicle Conference, Australia. The Conference will be held at the Adelaide Festival Centre. Contact: Myriad Conference Management, tel. (08) 387-3877, fax. (08) 322-6290, email: myriad@adelaide.dialix.oz.au

Nov. 16

Converting a Gas Car to Electricity - One-day class geared for the interested public. Location: Rising Sun Energy Center, Aptos, CA (Santa Cruz area). Instructors, Electro Automotive's Mike Brown and Shari Prange. Even if you don't want to build an EV, the information gained will help in buying an EV or in having one converted for you. For more info, 408-423-8749.

Nov. 23

Jahresschlussfest ECS, Switzerland. Information acquired from German publication. Contact: ECS, E. Stolz, tel. +41-1-826-0313, fax +41-1-826-0330.

Dec. 2-5

2nd SAE Global Vehicle Development Conference, Detroit, MI. Symposium featuring 70 presentations from industry leaders on global automotive topics including vehicle development, sourcing and regulatory issues. Held at the Westin Hotel, Detroit. Under the sponsorship of the Society of Automotive Engineers. Contact: SAE Promotions, tel. 412-772-7131, email meetings@sae.org

Dec. 7-8

Desert Electric Classic, Tucson, AZ. Location: Davis Monthan Air Force Base. Features the High School Challenge Series. Contact Electric Vehicle Technology Competitions, Ltd. (EVTC) in Phoenix, AZ at tel. (602) 256-2599, fax (602) 256-2606.

Dec. 11-13

1996 North American EV & Infrastructure Conference, San Diego, CA. Symposium, exhibition, ride'n-drive, held at the Sheraton San Diego Hotel & Marina. Sponsored by the Electric Vehicle Association of the Americas. Contact: EVAA, 601 California St. Ste. 502, San Francisco, CA 94108, tel. 415-249-2690, fax 415-249-2699

1997

Jan 22-27 - Convert It: The Workshop: Hands-on training from a pro. Electro Automotive (Mike Brown and Shari Prange) is doing their classic four-day hands-on electric vehicle conversion workshop. Location, Electro Automotive, Felton, CA (Santa Cruz area). Emphasis on safety and reliability. Geared for the amateur mechanic and EV hobbyist. The primary focus is actually putting together an electric Rabbit and getting it running. Cost \$400 per person, pre-registration required, space limited. (408) 429-1989.

Feb. 24-27

SAE International Congress and Exhibition, Detroit, MI. Annual conference and exhibition sponsored by the Society of Automotive Engineers, held at Cobo Center, Detroit. Contact: SAE, 400 Commonwealth Dr., Warrendale, PA. 15096-0001 tel. 412-772-7131, fax 412-776-0002, email meeting@sae.org, or visit SAE Web site at: <http://www.sae.org>

Apr. 7-10

EnV'97, Detroit, MI. Fifth annual Environmental Vehicles Conference and Exposition is held concurrently with the 12th Annual Advanced Composites and 6th Annual Advanced Coatings Technology Conferences and Expositions at the Westin Hotel. Sponsored by The Engineering Society of Detroit and SAE. For more information on the 5th Annual Environmental Vehicles Conferences, contact: Kristin Karschnia, ESD, 29355 Northwestern Hwy., Suite 200, Southfield, MI, 48034, tel. 810-355-2910, fax. 810-355-1492

Optima Batteries

continued from page 8

Temperature-resistant

Long life under high temperatures and high power at low temperatures. High electrolyte and case surface areas aid in thermal management.

Long life

Plate compression limits shedding of active components, thus significantly adding to cycle and calendar life.

Faster recharge time

The same 3 milliohm internal resistance that enables the battery to deliver high cold-cranking amps without overheating lets it rapidly accept charge.

Election Announcement

Please return your ballot proxies to Anna Cornell (see Board Member list for address on this page)



d B Associates

Electric Vehicle Consultants

Serving Since 1969

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231 Kuss Road
Danville, CA 94526
Phone & Fax (510) 837-7086

Board Member

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1113 Royal Lane
San Carlos, CA 94070
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Tel./Fax: (303) 442-6566

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Upland, CA 91786
Tel. (909) 949-7914
Fax (909) 949-7916

Steven S. Lough
6021 32nd Ave.
N.E. Seattle, WA 98115
Tel. (206) 524-1351
FaX: (206) 5241351

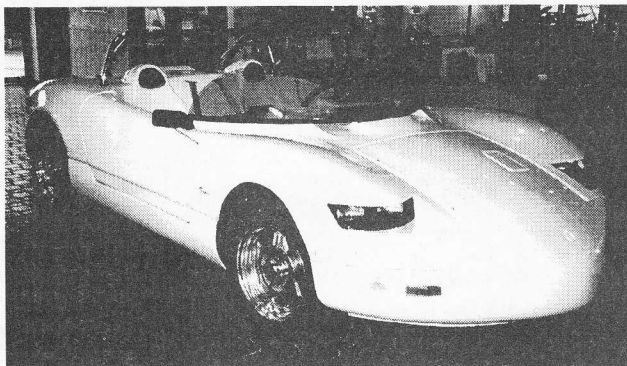
Stan Skokan, (Chair)
1020 Parkwood Way
Redwood City, CA 94060
Tel. (415) 366-0643
FaX: (415) 306-0137

Mike Slominski, (Treasurer)
951 So. Claremont
San Mateo, CA 94402
Tel. (415) 343-8801
FAX:(415) 343-4131

EV Want Ads

Tropica for Sale:

One of only sixteen ever built, this sleek, white sportster, owned by a legendary auto-motive executive, creates a sensation wherever it appears and may have collectable value. Fully equipped with digital instruments, AM/FM cassette and electrically activated trunk. Show-



room-maintained with fewer than 50 road miles, this Tropica has never been titled. Qualifies for 10% federal and state EV tax credits. Costing more than \$300K to build, this one could be yours for \$27,500. Contact Dave Goldstein, (301) 869-4954. (Gaithersburg, Maryland)

For Sale: '75 Honda Wagon. Meticulously converted. License "NOT GAS". 88,000 reliable electric miles. 18 (6V) batteries, Prestolite motor, Curtis/PMC Controller, DC/DC Converter, on-board charger, customer instrumentation, heater/defroster, power brakes, 4-speed Transmission, Stereo. Immaculate condition--like new! EAA Rally winner many years (both range and efficiency). All conversion and maintenance records. Many extras. Must see to appreciate this special electric! \$13,500. (408) 229-2435. (Penn Valley, California)

For Sale: 8 HP, 115 volt DC Briggs & Stratton range extender generator. Runs well.. \$300.00. Call (415) 388-0838. (Mill Valley, California)

For Sale: Jet 007, 120 volt, 20 new 6 volt batteries 23 HP GE DC Series motor, gas heater, PMC controller, many accessories. \$6,500. Call (415) 388-0838. (Mill Valley, California)

Member Want Ads

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

\$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

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

d B Associates	21
EcoElectric	17
EIN, Inc.	19
Electro Automotive	11
EV of America, Inc.	7
Go Ped	16
Kaylor	17
KTA Services	24
NESEA	5
Westberg Mfg. Inc.	11
Wide Evolutions, Inc.	7



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

EAA Reprint Order Form



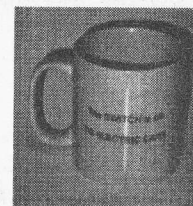
Auto SunShade
SS001.....\$8.00



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



Thermal Auto
Mug
MUG02....\$6.00



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



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



Bumper sticker 3.75 x 15 inches
BS800.....\$2.50



Bumper sticker 3.75 x 15 inches
BS002.....\$2.50



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

Printed materials

CE	Selected Current EVents (<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
BG1996	1996 Buyer's Guide to Electric Vehicles (Feb 96 issue CE)	\$ 5.00
BG1995	1995 Buyer's Guide to Electric Vehicles (Feb 95 issue CE)	\$ 5.00
TT001	Team Tucson Land Speed Record Plans	\$ 5.00
IDX001	EAA Current Events Index - 10 Years!	\$ 4.00
XA100	EAA XA-100 Hybrid	\$ 5.00

Other EV Items

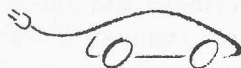
PN001	Ball point pen with "EAA, 800 phone # & Charging....Future"	\$ 1.00
CS001	Current Solutions/Motor Show Video Tape (14 minute runtime)	\$14.00
WL001	Window Literature Holder (fits pages 8.5 x 11 inch)	\$22.00
PARK01	"EV Parking Only" Sign (18"x12") green icon on white background	\$22.00

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

Name _____
Address _____
City, St, Zip _____

Item#	Size	Quantity	Item Description	Unit Cost	Amount

Make check payable
to: EAA (US dollars)



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

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

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 sell have been selected with safety and reliability foremost in mind. 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 10 variations from 2.0 HP to 28.5 HP
- ◆ CURTIS & AUBURN SCI. Motor Controllers from 24 V/175 A to 144 V/700 A
- ◆ CURTIS-PMC Throttle Potboxes & Footpedals
- ◆ CURTIS INSTRUMENTS Battery Fuel Gauges in 7 models
- ◆ K & W ENG. Onboard Chargers from 48 to 144 V
- ◆ ALBRIGHT ENGINEERING Main & Reversing Contactors in 5 models
- ◆ BUSSMAN Safety Fuses in 3 models from 200 to 800 A
- ◆ GENERAL ELECTRIC & HEINEMANN Circuit Breakers
- ◆ SEVCON & CURTIS DC-DC Converters from 48 to 160 V input/14 V/25 A out
- ◆ BYCAN Battery Chargers for 48, 120-144 V battery systems
- ◆ K & W ENG. AH-100 Amp-Hr. Meter & TD-100 Tachometer Drive/Rev Limiter
- ◆ 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 10 configurations
- ◆ DELTEC Meter Shunts in 4 models from 50 to 1000 A
- ◆ CRUISING Equipment E-Meters, Prescalers, & DC-DC's
- ◆ Electric Vehicle Heating & Air Conditioning Components
- ◆ 5 Conversions Kits for vehicles from 500 - 500 lbs. total wgt.
- ◆ 3 Conversions Kits for Go Karts — up to 90 MPH
- ◆ Complete ELECTRATHON Drive & Instrumentation 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 overview with schematic & recommendations
- ◆ Project Consulting/Engineering design
- ◆ Computer-based EV performance predictions

We want to be your #1 source for EV components
For an information-packed 45-page Components & Publications Catalog, send \$5.00

ELECTRIC AUTO ASSOCIATION

2710 St. Giles Lane, Mountain View, CA 94040

- Address Correction Requested ●

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EBAY

● Time Dated Material - Please Do Not Hold ●