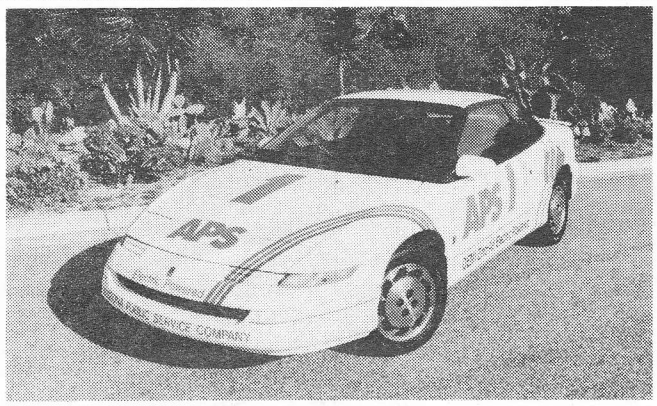
ELECTRIC AUTO ASSOCIATION

CURRENT EVENTS

April/May 1992 | Promoting the Use of Electric Vehicles Since 1967 | Vol. XXIV No. 3

Greatest EVent in History



Arizona Public Service Co. will race its converted zinc-air battery-powered Saturn SC in the electric stock category of the "500".'

PHOENIX, Arizona — More than 40 electric and other alternative-fuel vehicles from across the U.S. will compete in the Arizona Public Service (APS) Solar & Electric 500 race, April 24-26, at Phoenix International Raceway. By comparison, last year's inaugural event attracted 22 racers — 13 electric and nine solar powered vehicles.

This year's field is expected to grow even more as the entry deadline has been extended through April 20th. "We continue to receive calls from prospective racers who are just now hearing about the event," said race organizer Ernie Holden, of the Solar & Electric Racing Association (SERA). "Electric vehicle racing technology is so new and there's so much planning and work that goes into these cars, we'll accommodate as many as we can."

The APS Solar & Electric 500 showcases the latest technologies for non-polluting electric vehicles on the paved one-mile oval. Entries are so far rather evenly distributed among three of four racing categories.

- Electric stock car, a 200-kilometer race, spotlights street-registerable electric-motor powered vehicles.
- Electric hybrid competition, scheduled for 150 miles, showcases electric vehicles equipped with auxiliary internal combustion engines for longer range.
- Open competition features creative electric vehicle concepts. Entrants so far include a Formula-style race car, a classic-design midget racer and a Ferarri-replica kit car. The race is tentatively scheduled for two and one-half hours with the car travelling the farthest distance winning.
- In a fourth racing category, lightweight, experimental sun-powered racers take to the track for a scheduled 300-mile (100 miles per day) race. The event has attracted interest from several universities and at least two private companies.

SERA also announced this week it is adding at least two 25-lap "heat races" — one for electric stocks and one or possibly two for open competition vehicles. The races should feature rela-

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The Electric Turbine™

A Technological Breakthrough - Magnetics Research International (MRI) has developed a motor which successfully emulates the performance of all six principal motor types. The globally patented Variable Reluctance Motor (VRM) is designed to consolidate the advantages of numerous motor technologies through a remarkably versatile solid rotor and the use of stationary electrically excited field coils.

The VRM utilizes low cost electromagnets and entirely replaces expensive magnets used by all DC brushless motors when operating in the DC brushless mode. The cost is greatly reduced for comparable size motors, and the VRM technology means larger industrial drives are now achievable in DC brushless motors. The high cost of

(Continued on Page 3)

INSIDE

Editor's Corner

Twilight or Dawn?

On February 20, 1992 the local PBS television station, channel 54 KTEH, aired a story on the "Silicon Valley Report" show about battery technology and EVs. It was a fine 10 and one half minute piece with several minutes showing our "91 rally; a brief turn of the century history; and several minutes on the Lithium Polymer battery. It ended with a comment by a long time EAA member that he didn't think that we would have many more rallies because once "they" are manufacturing thousands of EVs a month "we will have done our job", and we can then "go on to something else." This sounds like a swan song for the EAA.

That may be true if our entire historic purpose had been to convince the world's auto manufacturers to build EVs, but the stated purpose on this newsletter header, and our history has been to "promote the use of Electric Vehicles". There are 185 million gasoline powered vehicles in the U.S. Certainly a very large portion are candidates for conversion, as the average trip length is 9 miles. We are the organization to address this issue and provide proof of conversion practicality and technical know-how to do it.

A recent Institute of Transportation Studies report says that at least 28 million households could use a present technology EV right now. However, the likelihood of purchase is strongly influenced by the cost. If household income must be greater than $50,000, then the potential market drops off rapidly.

*This is where we come in. A conversion cost of $5,000 to $7,000 for a used car versus $20,000 to $30,000+ for a new electric opens up a much larger potential market. Who are the conversion experts? **We are!***

*What happened when in 1980 IBM introduced the Personal Computer? Suddenly people perceived that personal computers were now real, and not just a toy. When the big three produce any EV it will have the same effect. The public will then perceive that **EVs are now practical** and then they will be more willing to consider EV conversions.*

In addition, as legislation is forcing commercial EV development (more than a dozen states are considering duplicating the California law), the public perception of the environmental problems of this world is increasing, and along with it, their interest in EVs. Sacramento Municipal Utility District alone has a list of 3,500 people who are interested in EVs. The New Zealand Electric Car Owners Club has 1,000 members. Strasbourg, France has become the first major French city to ban autos from downtown in order to clear the air; so has Bologna, Italy. Munich, Germany has been planning to do the same. Back home — alternative energy and environmental fairs and conferences keep setting new attendance records.

And now, thanks to Ernie Holden and the solar and Electric Racing Association (SERA), there is now a counterpoint to the Indianapolis 500 to showcase Electric Vehicle technology and performance to the world. I can only hope that this second time around that SERA gets International press coverage also.

*Considering all of the above, I can not but believe that this is just the dawn of a newly invigorated EAA with a bright future ahead for **promoting the use of electric vehicles.***

-Pb editor

Articles

If you would like to submit an article for Current EVents, the preferred form is on a floppy disk, formatted for DOS (Ascii Format) along with a printed copy of the article. Any form is acceptable. Also, include camera-ready photos, graphics or include TIF formatted files with your hard copy of the article. Please send to Paul Brasch, Editor (see address below.)

Advertisements

If you would like to submit an ad, please contact Susan Hollis/PCTEK at (408) 374-8605 or Paul Brasch at (408) 371-5969 between 10-5pm PST for additional information and rate sheet.

New Members

If you know someone interested in becoming a new EAA member, they may call EAA @ 800-537-2882 for a brochure and membership application. As a non-profit organization, the membership fee is tax deductible.

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Contributors:
Thanks for your contributions.
All members who contributed to "Letters to the Editors".

Bill Palmer
Bruce Brooks

Electric Turbine

(Continued from Page 1)

the powerful permanent magnets limits traditional DC brushless motors to approximately 10 hp. The VRM technology uses inexpensive electromagnets in lieu of the expensive permanent magnets. Therefore the practical limits on the economical size of electromagnets is dependent only on the size of the manufacturer's facilities. The application of the VRM technology enables feasible industrial drives of dozens, hundreds, or even thousands of horsepower.

The configuration of the VRM as an induction motor means that the MRI motor can compete in the multifarious line-start, constant speed applications that compromise 85% of the total motor market. The design features multiple bridge-like rotor poles which act as the bars of a squirrel cage and the cylindrical end portions which circulate the eddy currents and enable the rotor to follow the armature's rotating magnetic field.

The VRM operates in the synchronous mode. The motor receives 3-phase sine wave alternating current and an adjustable field current to maximize the power factor and provide efficient operation. The VRM provides power factor correction without brushes and their concomitant maintenance costs, via an over-excited field which presents a capacitive load to offset any presiding inductive load. This is especially useful for large manufacturing and public utilities that use inductive loads.

The VRM emulates any DC motor performance through the proper arrangement between armature and field windings without any inconvenient downtime. Because the VRM operates in a reluctance mode and requires no field coils, it provides the low cost synchronous performance demanded by all appliance manufacturers. Currently, manufacturers are tooling up to drive millions of industrial and domestic machines with reluctance motors. The MRI Variable Reluctance Motor provides a cost-effective answer. Hundreds of applications (such as computer peripherals and drafting plotters) will benefit from VRM technology. Configured as a stepper motor, the VRM appears in a multipole pancake shape and utilizes microstepping to assure inexpensive precise position control.

The VRM is programmable, permitting high torque and ultra high speed characteristics in the same motor. The high torque and speed, and variable speed characteristics of the VRM permit direct drive applications where high horsepower motor and gear train were used previously. This technology eliminates the need for gears, thus saving space, material costs, and the maintenance associated with power transmission systems. One such application is a high speed spindle. Currently spindles operating in excess of 3600 rpm use a complex system of gears or pulleys and belts. Depending on the design, the VRM Industrial Drive can operate at speeds in excess of 100,000 rpm, and in specialty applications smaller VRMs can maintain speeds in excess of 500,000 rpm. By eliminating complex transmission systems, the VRM Industrial Drive costs less, is more reliable, provides more precise control of speed, requires less maintenance, and has reduced weight.

The VRM's efficiency is well in excess of 90% on a continuous operating basis at both low speed or high speed, a characteristic unique to the VRM. Reprogrammable torque-speed slopes assure efficient operation under any set of load conditions.

The cost of manufacturing the VRM is extremely low. The same capital equipment, methods, and materials needed to produce the AC induction motor, (the least expensive motor currently produced) are used to produce the VRM. The VRM incorporates the low manufacturing costs of AC induction motors with the efficiency and control of the DC brushless motors. Indeed the applications are far reaching.

Configurations of the VRM in common DC brush performance emulations include:

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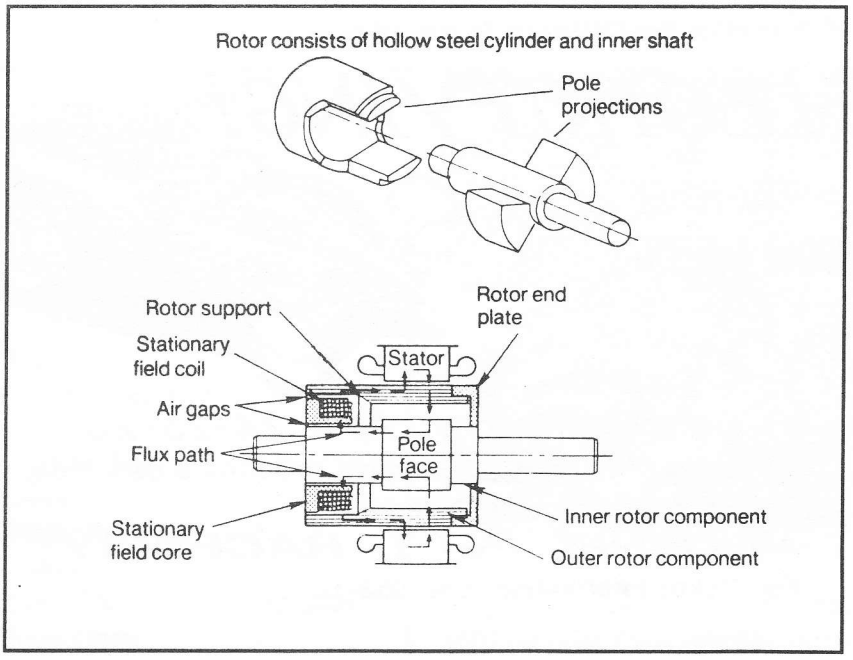

Electro Mag Motor Series

Study Shows Methanol Will Cost & Pollutes More

Results of an ongoing study by automobile and oil companies has determined that cars powered by an alcohol-gasoline fuel blend would actually pollute more and cost more. The Auto/Oil Air Quality Improvement Research Program released its findings at a press conference in Washington, and was almost immediately criticized by advocates of the use of methanol to reduce smog-causing emissions.

The report focused on a blend of 85 percent methanol and 15 percent gasoline, known as M-85. In addition to increased emissions of such pollutants as carbon monoxide and nitrogen oxide, it was estimated to cost up to 70 cents more per gallon than regular gasoline.

"On the federal level, these results should make it clear to our lawmakers that legislation for large methanol subsidies or mandates to compel the use of methanol-fueled vehicles are not in this nation's best interest," said Texaco president James W. Kinnear.

But, critics of the report said the results came from tests using older vehicles, whose fuel and emissions systems were not designed to handle a fuel other than gasoline. They also cited studies that have already determined "that emissions from a methanol-powered vehicle are 50 percent less smog-forming than the same volume of emissions from a gasoline-powered car."

(AUTO/OIL AIR QUALITY IMPROVEMENT RESEARCH PROGRAM RELEASE 2/14, NEW YORK TIMES 2/15)

Ed note: I am told that Methanol has 58% of the energy per unit volume that gasoline does, so you would probably produce twice the volume of emissions to travel the same distance, therefore the same pollution.

Greatest EVent

(continued from Page 1)

tively high speeds and close competition.

APS has been involved in electric vehicle research for 25 years and is title sponsor of this years race. By contract, the electric utitlity has options to continue its major involvement in the race through 1997.

Other sponsors include the U.S. Department of Energy, Electric Power Research Institute, Motorola, General Electric, Arizona Department of Transportation, Power Up Lubricants, One-2-One Communications, Chrysler Corp. and Goodyear Tire Co.

Major EV Recognition

The March 30th issue of the Electronic Engineering Times News Magazine acknowleges the electronic — EV connection. The April issue of the Smithsonian magazine also has a several page article on electric cars.

Glacial Melting Called 'Drastic'

Washington Post - High mountain glaciers in South America and Asia are becoming warmer and melting away at a "drastic and accelerating" pace that suggest global warming has been speeding up over the last 40 to 60 years, according to a glaciologist who testified last week at a Seanate hearing.

"The evidence is very clear that waming is taking place," said Linnie G. Thompson of Ohio State University's Byrd Polar Research Center.

It won't be much longer, Thompson said, before these ancient frozen repositories — which he studies for evidence of past climates trapped in the chemistry of the ice — are gone.

San Jose Mercury, March 3, 1992

Saving on Electricity: PG&E's 'Time of Use' Metering

By Bruce Brooks

Save over 40% on the cost of electricity for your Electric Vehicle?

At a recent meeting of the Silicon Valley chapter of the Electric Auto Association (EAA) there was considerable discussion and questions about Pacific Gas and Electric's "Time of Use Program". Even though I don't have my electric car running yet, I have been on the program at my home for nearly a year now. I first heard about the program at an EAA meeting and decided to check into it. I called my local PG&E office and was directed to one particular customer service representative who reviewed my usage pattern. She said I was a good candidate and sent me the information I needed.

When I got the literature it only took me a few minutes to decide I wanted to get on the program and get in on the savings. PG&E says this program is not for everyone. They probably are correct, but with a swimming pool, air conditioning and several electric appliances, I saved $156 dollars in the first six months on what would have been a $618 electric bill at the standard rates. Some EAA members reported a more difficult time with PG&E when they requested information, but I suspect it is because they are not big electricity users aside from their EV or they are on some other special rate program.

PG&E put this program into place as a $$$ incentive for large users to shift their usage from times of heavy loads on the utility to times when the load was lighter thus smoothing out the load on their generators and avoiding installation of new equipment.

First let me describe how the charges work, and then how much you can save on recharging your EV at off-peak electric rates using the Time of Use metering system. Without going into all of the special rates and funny ways PG&E calculates electric bills, lets just say that for most people any additional load they put on their electric service will get billed at the maximum rate. For "standard" service the rate for each Kilo Watt Hour (KWH) over the baseline is billed at $0.13682. This rate applies year around for each additional KWH you use regardless of whether you use it in the middle of the afternoon or the middle of the night.

For "Time of Use" users, the formula is more complicated, but it boils down to four different rates for those extra KWHs. There is a PEAK period from 12 noon to 6 pm on weekdays which has the highest rate and an OFF-PEAK period from 6 pm to noon and all weekend which has a lower rate. In addition, there is a differential between summer and winter which follows a calendar (about like daylight savings time). The PEAK rate is currently $0.31251 in summer and $0.10330 in the winter. But for recharging the EV, its the "Off-PEAK" rates that we are interested in and those are $0.09423 in summer and $0.07982 in winter. To track the usage at different times PG&E installs a new digital meter at your house or business.

As can easily be seen, if the off-peak rates can be used for charging the EV, the savings will be over 3.3 cents per KWH in summer and 5.7 cents per KWH in winter compared to the standard rates. To create an example, if you use 300 KWH per month charging your EV (25 charges of 12 KWH each) you would spend $41.05 a month for electricity using the standard rates no matter what time or what month it is. Using the "Time of Use" rates for the same number of charges would cost you just $23.95 in the winter months, and $28.27 in the summer. Extending that out for a full year would be $492.60 for the standard service and $313.32 for off-peak charging using the "Time of Use" meter—a difference of $179.28 a year just for the EV! I am looking for a savings of over $375 a year for my normal use and EV use combined.

Before you run out and sign up, you will need to look at your other electrical use habits and needs. If you can't get away from high daytime use in the summer, the 31+ cent a KWH rate could wipe out all of the other savings. By watching my meter I have found that with my family away from home most of the day we tend to use about 12%-15% of the months total during the peak noon to six period both summer and winter without the EV. When the EV starts running this summer, only about 8% will be peak period use. To accommodate the new rates we have made a few minor adjustments such as running the pool filter in the early morning, using a setback on the AC while we are not home and avoiding laundry and baking in the afternoon, but no real lifestyle changes.

While each EVer's savings will be different depending on the amount of electricity used and their other electricity usage patterns, checking into the program should pay off for most families with an electric car and living in PG&E's service area. For those not living in northern California, you should check with your local power company to see if they have a similar program.

Bruce Brooks is a member of the Electric Auto Association and is converting a 1973 VW Karman Giha to Electric.

Thanks Bruce. This is a great start on understanding PG&E's complex rate structure. - Ed.

EAA XA-100 Hybrid Electric Vehicle Project - Chapter 2

By Bill Palmer

This is the second of several articles about the project. The first, in the December '91/January '92 issue, described the role of EAA, as contractor to the California Energy Commission, and gave an overview of the work a team of EAA members and Stanford students and faculty did in converting and testing the car. The performance of the car was mentioned qualitatively. This time we will go more into the details of what we did, how and why. We hope our process and experiences will be helpful to any of you who plan to convert or build an electric car.

Why Electric and Why Hybrid?

Let's start at the beginning. Why build an electric car? I'll risk being accused of singing to the choir and review a few reasons. Electric vehicles can help solve three of society's problems: air pollution, global warming and dependence on foreign oil. Operating on battery power they produce no emissions, which translates to no smog and no CO2 contribution to the greenhouse effect. By charging at night they utilize power company generating capacity which otherwise would be idle and this off- peak power frequently comes from renewable sources such as hydrogeneration. Electrics are also clean and quiet.

Why build a hybrid if electrics are so good?

Straight electrics are fine as far as they go. They just don't appear to go far enough for the general public even though many studies have shown that the average daily car use is under 11 miles. Four questions seem to make the value of the hybrid concept clear:

1. How far would you be willing to drive if you knew your spare tire was flat? Most people say "Not very far. I'd get it fixed, then drive anywhere." This answer established two important concepts: aversion to perceived risk and willingness to carry spare equipment in case of need.

2. Would you buy an electric car that has zero exhaust emissions and is quiet, clean, efficient, brisk in performance and competitive in price to its ICE counterpart, low in operating cost and has a range between charges of 25 miles? Most people reply "It sounded great until you got to the 25 mile range part. I admit that 25 miles is more than I drive most days, but I would not want to be limited to that distance. What would I do if I wanted to go farther?"

3. Suppose we increased the range to 50 miles between charges by adding more batteries? Most people remain negative. Some will say something like "I don't care if it will go 100 miles. I may have to go 101 miles."

4. Would you like the clean-air, high performance electric car we mentioned in question 2 if we added a "black box" that would let you go as far as you want to, as often as you want to, anytime you want to, just by pulling into a gas station every few hundred miles like you do now with your ICE car? This "black box" would be an auxiliary power unit, an engine/generator that would be activated automatically whenever it is needed. It would be like a second spare tire.

Many people have reacted positively to this concept of the auxiliary power unit which permits unlimited range. They want to hear more about this car. The XA-100 is an experimental research vehicle built to test this concept and to introduce it to prospective users and to get their evaluation.

Planning

At the start of development of a new propulsion system several things needed to be decided. What specifically are we trying to accomplish? What functions should the car perform in addition to being a test bed? What performance should it have for speed, acceleration, hill climbing and range? Should we build the entire car from the ground up or convert a stock, engine-powered car?

Decisions

What do we intend to accomplish? We decided to build a car which: 1. will produce no emissions most of the time when it is driven on local trips, 2. will be capable of going unlimited distances as an ultra low emission vehicle (ULEV) and 3. will have acceleration, hill climbing and top speed capability comparable to the average conventional engine-powered car.

What functions?

We wanted the car to carry 5 people or 2 people and some cargo and its controls shall require no driver retraining.

Performance?

We established the following objectives:

- Top speed: at least 60 mph. - Acceleration: 0-30 mph in 10 seconds and 0-50 mph in 20 seconds.
- Hill climbing: Maintain 55 mph on a 3% grade and start from rest up a 20% hill or steep driveway.
- Range on fuel: unlimited.
- Range on batteries: We could have tried for long range on battery power alone, but that would have required a very heavy battery. Since we wanted an agile car with good energy efficiency, good handling, good acceleration and hill capability, we needed to keep the weight down. We did not want to exceed the car manufacturer's maximum gross weight rating any more than necessary. So we had to settle for whatever range we could get with a reasonable weight (about 700 pounds) battery pack trying several of the most attractive, readily available models of "deep discharge" batteries.
- Fuel economy: At least as good as the average engine-powered car ie:

(Continued on next page)

EAA XA-100 Hybrid EV

(Continued from previous page)

24 mpg city and 31 mpg highway. Since the car is expected to be used primarily on battery power for daily local trips with only infrequent use of the engine/generator, fuel economy was considered relatively unimportant. However, we expected it to be very good because the engine would be small and it would operate at its most efficient constant speed and load whenever it is used.

- Charging: Overnight from any standard 110 or 220 Volt receptacle

- Exhaust emissions: Less than California allowable ie: 220 ppm hydrocarbons and 1.2% carbon monoxide.

- Weight: Under 4000 lb.

Convert or build from ground up?

We decided to convert so the performance of the converted car could be compared with the standard engine-powered car. Also, we didn't have enough funding to build the entire car.

Series or Parallel Hybrid?

We decided on series with the battery and/or engine-generator supplying power to a single traction motor. This seemed simpler and more flexible than a parallel system in which the drive shaft is mechanically driven by either the motor or the engine. The series scheme allows battery charging by the engine/generator anytime, whether the car is moving or parked.

Choices

- Selecting Components: We had to decide which of several available cars, motors, engines, generators, batteries, etc. would be best for the project.

- Selection of a car to convert: Several car magazines publish useful data on popular cars such as aerodynamic drag, curb and maximum weight. For tires they list rolling resistance. A collection of such data and some calculations enabled the generation of a table. For this analysis we assumed that each car was equipped with the same low rolling resistance tires - Ward's Grappler II.

Each car was converted (on paper) to a hybrid EV with the same motor, engine-generator, controllers etc. and with the number of ALCO 2200, 6 V. 63 lb. batteries necessary to overcome aerodynamic drag and rolling resistance at 50 mph. for one hour and to keep motor current below 350 Amps. going up a 6% grade. Each battery was assumed to store 500 Whr. (2/3 hphr.) when discharged at a one-hour rate. That established the "EV curb weight".

Then 300 lb. of passengers and cargo were added to get EV gross weight which was compared to the car maker's maximum allowable gross weight. The last column of the table shows the EV weight margin as a negative percent of the manufacturer's rated maximum allowable gross weight. In other words every car was overloaded when converted to electric power. They are ranked in order of increasing overload (without modifications). The analysis shows the Corsica not only to have a sturdy suspension but also to require fewer batteries than some smaller cars. The better energy efficiency and more space for electric components made the Corsica the preferred vehicle to convert. An additional feature was that the Corsica rear suspension and axle construction would permit fairly easy adaptation to rear wheel drive if we decided to go that way.

In the next chapter we will discuss selection of the main components such as motor, engine, generator, controllers and batteries and how they were connected together and tested.

If you want to know more about any aspect of the project send your questions to Bill Palmer, 44 Dior Terrace, Los Altos, CA 94022.

Candiate Vehicles in an Electric Vehicle Configuration

Vehicle	Air Drag 50 MPH HP	No. of Batteries needed at 50 MPH to Overcome:				EV Curb Weight	EV Curb Weight plus 300# Live Load	Maximum Allowable Gross Vehicle Weight, lb (MAGVW)	EV Weight Margin % of MAGVW
		Air Drag	Rolling Resistance	Keep Below 350 A on a 6% Grade	Total				
1	2	3	4	5	6	7	8	9	10
Corsica	6.7	10.0	6.0	1.0	17	3600	3900	3750	-4
Merkur XR4TI	6.7	10.0	6.2	1.0	17	3620	3920	3750	-4.5
Eagle Premier	7.0	10.5	6.2	1.3	18	3740	4040	3750	-7.7
Voyager	10.1	15.2	7.7	1.1	24	4710	5010	4600	-8.9
Mazda 626	6.0	9.0	5.9	2.1	17	3520	3820	3500	-9.1
Audi-90	6.6	9.9	6.1	2.0	18	3650	3950	3565	-10.8
Cutlass FWD	6.6	9.9	7.0	2.1	19	4250	4550	3990	-14
Corrola	7.1	10.7	5.9	0.4	17	3520	3820	3245	-17.7
Tercel	7.1	10.7	5.2	0.1	16	3090	3390	2840	-19.4
Charade	13.2	19.8	5.7	0.5	26	3425	3725	2650	-40.6

Mexico City Extends Air Pollution Alert

This is the second such smog emergency in Mexico City in the last two weeks. According to World Health Organization guidelines, exposure to air with an ozone content of more than 0.11 parts per million should be limited to no more than one hour each year. Citizens in Mexico City were subjected to such air quality conditions for 1,400 hours last year.

"I worry that this is going to happen every week," said Homero Aridjis, president of the environmental organization known as the Group of 100. "Each week it's worse than before. It's very, very serious. Every day we have (ozone) levels of between four and seven hours of double or triple what it should be."

(UPI 2/19)

French City To Ban Cars in Downtown

The city of Strasbourg became the first major French city to ban automobiles from downtown areas as a measure for cutting down on air pollution levels. Only drivers with special permits will be allowed into the central city. All others must park on the outskirts and ride free shuttle buses downtown.

The city says it also plans to expand its mass transportation system soon. Local auto dealers are not happy however, and predict a 10 percent drop in sales as a result of the move. Strasbourg, home to 252,000 people, is France's seventh largest city and the seat of the European Parliament.

(AP 2/24)

Tests On Orbital Two-Stroke

A new, two-stroke engine developed by the Orbital Engine Corporation may deliver better fuel economy and lower emissions than standard four-stroke automobile engines. A prototype was tested recently by the Ford Motor Company and the Environmental Protection Agency (EPA), and yielded "promising" results. A major reason for developing two-stroke engines is to meet increasingly stringent auto emissions regulations. Most noticeable are regulations adopted in California, which are as much as 10 times lower than current U.S. standards. Results of the Ford and EPA testing showed the new Orbital engine "achieved emissions below the levels contained in the stringent California standards." Testing also showed the Orbital two-stroke to outperform 1992 vehicle engines in terms of fuel economy, in some cases by as much as 35 percent. Orbital is based in Australia, but has a U.S. unit headquartered in Tecumseh, Michigan. Both Ford and General Motors already have licensed their own two-stroke engine technology.

(WALL STREET JOURNAL 2/10)

Italian Cities Ban Private Cars

Following similar action taken earlier in the Greek capital of Athens to control rampant air pollution, Bologna, Italy banned private cars from the city on Monday.

Citing dangerous levels of pollution, the northern Italian city closed its downtown area to private traffic for 9 hours. Milan and 34 surrounding towns earlier had imposed a 12-hour ban on private vehicles.

(CHICAGO TRIBUNE 2/4)

California, GM Pondering Changes Necessary For Electric Cars

Since it looks as though electric cars will figure prominently in the transportation future of the United States, some interesting logistical questions need to be addressed. As it stands, no infrastructure currently exists for large-scale recharging, a la the gas stations of today.

While General Motors engineers are working on cutting down the recharge time of their Impact electric vehicle, officials in California are pondering legislation designed to facilitate the recharge process.

One possibility could be a modification of the California law requiring large companies to promote car pooling. The state could amend that law to provide for at-work recharging facilities for employees. The state could also force utility companies to provide cheaper electricity at night for recharging, since there's usually plenty of extra power in utility grids at that time.

Meanwhile, GM electric vehicle developers are trying to make improvements in the uses for the power cord used in recharging. In addition to getting electricity to the battery, the cord has the potential to do much more.

"Once a vehicle is plugged in we can not only run power through that interface, but information," said GM's West Coast electric car marketing manager Robert Wragg. "The utility could interrogate the vehicle (through the power cord) and find its identity and thus, the identity of the owner, sending him a bill no matter where he lives."

(WASHINGTON TIMES 2/14)

'91 EAA Symposium Reprints & More

Copies of past articles and editorials as well as a limited number of reprints of 3 of the talks given at the '91 EAA Symposium are available.

Symposium - Dr. Richard Post - *Flywheel Energy Storage*
Symposium - Chuck Lemme - *"Team Tucson" Land Speed Record Plans*
Symposium - Ambrose Manikowski - *Dr. Billing's Hydrogen Fuel Cell*
Editorial - *"100th Monkey"*
Article - *"Discovered: The perfect EV Battery."*

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Eastern State to Adopt CA Standards

Massachusetts became the first of what could be a number of eastern states to adopt automobile emissions standards based on those in California.

On January 31, the state agreed to adopt the stringent regulations over the protests of the automobile and oil industries,who claim the strict standards could add up to $1,000 to the cost of a new car.

Ten other states and the District of Columbia agreed last fall to adopt the California standards in an effort to alleviate smog in the nation's most polluted region.

Actual adoption of the standards has been under debate in each state and the District of Columbia since. Massachusetts officials contended that adopting the California standards would help the state meet overall Clean Air Act requirements, since automobiles are estimated to cause about half the state's smog.

The standards would only add about $200 to the sticker price of a new car, by their estimation, and would be far less costly than the cost of complying with industrial emissions regulations.

As in California, the new standards would require improved automobile emissions controls and a tighter emissions inspection process.

Also, by the year 2003, 10 percent of the cars and trucks sold in Massachusetts must put out no emissions at all.

(WALL STREET JOURNAL 2/3)

States Leading Way On National Energy Policy

The following are excerpts from an editorial titled "Leadership on Energy Policy Isn't Found in Washington," which appeared in the February 25 Christian Science Monitor:

"The vacuum of leadership on energy policy, which originated in the Reagan White House and has continued under George Bush, is being filled by bold ideas and action at the state level. New energy and environmental policies are rapidly emerging, piece by piece rather than through federal action.

"Nine eastern governors, and the mayor of Washington, D.C., have agreed to adopt the tough California standards for clean cars and clean air. By leapfrogging beyond Federal requirements, these states and the nation's capital will define the market for alternative fuels and vehicles powered by electricity, natural gas, or alcohol fuel.

"This development will not only reduce the amount of smog breathed by one-third or more of the nation's population, it will reduce our oil vulnerability, increase the international competitiveness of the U.S. auto industry by spurring new technology to develop fuel-efficient cars, and form an essential piece of the mosaic of a national energy strategy that is falling into place without Washington's leadership or action.

"Under the pretext of allowing the free trade market to prevail, the White House has for a decade used its influence to stymie efforts to foster efficiency, conservation, energy alternatives, and research and development of renewable energy technologies.

"The silver lining in the cloud of misplaced White House priorities is the emergence at the state and local levels of people of vision who are committed to a cleaner, leaner, meaner more productive, and competitive economy.

By taking action this year to enact national energy strategy legislation worthy of the name, Congress can show that the federal-state partnership — true federalism in action - is alive and well."

(CHRISTIAN SCIENCE MONITOR 2/25)

Ed Note: Amen to that!

French Make Headway

French auto makers Peugot and Citroen seem poised to take the European electric car market by storm in the next few years. What's more, the companies believe that consumers on the continent and in England will buy the vehicles of their own accord, and that California-style legislation mandating the sale of "non-emission" vehicles will not be necessary.

Plans already are in the works for the production of as many as 10,000 electric versions of the Peugot 106 and Citroen AX models, which will be made on the assembly line alongside their gasoline-powered look alikes. A collaborative effort by the PSA Peugot-Citroen group also has developed a "hybrid" version of the Peugot 405. The car is powered by two electric motors, plus a small diesel engine for recharging batteries and adding speed on highways.

The group also is set to begin a large-scale experiment with electric cars in the French city of La Rochelle next year. With cooperation from France's power supplier Electricite de France, PSA Peugot-Citroen will provide 300 La Rochelle drivers with the electric versions of the 106 or AX. Recharging stations will be set up in various parts of the city, to fill the role of the convenient corner gas station.

Both companies say they are motivated environmentally as well as economically to develop electric car technology.

"We are determined to preserve our planet's fragile ecosystem," said group chairman Jaques Calvet. "At stake is nothing less than our right to move about freely without polluting.

To win, we must identify, analyze, quantify and reduce or eliminate all types of pollution caused by the planet's rapidly growing road traffic."

(TIMES OF LONDON 1/24, FINANCIAL TIMES 1/23)

EPA Toughens Ozone Smog Standards

If a number of environmental and health groups have their way, the EPA may soon be revising its national standards for ozone smog. The agency has agreed to review the standards in order to settle a lawsuit brought against it last year by the American Lung Association and others.

The groups sued EPA because, they argued, the current standards for ozone pollution are outdated and need to be made stricter. Current EPA ozone standards, which measure the maximum allowable level of ozone pollution, have not changed since 1979.

"We're confident that the evidence does indicate the need to revise the standards," said Ron White of the American Lung Association. If there is a change in EPA standards, states will be required to take these new numbers into account when they draw up their plans to comply with Clean Air Act provisions.

The agreement between EPA and groups calling for revised standards was signed by U.S. District Judge John R. Bartels of New York City.

A consortium of 60 electrical utility companies has voiced its opposition to the order because they say they will not be given additional time to comment on any proposed changes in the standards. They currently are appealing the ruling.

(WALL STREET JOURNAL 3/2)

Miata-based Electric Car

Mazda and Chugoku Electric Power Co. will co-develop a Miata-based Electric car that will travel 112 miles on a charge, and will reach 87-mph top speed. The $1.20-million investment, could be completed as early as the end of the year. Using Ni-Cd batteries, the car will weigh 2970 pounds.

(AUTOWEEK, 3/9)

Letters to Current EVents

Dear Paul,

Nice work on the December/January issue.

How about an easy way for direct member to member answers for "Letters to the Editor?"

A notation in the *Letters* column could list the address and phone if the letter writter would like individual replies back.

Please give more thought to video tape rental of coverage of rallies and the like. It would be a treasury booster for EAA.

Joe McCarthy - The Woodlands, TX

Thanks for the comments, Joe. Anyone who would like return calls may say so in their letter. We don't have space for addresses, though, - Ed.

Dear Paul:

I decided last month to explore the interest on EVs in this corner of the desert, so I volunteered to give a speech at the EPSEA's monthly meeting. I covered the basic building blocks that make up an EV, and summarized where we are.

The Editor found the pictures of the Impact, and the Voltec A-2. I told him I knew little about the first and nothing about the other, but he thought they were cute pictures and printed them anyhow.

We never had such a terrific turnout. I was very pleased. Even people from Juarez, Mexico, showed up.

The problem I have is that they want to know more about the two models shown. Where do I go for the information?

P.S. I will print the EAA's 800 number in the next EPSEA Newsletter for anyone interested in joining EAA.

Hector L. Gasquet - El Paso, Texas

Call GM's 800# 1-800-253-5328. Does anyone know about the Voltek ? - Ed.

Dear Paul:

I am writing to correct a inaccuracy in the February/March issue of Current EVents titled, "Mounting an ADVANCE Motor onto a Karman Ghia". The statement was made:

> *The Advance DC motor is quite new on the market and there are no ready made adapter plates on the market that I could find for mating it to a VW.*

The **fact** is that Electro Automotive has been building adaptors since 1989. We began selling Advanced (correct spelling) DC motors and adaptors to suit in April of 1991. We do not stock adaptors since there are so many choices, but we have a library of patterns and will build adaptors on order. We can supply an adaptor for almost any manual transmission.

Our adaptors consist of an aluminum plate for the transmission face, a mating aluminum plate for the motor face, and a steel taperlock hub for the motor shaft (no set screws to work loose).

For EV owners wishing to upgrade from a Prestolite to an Advanced DC motor, we can supply a plate which will allow them to bolt the new motor to their existing adaptor.

Electro Automotive has been selling conversion components-including motors and adaptors-since 1979. I have been involved with the EAA as a member, chapter preseident, rally entry, rally master, commercial exhibitor, and advertiser. I am surprised and disappointed that Mr Brooks "could not find" my adaptors through my ads in the newsletter or from club member referrals.

Michael Brown - Electro Automotive

Mike,

I guess we differ in our definition of "ready made." I understand that you (and others) are prepared to "build adapters on order," but my definition of ready made assumes they are sitting around waiting to ship. I found more than one source who had Kaylor adapters sitting around, but not for the Advanced motors.

Please do not blame your advertising department for my not ordering from you; I did see your ads, I bought your book "Convert It," your catalog, and even attended one of your conversion seminars (all excellent) before I built my adapter. You might, however, have a chat with your marketing folks since I did not understand the benefits of having Electro Automotive build me an adapter at a price that was much higher than the less than $300 I spent. Perhaps the material you use, your quality workmanship, the taperlock hub or other features would justify the extra cost, but this information was not made clear to me through the above sources or during discussions with you and your staff.

Seriously, I do respect what you have done for the EV community and fully expect to buy other products from you in the future. I did not intend to slight you; my article was only intended to share my experiences in building my EV project. By the way, I road tested it for the first time on 3/15 — now on to the body work and paint.

Bruce Brooks

Mike's Response:

I believe that by your definition of "ready made" the kinds of adaptors available could be counted on one hand with fingers left over.

Each adaptor has to match a specific motor and a specific transmission. The possible variations run into dozens for even the most popular cars and components. It is not economically feasible for anyone to have dozens of different adaptors on the shelf. No one does.

People who specialize may have one or two types of adaptors in stock. Kaylor adaptors are available. However, they were designed for aircooled VW transmissions and obsolete aircraft generators only. They have little application in modern EVs, and are therefore, much cheaper than an adaptor that is built to suit a specific modern motor and transmission.

Michael Brown - Electro Automotive

Calendar

April 18 & 19 The College of the Desert presents the *Solar Energy Symposium '92* which includes a large display of electric autos. For more info, call (619) 346-8041, ext 378 or 571.

April 22 The City of Palo Alto presents *Palo Alto's Earth Day* on Wednesday from 11:30am-2:00pm on City Hall Plaza. For more info, call (415) 321-3070 or Lee Hemstreet, EV Coordinator at (415) 493-5892.

April 25 Toro Park Earth Day Committee presents *Monterey County's Earth Day*. This event will be held on Saturday, from 12:00pm-5:00pm at Toro Park. Toro Park is right off Highway 68, the highway to Monterey from Salinas. For more info, call (408) 755-3625 or Lee Hemstreet, EV Coordinator at (415) 493-5892.

April 25 The City of San Jose presents *Earth Day Every Day*. on Saturday, from 11:00am-4:00pm at the Plaza Park directly in front of the Fairmont Hotel. For more info, call (408) 277-5208 or Lee Hemstreet at (415) 493-5892.

April 24-26 Solar & Electric 500 2nd Annual Competition. Friday, Saturday and Sunday. Phoenix Int'l Raceway. Call (602) 953-6672 . **(See Front Page)**

April 26 *San Diego Earth Day* , Sunday in Balboa Park. EVAOSD participating. For more info, call Ron Larrea (619)443-3017.

April 26 Florida Solar Energy Center to host Sun-Filled Races. The Electric Auto Association of Florida will sponsor an Electrathon-class race at the Florida Solar Energy Center Cape Canaveral facility. For more information, call (407) 783-0300

May 9 *Energy Futures Fair '92*. Stanford Unversity, White Plaza, 8:30 am to 4:30pm on Saturday. (408) 321-5251

May 17-23 *4th Annual American Tour de Sol,* Solar and Electric Car Championship. Contact NESEA, Northeast Sustainable Energy Association. (413) 774-6051.

May 25-27 *The Urban Electric Vehicle*, an International Conference. Stockholm, Sweden. Phone no. 011 46 8 23 0990

May 31-June 4 SECV conference and expo in Melbourne, Australia; *From Vision to Reality*. For more information, contact Erika Anders, Phone no.011 61 3 646 2144 or FAX no. 011 61 3 646 7737

June 14 Second Annual FSEC SunDay Challenge at the Florida Solar Energy Center on Sunday at 10:00 am. For more info, call (407) 283-0300.

June 28 9th Annual Automotive Literature Swap Meet at Pasadena City College parking lot on Hill Avenue, corner of Colorado Boulevard in Pasadena on Sunday between 6am to 3pm. For more information, call Jeff Minard at (310) 545-1070.

June 28 Palo Alto Concourse De Elegance.

August ENER-RUN Transcontinental Rally. Washington DC to Los Angeles in alternative powered vehicles. Call Les Adam (501) 856-3877 for details.

September 9-13 Al Tran Ex '92, International Alternative Transportation Exposition, Santa Monica Civic Auditorium. (310) 285-0093.

September 19-20 World's Oldest EAA Rally, Electrathon and Symposium.

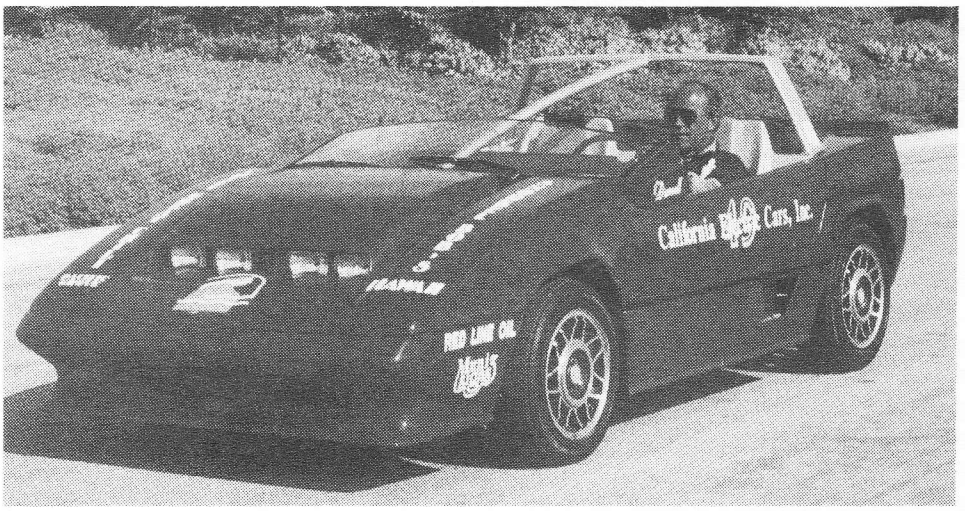
September 27-30th The 11th International Electric Vehicle Symposium.

California Electric Cars, Inc. Presents the "Monterey"

The First Production Electric Sports Car

Specifications

Top Speed	80 MPH
Range	80/100 Miles
Curb Weight	2400 LBS
Length	136"
Wheel Base	84"
Width	63"
Height	46"
Seating Capacity	2
Tires	
Goodyear Invecta	P175-65R14
Frame	
Welded Steel	256 lbs
Brakes	
Front Disk	Rear Drum
Drive Train	
Front Wheel Drive	4speed



For further information, call (408) 899-2012 Monday through Friday, 9:00 am to 5:00 pm (PDT) or write: California Electric Cars, Inc., 16692 Del Monte Boulevard, Seaside, CA 93955.

Senate Passes Energy Bill

The Senate passed its version of a national energy strategy bill by a vote of 94 to 4 on Wednesday. Among the many provisions in the measure, one in particular is expected to increase the use of non-gasoline fuels for transportation.

The bill will require car and truck fleets that operate in cities with a population of at least 250,000 to begin using fuels such as natural gas, ethanol, methanol, solar power cells and electricity as soon as 1995.

The measure will apply to government agencies and private businesses with vehicle fleets of 20 or more, but would not extend to rental cars or private vehicles.

In addition, 90 percent of all non-military fleet vehicles bought by federal agencies would have to be powered by fuels other than gasoline by the year 2000.

(WALL STREET JOURNAL, NEW YORK TIMES 2/20)

Electric Turbine

(Continued from Page 3)

- series DC motor performance — used in traction motor applications such as locomotives and elevators;

- shunt DC motor performance — used in constant power applications such as machine tool spindles that cut soft metals like aluminum at speeds up to 20,000 rpm; and hard metals like steel at slow speeds, 900-1800 rpm;

- differential-compound DC motor performance — utilized to obtain the advantages of both series and shunt DC motors;

- separately excited DC motor performance — used to obtain the maximum efficiency under any load condition. ✇

From American Motion Systems Inc. brochure. Contact Bil La Rosa, President, AMS (805) 482-0407.

It sounds like quite an advance. Large EV-like designs have been drawn up, but so far they have not been built and proven. I anxiously look forward to proven results and on the shelf order numbers. -Ed.

EAA Now on the Environet BBS

Thanks to Tim Rosener of the Silicon Valley chapter, we now have EAA information on the Energy and Transportation conference of the ENVIRONET BBS at (415) 521-9108 in San Francisco, a free Greenpeace bulletin board.

Set your modem for 1200 or 2400 baud, 8 bits, parity none, stop bits 1 and no CR/LF. We are starting to enter back copies of the Curent EVents and other announcements.

Bob Wing, Chair-Membership and Chapter Relations Committee

Joint Electric Car Effort

Chrysler Corporation, along with Westinghouse Electric Corporation, announced the formation of a joint program to develop a "commercially viable electric car."

The two will work to have a vehicle ready for sale to the public by the end of this decade, when California automobile emissions regulations will mandate the sale of "zero-emission" vehicles.

The Chrysler/Westinghouse consortium says it hopes the computerized electric motor will allow their vehicles to travel 200 miles on a single battery charge, and reach a speed of 60 miles per hour in 15 seconds.

Although Chrysler currently is involved in developing an electric minivan prototype, a spokesman said the company believes it essential to have a mass-produced electric passenger car to introduce on the market by the turn of the century.

(WASHINGTON POST 3/4)

Want Ads

VW Electric, Viking fiberglass body, Prestolite motor, Wasylina adapter, 16 batteries. $1,600. Scott Davis, 16250 Brook Acre Drive, Lost Gatos, CA (408) 356-3251

4 Govt. Surplus Electric Vehicles: 2 cars, 2 trucks; outstanding value. Also, new PMC parts, incl. controllers. Beyond Oil. (415) 388-0838

Wanted: Electric Pinto, needing work OK. Prefer located in Central or Eastern U.S., reasonably priced. All calls returned. (201) 839-9053, N.J.

1981 Bradley GT II Electric 96 Volt system, Gullwing Doors, New Curtis Controller, onboard Lester 96/12 charger, $6500, or best offer. Call (401) 783-9188.

For Sale: '66 Renault 96V sys. Baldor 10 HP shunt Mtr., Wasylina adpt. PMC 11E 96-120V @ 200A cont. Wasylina on-bd chargr. $950. Carl 510-582-6813

Jet Electrica: Re-manufactured Mercury Lynx. Black & Silver 2-dr. cpe. 96V syst., on-b 220V charger, air conditioned. $8000 FOB Mongomery County, Md. Write for details: J. Wise. 4900 Bluebonnet Ct. Rockville, Md. 20853.

Wasylina DC-DC Converter (new). $140. Lester 108V/10A Charger $400. 2CM77 Starter/Generator $350. (408) 867-5930 evenings.

Elec. Car, 1974 Honda Civic, new orange paint, 84 volts, prestolite motor, Russco controller, new tires, batteries — 2 years old, $2500 OBO. S. Baker, 127 Santa Rosa Ave., Pacifica, CA 94044. (415) 355-4448

1-1981 JET "Electrica" Escort, 9,800 mi. good cond., 96 V only $5,000. Can Deliver. 1-1981 Jet 600 "Electrica Van", 14500 km., good cond., 102 V, FOB Houston, TX. Can deliver. $4,000.

2 - New G.E. 20.9 h.p. MOTORS still in the box. Only $1,050 ea. 1 NEW 72 VDC conversion kit. Includes Baldor motor with VW Bug trans and adapter plate & hub, PMC 72\96 controller, 12/72 automatic charger, main contactor, shunt, meters, some cables and set of HYDROCAPS. All only $1800. New in the box 96 V Prestolite Motors, $1075 ea. New, PMC 96 V controllers, $550 ea. New, 12/96 V chargers 220 VAC, $550 ea. Lot of new and used JET 600 Van parts. For more info, contact K.D. Bancroft, @ (713) 729-8668

1980-Electra-Van-600-Jet Industries-12,500 miles. 21 H.P. G.E. motor, extra brushes. 17-6V =102V. will go 60 mph. PMC-25-controller. Small blower. Licensed until next Nov. Needs new batteries. 3 yr. old 6 V. ones only take 10% charge. Needs charger. Has tow-bar and backseat back-rest-removable. Elec. F and Reverse. $6,000/$8,000 if I add batts. and new 14 lbs. charger.

Also have G.E. 2 CM 65 120 V.D.C. aircraft generator-motor with adapter-plate with bearing, flywheel and clutch for VW. Also same motor duplicate except missing the shaft. $400/all.

Also 2-G.E.-2 2CM76 motor-generators-defective shunt-fields. $100/each.

Adapter-plate with flywheel for VW (Kaylor brand). $200

Have surplus -120 V. A.C. 8000 W. generator (no engine). $50

Have surplus -24 V. D.C. 3 1/2 H.P. elec. motor (geared) I used to power home railway running masonite wheels on 2 x 4 - tracks. $50

5-24 V. alternators are for sale $50/ea.

Write: Dave Abell, Box 103, Finley, CA 95435

Rates for Want Ads

30 words for $5. For each additional word, 25 cents per word.
Please use abbreviations whenever possible.
The EAA is not responsible for the accuracy of ads.

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April/May 1992

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