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F. V. E. A. A. NEWSLETTER

SEPTEMBER 1989

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MEETING NOTICE

The next FVEAA meeting will be
SEPTEMBER 15th at
Cragin Federal Savings & Loan
333 W. Wesley st. Wheaton, Il
Time - 7:30 P.M. sharp. Guests
are welcome and need not be
members to attend the meeting.

SECRETARY
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John Ende
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Downers Grove Il 60516
312/968-2692

DEADLINE for newsletter *STUFF* - in my hands the friday before the next meeting. Editor

THE PREZSEZ

We had a busy August 19th weekend when on Saturday the FVEAA had 4 cars in the Woodale celebration and the next day had 4 cars in Montgomery. The Woodale parade was mostly past empty fields but we had the opportunity to exhibit cars after the parade. Member Ken Woods was on hand to get pictures. The Montgomery event had a good croud but there was no car

display following. We did get a chance to honk at member Ken Myers who was watching.

A nominating committee will be appointed to select candidates for FVEAA offices in the coming year. Elections will be held during the November meeting. Let me know if you would like to be part of the committee.

An invitation has been

received from the Valley Shopping Center to participate in next year's celebration. In my opinion, we should try to exhibit our cars at several shopping centers during the rest of this year. Our future activity will be discussed at the next meeting. Les Stone will also bring Material on his electric bike.

BILL



**FOX VALLEY ELECTRIC
AUTO ASSOCIATION**

6542 Fairmount Downers Grove Il 60516

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

Alternative-fuel research is back in the fast lane

Detroit eyes methanol, electric cars

By Paul A. Eisenstein

DETROIT—Under pressure from environmentalists concerned about poisonous air and the awesome "greenhouse effect," Detroit's automakers are taking a fresh look at alternative ways of powering their products.

After nearly a decade of focusing almost exclusively on traditional cars and trucks powered with gasoline, the automakers are dusting off old studies on using alcohol, hydrogen or electric power in vehicles of the future. They also are continuing their efforts on solar-powered cars.

The impetus is coming from Southern California, where, after decades of effort aimed at controlling the region's blanket of smothering smog, officials are rolling out their heavy weaponry in the battle for clean air.

A massive and controversial plan under discussion in California could drastically slash the emission of noxious hydrocarbons, carbon monoxides and nitrous oxides by the early 21st Century.

The plan, if carried out, would carry a heavy price. Even corner hamburger stands would have to install costly devices to reduce the smoke coming off their grills. Certain solvents would be forbidden. Lawnmowers would be tightly controlled. And limits on pollution from cars and trucks would be unprecedented.

As Detroit watches and plans, Southern California officials are proposing to abandon troublesome gasoline in favor of cleaner-burning methanol, one of the simplest forms of alcohol.

Some refiners already add a bit of methanol to their gasolines, particularly in high altitude areas, such as Colorado. Methanol is the fuel of choice for the Indianapolis 500.

And now, says Chrysler executive engineer Gordon Rinschler, "our crystal ball says methanol appears to be the most likely alternative" to gasoline for passenger cars, as well.

As race-car drivers have discovered, methanol has a higher octane than gasoline and burns far more efficiently. The turbocharger on a prototype Dodge Daytona modified to run on methanol had to be tuned down because the engine was generating more horsepower than it was designed to handle.



Ford Motor Co. claims the ETX-II Aerostar "brings battery-powered cars and trucks a step closer to reality."

"That means we could get more horsepower out of smaller engines," notes Gene Zimmerman, a systems engineer with Chrysler's Advanced Engine Systems Development unit.

The biggest advantage of methanol is that it is a relatively clean fuel. Chrysler's test vehicles emit half the hydrocarbons, carbon monoxides and nitrous oxides of equivalent gasoline-powered vehicles.

Proponents say methanol could help shield the nation from another Middle East oil crisis, because a primary source, coal, is in abundant supply.

On a per-gallon basis, methanol's cost is higher, but experts say that would come down with mass production.

As far as service stations are concerned, methanol is pretty much the same as gasoline. But as far as the typical car is concerned, there are some big differences. Motorists who have used the gasoline-methanol blends already on the market have experienced some troubling difficulties.

Alcohols are remarkably good solvents, and they can corrode metal gas tanks and eat away rubber fuel lines. Prototype methanol vehicles use stainless-steel fuel system components.

Methanol also causes hard starting in cold climates; so test vehicles currently require a 15 percent blend of gasoline. A car also uses far more methanol than gasoline. A modified Chrysler LeBaron delivers 21.2 miles per gallon with gasoline but only 12.9 m.p.g. with methanol.

To beat the drum for methanol, General Motors Corp., the Society of Automotive Engineers, the U.S. Department of Energy and the Canadian government recently sponsored a Methanol Marathon.

The road rally pitted college teams from schools across the United States, with each converting an identical 1988 Chevrolet Corsica LT equipped with a 2.8-liter, fuel-injected, V-6 engine to run on methanol.

The modified vehicles then ran a winding, 1,100-mile course through the U.S. and Canada.

Some of the approaches were novel. One team, for example, hooked up what can best be described as a miniature microwave oven to help overcome methanol's cold-weather starting problems.

It's no coincidence that the Methanol Marathon wrapped up in Washington, D.C., where lawmakers are studying what to do about a new version of the Clean Air Act.

Sen. Max Baucus (D., Mont.), chairman of the subcommittee on environmental protection of the Committee on Environment and Public Works, says that as part of the new legislation, "there will be some incentive for alternative fuels."

Baucus isn't saying precisely what form such an incentive will take, however.

Despite his company's involvement in methanol research, the word is caution, as far as GM President Robert Stempel is concerned.

"We would not want to switch to methanol only to find out we made a mistake," he said. "Any substitute for gasoline has to be at least as good as gasoline."

While methanol may be a cleaner-burning fuel than gasoline, there are some tradeoffs. Burning methanol creates formaldehyde—though engineers believe they can eventually solve that problem.

And while methanol may burn clean, the process of converting the fuel from coal is environmentally dirty. An alternative source is natural gas, but vast supplies presumably would have to be imported from the Middle East.

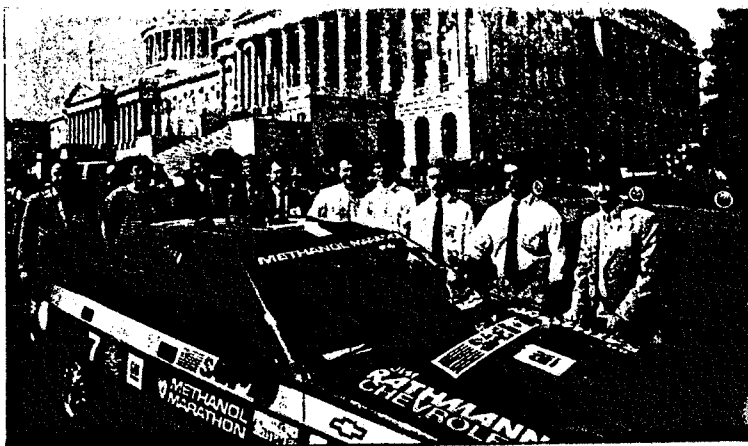
Meanwhile methanol does nothing to solve the pressing long-term problem of the greenhouse effect.

Like gasoline and any other carbon-based fuel, a key byproduct of burning methanol is carbon dioxide. The more carbon dioxide in the atmosphere, scientists believe, the more solar heat gets trapped, and there is preliminary but mounting evidence that rising levels of carbon dioxide are resulting in a global warming.

"If there's another hot summer [like that of 1988]," said Baucus, "I think the public consensus will be for controls on greenhouse gases."

That would force the auto industry to look at perplexingly new or stubbornly old and unsolvable alternatives.

CONT.



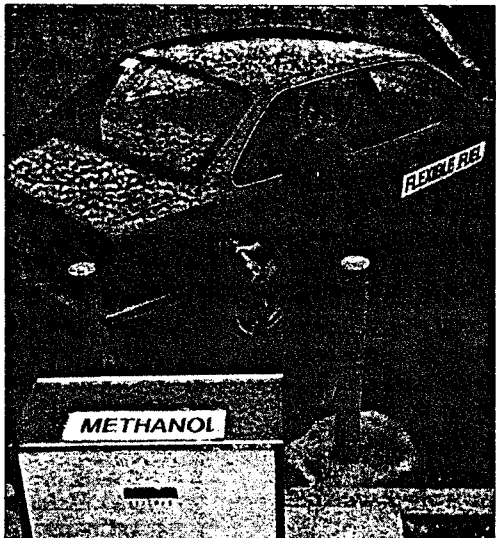
Florida Institute of Technology team at the finish of the Methanol Marathon in Washington, D.C. Colleges competed in a road rally established to see how methanol fuel performs.

Alternative fuels

One possibility is liquid hydrogen, but storing a fuel that turns to gas at temperatures near absolute zero isn't easy. And there would be incredible safety problems to overcome.

A hydrogen fuel tank would be extremely difficult to protect in the case of a serious car accident.

And producing the fuel—typically by splitting water into hydrogen and oxygen—requires massive amounts of energy.



A Ford researcher fuels a test car. It was modified to run on methanol, ethanol, gasoline or any combination of those fuels.

"Hydrogen is a great fuel," says Joe Colucci, a department head with General Motors Research. "We just don't know how to get it, store it or distribute it."

The other alternative hovering around for decades is the electric car. In Britain, electric vehicles dubbed "milk floats" are used for short-range urban deliveries. Many golf cars and light-duty vehicles in this country operate for short distances with electric power.

After the last oil crisis, GM actually promised to put an electric car on the market by 1984. The plan foundered, however, when researchers could find no solution to the biggest drawback of such vehicles: the need for heavy, expensive and inefficient batteries, which can typically travel no more than 50 miles without a lengthy recharge.

Ford Motor Co. has demonstrated a new electric car, dubbed the ETX-II Aerostar, which the company claims "brings battery-powered cars and trucks a step closer to reality."

The ETX-II prototype has been under joint development with General Electric Corp. as part of a seven-year program partially funded by the U.S. Department of Energy.

The vehicle is based on a Ford

Aerostar mini-van, and features a newly designed, two-speed automatic transmission designed to improve performance.

Even with all the improvements in the system, however, the vehicle still has a maximum speed of only 65 miles an hour, and a 100-mile range. It takes 20 seconds to go from zero to 60 miles an hour and it requires eight hours to recharge.

Mass production is still years away, admits John P. McTague, Ford's vice president of research.

"There still are significant technological challenges, particularly in the area of battery capability, before electric vehicles would be suitable for a large group of potential customers," he said.

Even if the battery problem is solved, GM President Stempel remains skeptical, warning that electric cars are not the environmental panacea some perceive.

"If the electric car is powered by a coal-fired plant, we've just transferred the source of carbon dioxide from the tailpipe to the smokestack," he said.

To make the best use of electric vehicles, he says, will require a nonpolluting source of energy. That would mean the ultimate solution won't come until scientists learn to harness the wind, the sun or fusion.

MINUTES OF THE FOX VALLEY ELECTRIC AUTO ASSOCIATION....AUGUST 18th 1989

The meeting was called to order PROMPTLY at 7:30 P.M...the secretary was a bit late...but arrived to catch up quickly...

The treasurers report was as follows...checking account balance \$1,017.33, savings account balance \$860.12, for a total of \$1,877.45.

Henry Setton reported on MID-CON '89 exhibit for Sept. 12 thru Sept. 14th., expects a good turnout and will get more details at the September meeting.

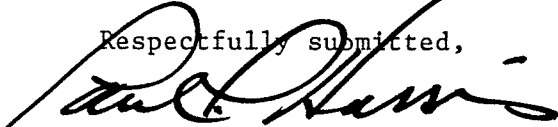
Henry Setton presented a trophy to John Stockberger for the July 4th parade exhibition, for BEST INDIVIDUAL FLOAT of the parade. John took FIRST PLACE... George Krajnovich was not present to accept his SECOND PLACE trophy..WOW this just goes to show that we have some mighty fine representatives in our group, and the people are interested in what we are doing.

Ken Woods reported on the September 16th Illinois Solar Association doings at the Museum of Science and Industry. Joe O'Gallagher, a physicist at the Univ. of Chgo. will go on roof ?? to look over the Solar Unit???? (I don't know if I got that last notation right)...but be there at 11:00 A.M.. Ken will be sending out informational packages and I.D. units to those interested.

We broke for coffee and then the featured speaker of the night, Dr. Edwrad Francis spoke on Photovoltaic Cell installation at the Blackberry Farm and the design procedures used and also showed some samples of the P.V.s

The meeting was adjourned at 8:50 P.M. by the president, William Shafer.

Respectfully submitted,


Paul P. Harris,
Secretary

MONTAGE

Mr. Wizard

Township Assessor Shafer gets a charge driving about town in his electric car

By MICHAEL SIMON

Oak Parker William Shafer, like Batman or Superman, has an alter ego. Officially, he is the mild-mannered Oak Park Township Tax Assessor. Off duty, he transforms into "Super-Inventor," builder of electric automobiles.

A Henry Ford he is not; there are common ingredients, but not the same finished product. Shafer, who is comfortable listening to or playing music in his basement workshop as he is explaining the second law of thermodynamics, has taken it upon himself to solve some social, economic and ecological problems through his pursuit of his first love—electricity.

An electrical engineer by trade and inventor by nature, Shafer, after getting tired of waiting in gasoline lines during the Arab oil embargo of the early 1970s, combined the two callings and did something about the wait.

He got out of line and six months later into his response, an electric car.

With the grin of a proud father, he sits behind the wheel of his 1966 Dutch manufactured electrically powered "baby" and recounts how it all came into being.

"I was working for Commonwealth Edison in Maywood and commuting back and forth when the oil embargo hit. The car came about more out of the frustration of waiting in the long lines than the rapid rise in fuel prices. I started thinking and talking about an electric car, and in about two months I developed the design.

"It took another four months to build, which explains how I got out of the gas lines. Now, all I need is an electrical outlet to recharge and I am ready to go."

He shows off his unusual "fuel pump" by opening his garage door and pulling down a yellow, 50-foot, three-pronged extension cord inserted into an outlet with an



Two cents per mile: Bill Shafer's electric car was inspired by the 1970s oil shortage. It is still cheap to run. (Journal photo by Frank Konrath)

electric meter waiting to ring up the tab.

Instead of the conventional-miles-per-gallon formula used by liquid fuel consumers, Shafer notes miles per watt hour. Translated, it means it costs a little over two cents per mile for electricity used.

There are some not-so-obvious drawbacks associated with an electric car that keep it from competing with internal combustion engine automobiles. "The biggest problem," explains Shafer, is the storage problem. "This car has the equivalent storage capacity of a one-gallon tank on a conventional automobile.

"The range is very limited and there is no way to measure accurately how much energy is in reserve. It is like

driving a conventional car with a gallon of gas and not knowing when you are low on gas to stop and refill the tank," he said.

He points out another glaring disadvantage of owning an electric automobile. "Because the engine does not produce heat like conventional cars, there is no heat during the winter. I bundle up," he says with a laugh.

Even with its drawbacks, it does have its advantages, Shafer notes. "One of which is when other cars won't start because it is too cold, mine will. I just turn the switch, press the accelerator and I am off."

Another big advantage he points out is the fuel efficiency of the electric engine. "When I stop, the engine does not idle; it runs only when I press the accelerator. It is great for a suburb like Oak Park which has stop signs every three or four blocks, especially in residential areas. While most cars waste fuel stopping and starting every three or four blocks, I only use fuel during acceleration."

There are other benefits to be enjoyed, he says. "There is no air pollution, because there are no fumes produced. I would say in the very near future, especially in southern California, electric automobiles will become fashionable because of the air quality issue alone.

"Electric cars are relatively easy to build. I used an old World War II aircraft DC motor generator, some conventional golf cart batteries and a 1966 Dutch built Daf automobile. It cost less than \$3,000 at the time.



Under the hood: Bill Shafer (and batteries) under the hood of his electric car. (Journal photo by Frank Konrath)

LEAD ACID BATTERIES

by Bill Glazier
VANCOUVER ELECTRIC VEHICLE
ASSN.

Today a short lesson on Lead Acid Batteries and answering the question about washing your car battery. At any stage of the charging process it is well known that the battery gives off a certain amount of GAS that includes HYDROGEN and makes that a very explosive mixture. Also in the gas is a certain amount of SULPHURIC Acid, not much, but enough to fall on the surface of the battery as a light mist. This light mist soon becomes a conductor of Electricity in the form of a short circuit from the positive to the negative terminals. In effect it is draining the battery all the time, mostly when the car is not running. I have seen fork lift batteries so filthy on top they could completely discharge over a few days if they were not on the charger. So, to prove the point to yourself place a voltmeter with the positive prod on the positive terminal of the battery and with the other prod touch the battery any place on the top of the battery. Use a low voltage setting on the meter and don't bet anyone there will be no reading. Any battery must Gas to some degree and voltage regulators being what they are the chances of your regulator being set perfect are slim. If the setting is slightly high you will have excessive gas, and acid, and if the setting is low you will have a continuously undercharged battery. That will mean a short life for the battery. When one is in the battery business for a considerable period you will have people coming in to brag about the 8 or 10 years they have had the

battery in their car. If you put a meter on the battery while the car is running you will find that the reading will invariably be 14.7 Volts. This is the perfect float voltage for a car battery and will maintain the plates in the best possible condition over a long period of time.

Because you do not change the voltage regulator settings on a car that is the optimum setting it does not necessarily apply to batteries used for traction purposes. In that case you will need to be able to adjust the settings because a new battery can read as high as 18 volts, when fully charged, to as little as 14 volts as the battery get older. Any further charging when the battery reaches these maximums will cause overcharging, heat rise, and permanent damage to the battery. Many chargers use voltage to tell the charger when to cut off the high rate and go to float. If your battery cannot reach that preset voltage it will keep on charging and destroy itself. If the high rate voltage is too low it will discontinue charging too soon and the undercharged plates will remain spongy. A spongy plate allows active plate material to shed and fall to the bottom of the battery eventually causing a short circuit. When I was involved with Ernie Davidson in the mfg. of marine batteries we had control of 90% of that industry. Peculiar to our coast is a standard in the marine industry of 32 volt systems made up of four 8 volt batteries which are used for starting the diesels as well as for all electronic equipment. Before the coming of high tech we set all regulators to 2.5 volts per cell or 40 volts maximum. This worked great for many years until

suddenly we were plagued with a rash of battery failures with only a few months service as opposed to the usual 4 years. An examination of the batteries showed that the negative plates were all mushy indicating undercharging. Investigation of voltage regulators on boats turned up settings of 37 or 38 volts maximum, the reason being that the 32 volt electronics could only sustain surges to a maximum of 40 volts. When the diesels were cranked the surface voltage of the batteries drops considerably and the reaction time for the voltage regulator to cut back after starting was too slow to hold the voltage at 40 volts, sometimes allowing the surge to blow electronics. The logical answer for the boat operators was to cut back the voltage regulator to 38 volts and that ended their electronic problems yet provided plenty of cranking power during the short life of the batteries. Our solution to the problem was just as simple. We cut off the last cell in one of the batteries, welded on a new terminal, and created a 30 volt battery system. Our batteries went back to being fully charged and lasting for years and the boats had no more electronic problems. This became known in the industry as the "30 volt tap" and is still in use today. NEXT, The why of equalization and reverse polarity.



FOR SALE ---- ELECTRIC CAR

1973 4 Door SUBARU Deluxe Model Series 1400

The car is in remarkably good condition. It is orange. The tires are in good condition. It was converted to electric power in 1980. It has been in service ever since with standard maintenance of new brakes, and two sets of batteries. The current set of batteries, all thirteen, are new and have approx. 50 miles on them. It has always been garaged since it was converted and is in excellent running condition. The mileage is currently 39,583 miles. Of those 6,500 miles were under electric power. The car was converted by John Stockberger, Ken Meyers, Everett Harris, John Ahern, and Len Fisher at the Electric Auto Works in Batavia, IL. It is completely equipped with a custom built tow bar, spare tire and radio.

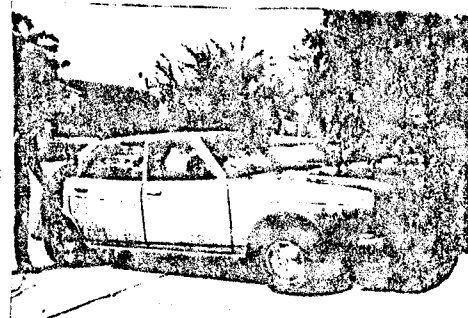
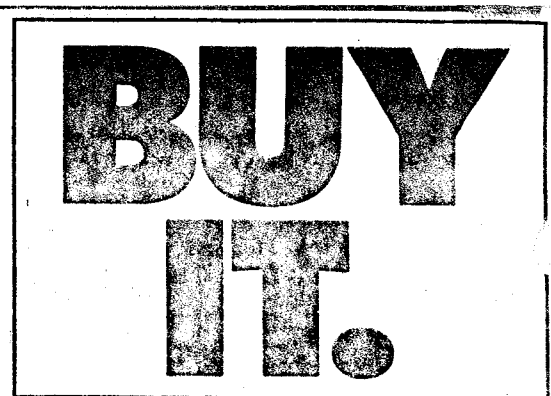
It was the pace car for the 1980 Americas Marathon (26.2 mile race) in Chicago. It is described in "The Complete Book of Electric Vehicles" by Sheldon Shachet, Page 178 of the 2nd edition. At present it is licensed and is insured by Allstate Insurance Co.

PROPULSION: There are 12 six volt batteries (Two series of six to supply 36 Volts at 400 amperes.) One 12-volt auxiliary battery provides power for lights, controls, etc. The Electric Drive Motor is a surplus aircraft generator that can achieve a maximum speed of 42 mph with a cruising speed of 30 mph. Range has been noted at approx. 50 miles.

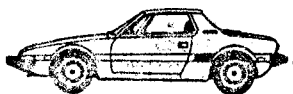
Controller: Custom designed Transistor Motor Controller, made by Electric Auto Crafters Batavia, Il, 36 volts at 400 amps.

It has a custom built on-board charger which charges the 36-volt and 12-volt batteries automatically. The car can be plugged in anywhere there is a 120 volt outlet.

Selling Price \$1750, Henry Setton, Phone 465 0334



FOR SALE



'74 FIAT X/1.9
Good cond. No rust thru
4 cyl. 4 speed runs ok
'75 FIAT X/1.9
Rusty - Bad engine half out
Extra Rebuilt engine
Good parts car.
\$600 takes ALL

'82 Dodge Colt hatchback
4 cyl. 4 speed with 2 speed
power/economy shift (8 speeds)
Air cond. Needs CV joint.
\$150.00

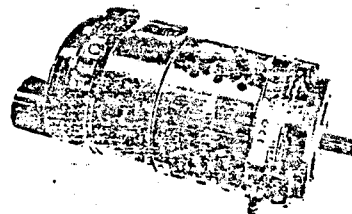
John Emde 968-2692

FOR SALE

2CM77 400 AMP MOTOR
\$100.00

Jim Medek
117 Imperial Court
Palatine Il 60067

312/934-1154



FOR SALE

Electric car \$1800 D.B.O.
1975 Honda Hatchback
New tires 54 Volt
On board charger
Needs new batteries
Good condition

Everett Harris

312/232-0344



I built a freeway-safe electric car

by Bob May

I built an electric car—a modern one, capable of 65 miles per hour. I've been driving it to work for a year and a half and have put 4500 miles on it during that time.

When I started the project, my goal was to build a freeway-safe electric car. When I drive on a highway, I want to blend with the traffic and avoid tailgaters, so acceleration and speed are a must. I was surprised to learn that not many electric car drivers feel the same way. Most believe that a maximum speed of 45 mph is adequate. Consequently, my first two tries at a car fell woefully short of my desires.

My first attempt was a Fiat 850 convertible project that I took over from someone else. When I drove it, I discovered a major flaw: a 4500-rpm engine had been replaced with a 3000-rpm motor. Even in highest gear with the motor turning at maximum design speed, the car could travel only 43 mph.

My second try is the car I drive now—a VW bug converted to dune buggy converted to electric car. For this conversion, 72 volts of propulsive battery is usually considered adequate. With freshly charged batteries, a speed of 53 mph is attainable. But when batteries get below half-charge, the voltage drops considerably under the high current loads—and so does the speed.

To achieve my 65 mph maximum speed, I added four more batteries to generate 96 volts. I also replaced my 72-volt motor controller with one rated for up to 120 volts. Now, even when my battery is almost discharged, I can still go 55 mph.

Although I do most of my driving at highway speeds, the car usually will last more than 45 miles on a single battery charge. If I drove at its optimum speed (30 mph), it would have a range in excess of 100 miles. That is about the best that a modern electric car can be expected to do.

For a lot of driving, the 45-mile range is not bad, particularly if the car



keeps up with traffic. I get 1.5 miles per kilowatt hour, and since I pay 4 cents per kilowatt hour, my fuel costs are under 3 cents a mile.

That is not a realistic number, however, because of battery life. I expect to get 40,000 miles total on a set of batteries, which adds another 2 cents per mile to the fuel cost. The result, 5 cents per mile total, is equivalent to gasoline at \$1.50 per gallon for a car capable of 30 miles per gallon. When gasoline prices begin to rise again, interest in the electric car should increase.

Two factors have limited advances in the electric car: Newton's law of motion, and the lead acid battery. Because of Newton's laws, an electric car needs to be of minimum weight to reduce the energy required for stop and start driving. My car weighs 2,400 pounds; 1,100 pounds—or 44 percent of that weight—is the lead acid batteries. In the century since batteries were developed, many brilliant minds have searched without success for a more efficient replacement.

Actual battery life varies due to manufacturer and maintenance. Most batteries require frequent watering, which not only becomes tiresome, but provides opportunity for contamination that shortens the battery's life. My car has special catalytic caps that recombine oxygen with the hydrogen gas which is

generated during charging. I add water only once a year. Of course, I live in the desert, where temperatures can exceed 115 degrees. Otherwise, adding water might be a biennial event.

Converting a small car to electric power is not difficult. All of the parts you need are readily available: motor, controller, charger, relays, gauges, adapters and advice. The Electric Auto Association is ready and able to advise you. Its members have been driving electric cars for years.

If I were to duplicate the project, the cost would be that of a gasoline-powered vehicle plus about \$4,000 for everything to convert it, including battery charger. But it has been fun. I'm able to drive at the speed limit and pass lots of cars. In my dune buggy the batteries are clearly visible and I get lots of thumbs-up from other drivers. I sometimes go for two months without driving my backup car, which I use only if my trip is beyond my electric car's capacity.

Today there are many electric cars in constant use. When gas prices rise again, there will be even more. And development of a more efficient replacement for the lead acid battery could change everything.

The future of the electric car will be assured when the world runs out of gas. In the meantime, it is really just a nice hobby.

Bob May is a project programmer at Bell Road in Phoenix. He is a past president of the Phoenix chapter of the Electric Auto Association.

NOTE: SEE LETTER ELSEWHERE IN THIS NEWSLETTER. (ED)

[Excerpts from a letter by Robert E. May.]

August 14, 1989

Dear Bill,

Thanks for the letter & info.

I sold my Electric 1-1/2 years ago. After putting 7000 miles on it, it was due for new batteries. After 3 disc operations, I was not about to risk manhandling 16 - 65 pound beauties!

Also, I am not really an Electric Car advocate. I think they will come of necessity, not choice.

Good luck on your hybrid. One of our members tried one but gave it up. My view would be to have a gas turbine/generator for battery recharge enroute or while waiting. I have also successfully AVOIDED solar cars. No way would I drive a 350 lb. car only 3 feet high in Arizona.

I usually have a hassle with EV advocates because I consider battery replacement to be a fuel cost, not a maintenance cost. Also I think a EV should be capable of 65 MPH and decent acceleration. Of course, if you have both of those, you also get greater range.

But that was last years hobby!

Bob

LOCAL EVENTS

Week of Sept. 12 - 14
MID-COM '89
Rosemont/O'Hare Conv Ctr.
River Rd & Kennedy Expwy.
Rosemont Illinois
9:00 A.M. to 5:00 P.M.
(see Henry Setton)

Friday Sept. 15
F.V.E.A.A. Meeting
Wheaton Illinois
7:30 P.M.

Sat. Sept. 16
Illinois Solar Assn.
Solar Exhibition
Museum of Science & Ind.
Chicago Illinois
11:00 A.M. (see Ken Woods)

Sat. & Sun. Sept. 23-24
Radio Expo 89
Lake County Fairgrounds
Rts. 45 & 120
Grayslake, Illinois
6am \$5.00

Friday Oct. 20
F.V.E.A.A. Meeting
Wheaton Illinois
7:30 P.M.

Battery dead? Try out this new spare

Associated Press

NEW YORK—People who habitually leave the headlights on and the jumper cables at home are target customers for a new battery from GNB Inc. that has a built-in spare.

The squarish Champion Switch combines a conventional 12-volt main battery and a reserve into a package that fits in about 70 percent of the cars on the road, GNB said.

If the main battery dies because the lights were left on, the driver can flip a switch on it and start the car off the reserve. The reserve is good for 20 engine starts, just in case the engine keeps conking out, and both main battery and reserve can be recharged.

The Champion Switch does well in sub-zero weather, especially with the reserve switched on, although that is not its main feature, said Thomas Hatterschide, a GNB vice president for engineering.

The suggested retail price is \$109.99, roughly twice the price of conventional batteries, although some retailer discounting is likely.

The battery goes on sale in Southeastern states around Oct. 1 and elsewhere in the

country in 1990, as the factory in Columbus, Ga., gears up production. It has been on sale in Australia since November.

Back-up batteries have not been popular because there was no room for

them under the hood. GNB's Pulsar design makes it possible to create battery "slices" by regrouping the positive and negative plates. The slice has the same voltage as a regular battery but less current.

GNB is based in St. Paul, Minn., and is a subsidiary of Pacific Dunlop Ltd. of Melbourne, Australia. It is not connected with Champion Spark Plug Co., although it has rights to use the Champion logo.

**If you habitually
leave your head-
lights on, you
may be a cus-
tomer for this
new battery—
with a built-in
spare.**