FVEAA NEWSLETTER
March 1984

MEETING NOTICE

The Fox Valley Electric Auto Association will meet on Friday, March 16, 1984 at 7:30 in the Mid-America Federal Savings Bldg. located at 250 E. Roosevelt Rd. in Wheaton, Ill. Our president, Joe Pollard, will continue his explanation of formulas that we frequently use.

FROM THE PRESIDENT

Come to the meetings! We need your input and help. Also, don't miss the continuing series on Basic Transformer and Motor Design.

FOR SALE by club member, Marion F. Bramel - Electrified Fiat 1974 four-door, G E motor, 72 volt system, 12-6 volt batteries, SRC Control. Asking $900. Address - 502 McHugh Road, Yorkville, IL 60560. Phone (312)553-5344.

FOR SALE by Roger Sutfin - 1966 Renault Dauphine four-door sedan. No motor. Rear trans-axle. Car in good condition. Asking $400. 1800 lbs. with electric motor and batteries. Call 858-4788, or 858-2189 and leave message. (Roger would also like to obtain a narrow, 3-wheel electric scooter. Something that could be fixed up would be all right.

FOR SALE by John Kennedy - 1981 Fiat Strada four-door Hatchback with sun roof. Lectric Leopard - blue - Model 96A - 3000 miles. Runs perfectly. Cost $14,000 new - asking $3400.

fox valley electric auto association inc.
624 Pershing St. Wheaton, Il.
60187

Minutes of FVEAA General Meeting
Feb 17, 1984

The meeting was called to order by President, Joe Pollard at 7:30 P.M.

The Treasurer's report was read by Jack Cahill. Last months balance was $1056.83. Our balance on Feb 17, 1984 is $1100.80. The report was approved by the membership as read.

Bob Randerson reported buying Alco 2000 batteries from the Easy-Go Golf Cart Battery Company in Lake Zurich, Illinois. These are 6 volt batteries. They cost Bob $38.25 each. Bob is quite satisfied with them. He says they even deliver them for the stated price.

Fred Kalkirtz wishes to clean out his garage and has several items members may be able to use. He has several pieces of panelite material of varying thicknesses that could be useful as base material on which to mount controllers, etc. He also has some 200 amp fuses and some 100 amp, 2 pole, circuit breakers.

An informal poll was made of the members present to determine how many running cars were in the club. We had 7 members present with running cars and 3 more were identified as not present. 7 other members indicated they had cars under construction.

John Newton reported contacting a company concerning the LASER cutting of the plates for the main pole pieces and the plates for the armature. The prices for enough to assemble 2 motors came to over $3000.00. This is a bit too steep for us but, John advises us not to get discouraged and to continue shopping around for more favorable prices.

Vladimir Vana gave a short presentation on the controller he has under construction.

The meeting was officially adjourned at 8:22 P.M.

Emmediately following the general meeting, Joe Pollard continued his series of lectures on electric and magnetic theory. The evenings discussion dealt with the formulae pertaining to the magnetic equivalents of Ohms Law.

Submitted by,
George Zarins, Secty.

Electric car may run on sea water

By HARIHAR KRISHNAN

Accent on living

So long as there is seawater, George Thiess figures his prototype electric car will never run out of fuel. Thiess invented the digital watch before going into automobile technology.

RICHARDSON (UPI) — As long as there is sea water, George Thiess figures his prototype electric car never will run out of fuel.

Thiess is so convinced about the success of his invention that the word petroleum has become anathema to him.

"I don't think OPEC will even speak to me," the engineer from St. Louis said.

In a small office/warehouse, Thiess and Jack Hooker, his partner in the Electric Motor Cars venture, are working on their invention.

They say they are close to testing an electric car that will operate on magnesium made from processed sea water. The magnesium will charge a regular battery using a patented chemical solution called electrolene, Thiess says.

The magnesium-powered battery will eliminate the limited range problem plaguing the current line of electric cars, he says. Today's batteries won't take a car more than 40 to 50 miles without a recharge. The charges last up to 10 hours.

"We have solved that through electrolene, and by replacing the battery's magnesium rod every 400 to 500 miles," Thiess says. "The electrolene is pumped into the gasoline tank. Replacing the magnesium rod is as easy as filling your radiator or adding oil. No, don't talk of oil. There will be no motor oil of any kind in our car, perhaps some grease for the transmission.

"You can convert any automobile plant into an electric car plant without much trouble," says Thiess, who is using a Mercedes-Benz. "You don't even have to make drastic changes in battery production. It will even cost less to operate an electric car because our electrolene uses ordinary chemicals .... I can't reveal what they are."

The project, which Thiess says takes advantage of the abundant supply of electricity, is under contract with the U.S. Department of Energy. Thiess says his company has been asked by the department to collect data on the car and its feasibility for commercial production.

The inventors say a cubic mile of sea water converted into magnesium will power every new car built in the country in 1982 for a full year. That translates into 72 billion miles of driving on "a drop of ocean," they say.

Magnesium is the seventh most abundant element on earth.

"If Henry Ford and other car pioneers could do it over again and they had today's technology, they wouldn't use the combustion engine," says Hooker, a former Mercedes car dealer and banker. "We're on the edge of a real technological breakthrough."

"At the present time, something like 95 percent of all electricity generated in the United States is through nonpetroleum sources whereas transporation is 65 percent petroleum-based," Thiess said. "The latter figure is climbing at a rapid rate.

"We are becoming more and more petroleum-dependent for transportation and less and less petroleum-dependent for electricity. So the key is making transportation electricity-dependent. The electric car is the car of the future. It is that simple."

Thiess, who said he invented the digital watch before going into car technology, says magnesium and zinc pack more energy per pound than any other metal.

"But magnesium is easier and cheaper to produce than aluminum or zinc or iron," Thiess said. "Any chemist will tell you that. With constant improvements being made on batteries, the use of magnesium will become even more attractive."

Thiess thinks his electric car has the best potential for success in countries where gasoline is selling for $4 to $5 a gallon.

"We have received many inquiries. I have already had visits from parties in Singapore and India and some European countries."

Besides the cost advantage, Thiess says a magnesium-operated electric car also is pollution-free. He said magnesium was the safest element on earth.

Mit Adamus	3730 Sterling	Downers Grove,	IL	60515	312-963-3077
John Adhern	624 Pershing	Wheaton,	IL	60187	312-668-1426
Gary Beeman	501 E. Seminary	Wheaton,	IL	60187	
Jean-Guy Belanger	50 Acadia Drive	Hamilton Ontario,	Canada		
Marion F. Bramel	502 McHugh Rd.	Yorkville,	IL	60560	312-553-5344
Gordon S. Brand	418 Summit Street	West Chicago,	IL	60185	312-231-0136
Alfred Brinkmeyer	4323 Devon Street	Lisle,	IL	60532	312-968-7052
Jack Cahill	1 S 736 Vists Avenue	Lombard,	IL	60148	312-629-3989
Thomas J. Cheever	12319 S. 90th Ave.	Palos Park,	IL	60464	312-448-7676
Andy Chernivsky	106 56th Ct.	Downers Grove,	IL	60516	312-969-4780
Richard Cole	25 W 380 Armbrust Ave.	Wheaton,	IL	60187	
Dale Corel	595 Gates Head North	Elk Grove Village,	IL	60007	312-228-5952
David P. Cosgrove	637 Maywood Lane	Lisle,	IL	60532	312-968-5426
Frank Del Monico	5629 Bohlander Avenue	Berkeley,	IL	60163	312-544-6312
Donald Drake	445 Riverside Dr.	Villa Park,	IL	60181	312-832-1675
Dick Dunbar	1819 Wilmette Ave.	Wilmette,	IL	60091	312-251-8439
Mike Emberson	R.R. #2	Nanitcoke Ontario	Canada		
John Emde	6542 Fairmont Ave.	Downers Grove,	IL	60516	312-968-2692
Leonard T. Fisher	6351 Amston Dr.	Dublin,	OH	43017	614-764-9733
John J. Foster	14318 University Ave.	Dolton,	IL	60419	
George W. Frees	P.O. Box 578	Williams Bay,	WI	53191	414-383-3952
Jim Fritz	1621 W. Ogden	Lisle,	IL	60532	312-963-0901
Hendly Hall	530 Lawn Drive	Loves Park,	IL	61111	815-877-7290
Everett K. Harris	214 Nebraska Street	Geneva,	IL	60134	312-232-0344
Fred Kalkirtz	625 S. Grove Street	Oak Park,	IL	60304	312-383-7239
Harry Kampert	326 W. Lake Street	Barrington,	IL	60010	312-381-5612
John E. Kennedy	15800 Terrace Dr.	Oak Forest,	IL	60452	312-687-6398
Keith Kraft	425 S. Oak	Itasca,	IL	60143	312-773-3392
George Krajnovick	17 W 381 Eisenhower Road	Oakbrook Terrace,	IL	60181	312-834-0370
Donald Kubick	249 Arlington Heights Rd.	Elk Grove Village,	IL	60007	312-437-0453
Mark A. Melnicoff	321 S.E. Garfield Ave.	Mundelein,	IL	60060	312-566-5285
Kenneth O. Myers	1303 Indiana	St. Charles,	IL	60174	312-584-6057
E. Charles Miller	156 S. Weston	Elgin,	IL	60121	312-742-2052
Milwaukee Electric Auto Assoc. (c/o David Parez, President)	3251 W. Illinois Street	Milwaukee,	WI	53207	
Dana Mock	154 Denver Drive	Bolinbrook,	IL	60437	312-759-8033
Richard Ness	2129 N. Narragansett	Chicago,	IL	60639	312-889-7757
John Newton	22 W 450 Ahlstrand Dr.	Glen Ellyn,	IL	60137	312-469-3434
Neil Ott	1110 Plainfield Road	Darien,	IL	60559	
Dennis Pelkowski	1954 S. 8th Street	Milwaukee,	WI	53204	414-383-3952
Frank Pietrolonardo	1122 E. Thomas Street	Arlington Heights,	IL	60004	312-255-1665
Joseph Pollard	29 W. Childs Street	West Chicago,	IL	60185	312-231-8160
Bob Randerson	25 S. Spring	LaGrange,	IL	60525	
Robert J. Reek	108 N. Russel Street	Mt. Prospect,	IL	60056	312-255-4672
Sol Rubino	321 48th Street	Bellwood,	IL	60104	312-544-2917
Jim Saltigerald	320 Eastside Dr.	Geneva,	IL	60134	
William H. Schaffer	308 South East Avenue	Oak Park,	IL	60302	312-383-0186
Stanley C. Schneidmiller	1108 Neoga Street	Jupiter,	FL	33458	
Robert J. Shelko	1912 Nottingham Rd.	Cleveland,	OH	44110	216-531-0550
John M. Stockberger	2S643 Nelson Lake Road	Batavia,	IL	60510	312-879-0207
Les Stone	1214 Haase	Westchester,	IL	60153	312-562-5403
Roger Sutfin	375 Anthony	Glen Ellyn,	IL	60137	312-858-2189
Carl Swick	14713 Holly Ct.	Orland Park,	IL	60462	312-349-8816
Garrett Swierenga	322 N. Cass	Westmont,	IL	60559	
U.S. Electricar Corp.	250 S. Main Street	Athol,	MA	01331	249-2177
Vladimir J. Vana	5558 Franklin	LaGrange,	IL	60525	312-246-3046
Horace Wetherbe	918 Howard Street	Wheaton,	IL	60187	312-668-5809
Fred M. Wityaz	278 Manistee Ave.	Calumet City,	IL	60409	312-891-1454
Andrew Wohlert	219 S. 6th Street	St. Charles,	IL	60174	312-584-8364
George Zarrins	1454 W. Glenhill Drive	Glendale Heights,	IL	60137	312-682-1214

KAYHAN—SIPA/SPECIAL FEATURES

Iranian forces travel on an Iraqi canal in an attack on enemy positions.

Iran-Iraq War: Odds On New Oil Crisis

Iran's Khomeini will find the U.S. a determined foe if he attempts to close off the entrance to the Persian Gulf.

Rising intensity of the war between Iran and Iraq triggered fears in early March that the conflict might choke off flow of Persian Gulf oil to the West and inflict new economic woes on a world just emerging from recession.

At stake: 8 million barrels of oil a day—one sixth of the non-Communist world's consumption—carried by tankers from the gulf through the Strait of Hormuz into international sea-lanes.

The latest jitters over a possible oil shortage were set off by Iraq's claim, never confirmed, that its warplanes had inflicted "destructive strikes" on Iran's principal oil terminal on Kharg Island in the gulf on February 27.

Worry in the West arose from the fact that Iran's fanatical Ayatollah Khomeini has threatened to blockade the Strait of Hormuz if Iran's petroleum facilities in the region were attacked.

U.S. ships on station. In a prelude to possible U.S. involvement, President Reagan vowed to keep the strait open, declaring: "There's no way we could allow that channel to be closed." The U.S. Navy has three warships in the gulf and more than a dozen vessels in the north Arabian Sea. Britain and France have two ships each in the area.

While conceding that Iran's Khomeini is unpredictable, Western oil experts tend to discount his threats. Behind this low-key reaction is the belief that interrupting oil shipments would not be in Iran's self-interest. The 2 million barrels of Iranian oil shipped daily through the Strait of Hormuz are Teheran's only source of funds to finance its costly 3½-year war with Iraq. "Why close the strait when your entire livelihood depends on it?" asks one American military analyst.

Also, experts say, a blockade would not damage Iraq. Most of its oil is transported by pipeline through Turkey.

Even if Iran blockaded the strait, oil analysts predict, the industrial world would not face any immediate emergency approaching the crisis brought on by the Arab oil embargo of 1973.

Their assessment: The U.S., Europe and Japan are better prepared to handle an oil shut-off and could cope with any blockade Iran could mount, the worst effect being a jump in oil prices—not big shortages of gasoline and fuel oil.

Over the last five years, Western nations have shifted their purchases to countries outside the Middle East. The U.S., for instance, has so increased its imports from Mexico, Canada, Britain and other sources that Saudi Arabia, once America's No. 1 supplier of foreign oil, now ranks sixth. In all, gulf petroleum imports account for only 4 percent of U.S. oil needs.

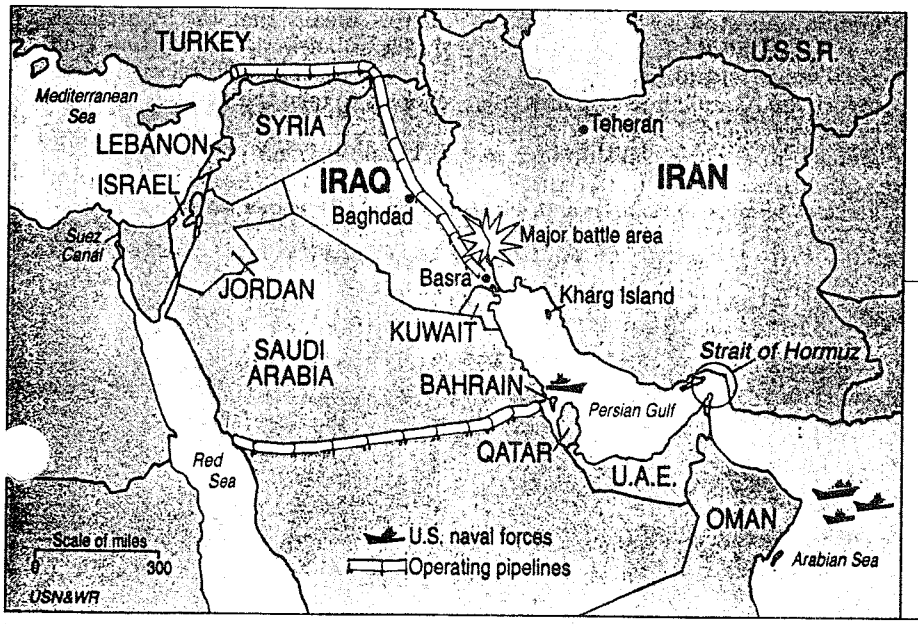
Western Europe and Japan still depend heavily on Persian Gulf crude, but they, like the U.S., have moved to protect their economies through energy conservation and oil stockpiling.

Supply cushions. Some 900 million barrels of crude oil are stored in Japan, Europe and the United States. Such stockpiles did not exist in 1979 when Iran's Islamic revolution dealt another oil shock to the world.

The 375 million barrels in underground caverns in Louisiana and Texas could take care of U.S. needs for three months. Europe has a 90-day reserve. Japan has a 121-day supply.

Saudi Arabia, the gulf's richest oil state, also has moved to insulate itself against an Iranian blockade. The Saudis assembled a fleet of 25 tankers in late 1983, filled them with up to 60 million

A Region Where Turmoil Rules



Who's in Danger

Share of oil supplied by Persian Gulf producers in first half of 1983—

U.S.	4%
Western Europe	45%
Japan	65%

USN&WR—U.S. Dept. of Energy, Central Intelligence Agency, OECD

barrels of oil and left them floating in waters outside the gulf.

The Saudis could increase shipments through a new pipeline running from the Ghawar oil field in the eastern part of the nation to the Red Sea. The line carries only about 40 percent of its daily capacity of 1.6 million barrels.

In addition, the world oil glut has many non-Arab producers pumping less crude than they could. Nigeria, Indonesia, Mexico and Venezuela, all heavily in debt and short of cash, stand ready to turn up the spigots.

What this means, analysts say, is that Iran could send oil prices soaring through a brief blockage of the strait or through threats that would hike insurance rates for oil tankers. But it could not reduce supplies enough to inflict an economic crisis on the West.

There are serious doubts about whether Iraq actually attacked Kharg Island, as it announced. One U.S. official called Iraq's claim an "escalation [of the war] by proclamation." Most experts saw the Iraqi claim as psychological warfare designed to frighten Iran and draw it to the negotiating table.

Yet while the world worries about oil, evidence is mounting that the conflict itself is nearing a crucial stage.

"Tiger by the tail." Iraqi President Saddam Hussein started the war in September, 1980, in hopes of regaining from an unstable Iran the Shatt al Arab waterway leading to the Persian Gulf. Today, he wants only to avoid defeat. "Saddam Hussein grabbed a tiger by the tail, and now the tiger is mauling the hell out of him," says a U.S. authority on the Mideast.

Hoping to administer a final defeat, the Khomeini regime has been massing an estimated 400,000 regular troops and reserves along the Iraqi border.

Thousands of Iranian troops—many of them poorly armed, preteen youngsters—died in late February in massive human-wave offensives against Iraqi positions east of the gulf port city of Basra. Iraq claims it repulsed the attacks and killed 30,000 Iranians.

An Iranian victory could lead to the overthrow of Saddam Hussein in favor of a government run by Iraq's Shiite Moslem majority with close ties to Iran. That could enable Khomeini to use Iraq as a base to export his radical version of Islam to Saudi Arabia and other pro-Western Persian Gulf nations.

Such a development could change the face of the Mideast with incalculable consequences to a region that is an important supplier of oil to the West. □

By STEVE HUNTLEY with RON TAYLOR and BOB HORTON in Washington and the magazine's overseas bureaus

Blockade of Vital Strait Wouldn't Be Easy

If Iran should attempt to block the strategic Strait of Hormuz, the United States is primed to act swiftly to neutralize any military threat to Persian Gulf oil shipments.

Moreover, according to Western military analysts, Iran's ability to enforce a blockade of the strait is so limited that the U.S. and its allies would have little trouble keeping the waterway open.

With an aircraft-carrier battle group stationed nearby in the north Arabian Sea and with other warships on patrol inside the gulf, the U.S. is prepared to overcome three principal military contingencies:

■ **Mining the strait.** Iran is believed to have purchased from France mines that could be laid in ship channels in a bid to paralyze the steady traffic of oil supertankers that pass through the gulf each day.

But a successful mining operation would be difficult because the width of the strait—30 miles at its narrowest point—would require placing hundreds of charges close together. The waterway is also too wide to be blocked by sinking a few ships.

Very swift currents in the strait make surface mines impractical, while 300-foot-deep ship channels would minimize the effectiveness of mines moored on the bottom.

Even if Iran succeeded in laying mines, U.S. mine-sweeping helicopters from the carrier *Midway* could remove the explosives within hours, military experts say. "There's no way Iran can mine the strait and keep it mined," one strategist concludes.

■ **Naval attacks.** Small, fast torpedo boats sold to Iran by the U.S. before the Ayatollah Khomeini's rise to power could become a serious menace to commercial shipping, as could a number of larger vessels in the Iranian Navy. Yet Iran's naval power is believed no match for t' American flotilla in the region.

In addition to the *Midway,* the U.S. force includes about a dozen cruisers, frigates and destroyers, plus support ships. If necessary, the warships could escort supertankers through the gulf, providing protection against both sea and air attack.

To guard against kamikaze raids, the Navy in recent weeks issued a warning to foreign mariners and pilots not to approach within 5 miles of the American ships. Iran refused to honor the limit, and on at least three occasions the U.S. destroyer *Lawrence* fired flares at approaching ships and a plane to warn them away.

■ **Air threat.** Iran's once powerful Air Force is virtually in shambles after the loss of most of its U.S.-trained pilots and heavy attrition in the war against Iraq. Many of the sophisticated American-made fighter planes and much of other hardware sold to Iran in earlier years have been cannibalized in the war effort. Iran now is believed to have fewer than 70 operational combat planes.

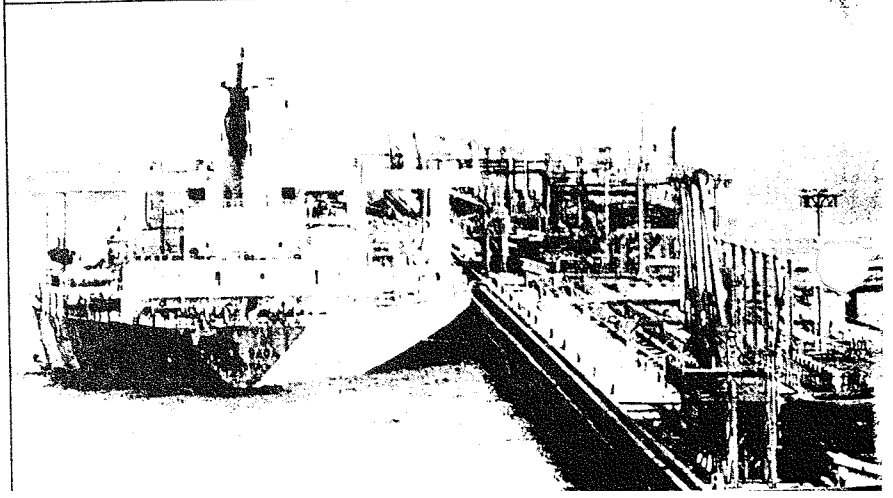
Aboard the *Midway* alone are about 75 aircraft, many equipp[illegible] with the most advanced air-t[illegible] missiles, which military men say could inflict heavy damage on Iran's aging fleet of fighters. American pilots would be further aided by radar planes that could pinpoint enemy targets and track their movements.

The carrier-based planes also would be effective against Iranian warships or artillery positions on land that threatened access to the gulf.

In the view of Pentagon analysts, all this means that the Ayatollah's threat to bottle up the Persian Gulf is a vow he cannot fulfill even if he chooses to take the gamble.

By ROBERT A. KITTLE

Iran's oil terminal at Kharg Island, which Iraq claims its warplanes attacked.



AP

The Next Sound You Hear Will Be Your Electric Car

B-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-

Detroit to Chicago in an almost practical ohmsmobile/By Chris Packard

Impression First a test. Sit back for a moment and pretend there's a new electric car sitting in your driveway. Try to visualize it. If, in your mind's eye, you see either a slightly sleeker 1910 Baker Electric or a bean-shaped two passenger commuting module regulated by computer and tipped up on end for easy parking, you fail. Don't feel badly. If you saw a modern electric car you probably wouldn't recognize it. The 1971 EFP Electric Passenger Sedan I recently drove from Detroit to Chicago is a thoroughly contemporary four-door sedan. It is an electrified American Motors Hornet capable of breaking any speed limit in the country; it will carry four passengers for more than sixty miles at 60 mph on a single battery charge.

This was the second Hornet built by Electric Fuel Propulsion Inc., Detroit, Mich. – the country's largest, and perhaps only, manufacturer of electric passenger cars. The first was built for neo-ecologist Arthur Godfrey; was entered by Cornell University in last summer's Clean Air Car Race; won the pure electric class of that race; and burned while on loan to Con Edison of New York. EFP is not ruling out the possibility of sabotage.

When I drove the new Hornet, it was still very much a prototype or "rolling breadboard" as EFP's electronics whiz kids call it. The Detroit to Chicago trip was the first test of the car, its 144-volt battery pack (the system was designed for 120 volts), and a newly designed inverter which charges an accessory battery off the propulsion batteries.

On the outside, the EFP has camouflaged the sedan's American Motors heritage with a solid fiberglass panel across the front in place of the original Hornet grille. From the driver's seat the only giveway to the electric propulsion system is a gauge panel on the parcel shelf below the glovebox. In the future even this will be integrated into the AMC decor – EFP has made up amp and volt gauges to replace non-essential instruments in the Hornet dashboard.

It took me about ten miles to get adjusted to the EFP electric before driving became more or less natural. A steering column lock-type ignition key activates the electric propulsion system. When you turn the key, nothing happens; your first instinct is to try again because the starter must not have caught the first time. Depress the clutch, shift to first gear, release the clutch – still nothing happens. No noise. No motion. If you're used to driving internal combustion cars, you forget that electric motors are either off or on. There's nothing called idling. Push down on the accelerator (against a rather stiff return spring) the motor controller begins buzzing, you hear an electric motor turning beneath your feet, and the car begins to move.

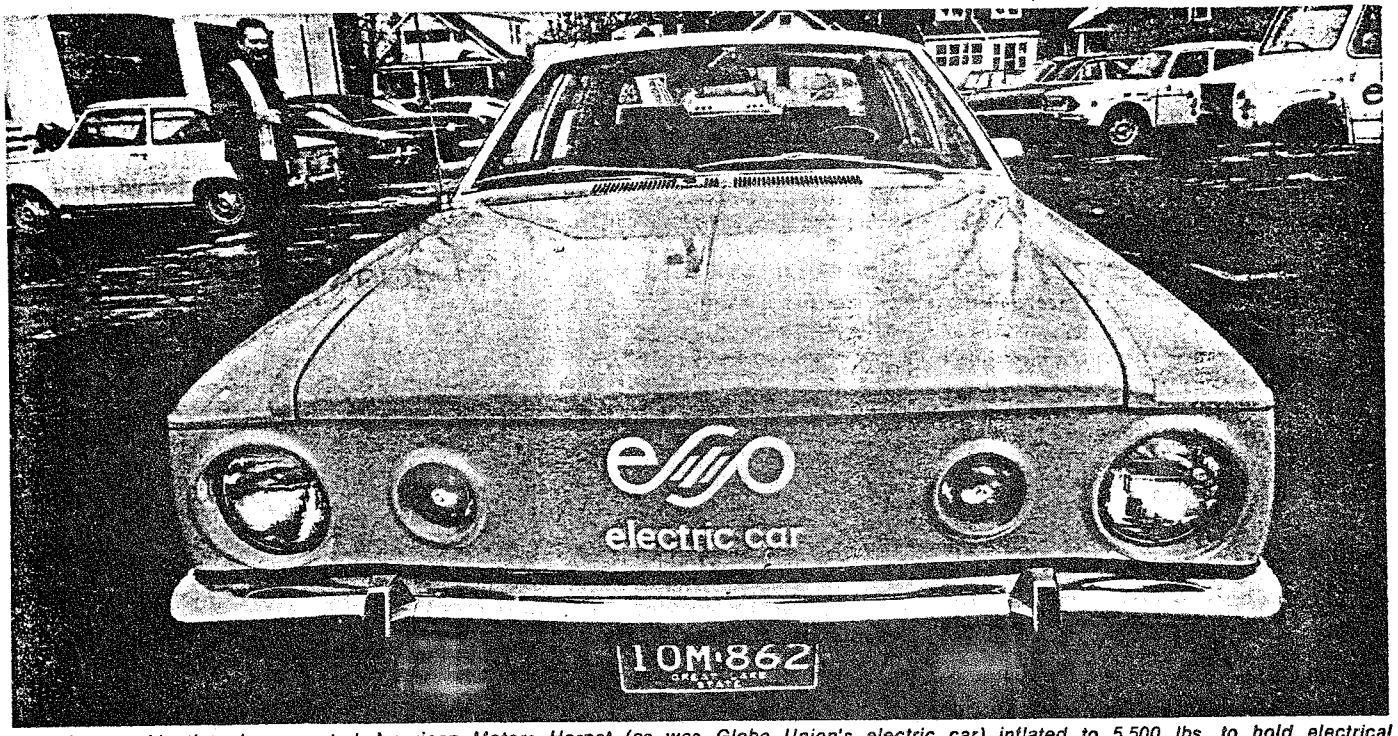
If you're used to shifting a standard transmission by ear, the electric car will fool you. At 5000 rpm, the transmission is whining so much (you never heard it over the roar of your gas engine) you want to shift to a higher gear to keep things from blowing up. You learn to ignore the noises, holding the car in first gear to 28 mph before shifting. Second gear is the cruising gear because it keeps the motor turning at close to its maximum rpm (7000) where it draws the least amperage from the batteries. The lower the draw, the further the range between recharges.

The EFP electric is a heavy car by anyone's standard (5500 lbs. on a truck scale) and putting that much weight on a chassis designed for less than 3000 lbs. creates strange problems for the neophyte driver. In heavy traffic, I saw the light flicker yellow up ahead, took my foot off the accelerator and started searching for a break in the traffic so I could get into the left lane. By the time I realized electric cars don't have a compression braking effect – the motor shuts off as soon as you lift your foot – I was drawing a bead on the trunk lid of the car ahead. I had to get on the non-power-assisted brakes hard to stop. Once that much weight gets rolling, it takes a lot of brake pedal pressure to stop it.

I was driving the EFP sedan with

Doing?

Notice The Date. What Have We Been



Photography: Dick Clapp

Electric car this time is converted American Motors Hornet (as was Globe Union's electric car) inflated to 5,500 lbs. to hold electrical gear. Car has 20-hp electric motor, 24 regular car batteries, and all necessary recharging equipment. Note location of spare in car shown below. Driven very similar to a conventional car, the electric car went 0 to 60 in 30 secs hampered at low speeds by controller hesitation. From Detroit to Chicago, car averaged 49.32 mph one trip, doing the 328 miles in 13 hours, seven recharging and six on the road.

Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z

Holiday Inns are used as recharging stations with a series already set up between Chicago and Detroit. Auto's gas cap hides three-prong socket and driver just attaches thick cord to start recharging. In-car charger knocks 220-volt AC current down to size for 6-volt car batteries. Average battery recharge took 1 hour, 23 minutes, leaving time to remember car's good points.

two of the company's engineers – George Schwartz, a member of the Cal Tech electric car team which challenged MIT in the 1968 Great Electric Car Race, and Bob Rice, who manufactured electric cars in, of all places, Taiwan. He only stopped because the Chinese government couldn't register them without knowing the piston displacement. We were making the 660 mile round trip to Chicago on what EFP calls the "World's First Electric Car Expressway" – which turns out to be no more than Interstate 94 with charging stations set up at six Holiday Inns adjacent to the highway.

Five years ago, when Robert Aronson, founded Electric Fuel Propulsion Inc., and started building electric cars in Detroit, he needed a long distance run to demonstrate his wares. In his search for charging station sponsors, Aronson approached Kemmons Wilson, chairman of the board of Holiday Inns Inc. who became personally enthusiastic about electric cars. Aronson got his charging stations and the Inns along the electric car expressway have sold a lot of dinners to Aronson and his customers.

EFP bolted a grey, metal electrical box (about a foot square) to the rear walls of five of the motels along the route. Each box is equipped with a three prong 220-volt plug like the one behind your clothes dryer, a switch, and a lock. EFP has since built a new generation of charge stations. They are free-standing blue, molded plastic boxes (about 4 ft. high) topped with white illuminated "charge station" signs. There are a meter, switch, and extension cord behind a locked door. So far the Benton Harbor Holiday Inn has the only new charge station on the electric car expressway.

Our first of 11 recharging stops was at the Ann Arbor Holiday Inn, about 55 miles west of Detroit. The procedure was simplicity itself. At each stop we backed up to the curb; removed the Hornet gas cap which covers a three prong plug mounted in the former gas tank filler hole; connected a three wire extension cord the size of a man's wrist; and switched on the power.

The Holiday Inns' electricity is 220 volts alternating current; the electric car's two dozen 6-volt batteries are direct current. So before it gets to the battery pack, the incoming electricity goes through an onboard charger. The 220-volt current is knocked down to a voltage the batteries can handle and converted to direct current. This charger is one of EFP's major breakthroughs in electric vehicle technology in the past five years.

Back on Interstate 94 at 60 mph, the volt gauge registered a full charge of 144 volts and the amp gauge indicated we were in the most economical cruising »»»

range – drawing about 200 amps. When passing or climbing hills, the motor controller changes the power demands to about 120 volts and 400 amps. In this mode the car has the same feel of acceleration as a full-sized car with a V-8 engine. Shifting the electric to third gear and flooring the accelerator produced about the same sensation as kicking the V-8's automatic transmission into "passing gear." We clocked 50 to 70 mph passing time at 12.5 seconds with a stop watch. Zero to 60 time is rather slow at 30 seconds because the controller hesitates for long periods between electrical modes at low speeds.

We followed the Interstate to Chicago, recharging at a Consumers Power Co. substation at Jackson and Holiday Inns at Kalamazoo and Benton Harbor, Mich., Michigan City, Ind. and at Chicago's Kennedy Expressway Holiday Inn, where we spent the night. We had covered 328 miles in about 13 hours – seven hours recharging and six hours driving. Our average battery charge took an hour and twenty-three minutes, and our average speed was 49.32 mph.

Next morning in Chicago, we took

1971 EFP Electric Passenger Sedan

SPECIFICATIONS

Body		1971 American Motors Hornet 4 door sedan
Dimensions:	Wheelbase	108 ins.
	Length	181 ins.
	Width	70.6 ins.
	Weight w/driver and luggage	5500 lbs.
	Distribution	2200 front, 3300 rear
Drivetrain	Drive motor	EFP designed DC series traction
	Power output	20 hp
	Range	0-7000 rpm
	Transmission	3 spd AMC with floorshifter
	Ratios 1st 2.55	
	2nd 1.56	
	3rd 1.0	
	reverse 2.55	
	Differential	AMC 4.44 to 1
Tires		Michelin 195 x 14 Radial ply @ 36 lbs. pressure
Onboard charger		Solid state, 50 KW on 220 volt AC, three phase 150 amp circuit
Heater and defroster		Stewart-Warner gasoline heater w/1 gallon tank
Power supply		24 6-volt EFP Tri-Polar lead-cobalt storage batteries and 1 12-volt accessory battery
Motor controller		Solid state, stepless modified forklift truck unit
Price		approx. $10,000 depending on quantity ordered
Performance	0-60	30 seconds
	50-70	12.5 seconds
	Top speed	79.2 mph

three businessmen for what later proved to be a crucial two-mile ride around the block. They were representing a Japanese trading company interested in buying rights to manufacture EFP cars under the Rising Sun and had arranged to see the car when it was in Chicago.

Then we started home. About ten miles west of our first recharge station, we noticed the batteries' voltage had dropped to nearly dead. We slowed to 20 mph, turned off all acccessories and shifted the transmission to first gear to keep the motor turning at full speed where it draws the least power.

We didn't quite make it. The car stopped less than two miles from the Holiday Inn. So we sat in the car for 20 minutes while the batteries rejuvenated themselves enough to creep to the charge station but didn't quite make it on this run either; we pushed the last ten feet by hand. The remainder of the return trip went without incident. Our average speed figured out to 45.66 mph including the time we sat waiting for the dead batteries to "come up."

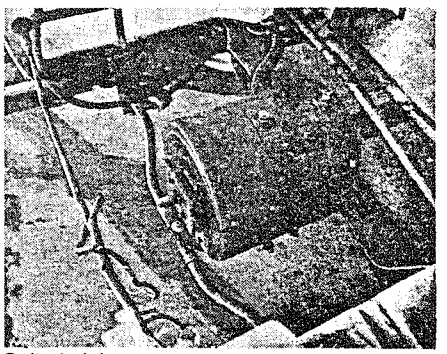
Thirteen hours to Chicago is not good *but* the EFP sedan does shatter a lot of myths about electric cars. It is not slow; we timed a top speed run at 79.2 mph. Its range is not limited to an eighteen hole golf course; on the round trip we averaged 54.8 miles per battery charge which is probably further than the average businessman commutes in a day.

The EFP sedan had its disappointing aspects too. It is unreasonably heavy and not nearly as quiet as electric car enthusiasts would lead you to believe. At 60 mph the electric Hornet is about as noisy inside as a gas Hornet.

The electric motor does make some noise, the American Motors floorshifter rattles, the transmission sounds like it was filled with crushed walnuts instead of gear oil, and the wind noise from the ill-fitting bodywork is unreasonably loud. During our overnight trip luggage space was at such a premium, we had to carry two suitcases, the spare tire and jack on the rear seat. Admittedly this was a prototype with extra equipment in the rear compartment and production models may have more luggage space but there's a limit to how many batteries can be removed without affecting performance.

EFP will probably drop the Hornet line because of these space problems and in the future produce electrified Matadors which have about twice as much room for batteries. When they move up to the more expensive cars, EFP will retain their present delivery arrangement with American Motors and continue building cars as they have the Hornets.

On the Electric Fuel Propulsion production line, a 20 hp DC traction motor (about twice the size of a gallon paint bucket) is bolted to the Hornet clutch and three speed transmissions, using an aluminum adaptor plate. Angle-iron racks, above the motor, hold a dozen EFP 6-volt Tri-Polar Cobalt electric vehicle batteries. Eight more are housed



Bolted right up to the Hornet 3-speed transmission is this 20-hp DC traction motor. Power drawn can climb to 120 hp for freeway passing, but this mode quickly drains juice.

in the rear under a plywood trunk floor. These look like ordinary auto batteries, but have three times as many internal cell connectors. They have plates made from a secret formula and carefully engineered acid circulation characteristics. They are the backbone of EFP's success with electric vehicles and are protected by more patents than Carter has pills.

After the batteries are installed under the hood, the remaining space houses the motor controller. The electric car driver is unaware of the controller's operation, much as the driver of a conventional car is oblivious to the operation of his carburetor's accelerator pump or the advance mechanism in his distributor.

The solid state controller used in the Hornet is a much-modified unit from an English forklift truck. It progresses

through three phases (like ranges in an automatic transmission) in response to driver pressure on the accelerator pedal.

From a dead start, the controller is in SCR (silicon controlled rectifier) mode. An SCR is a miniature electronic switch which pulsates rapidly off and on, never allowing the batteries to deliver a full jolt to the motor. EFP engineers say if full battery power were ever delivered during initial acceleration the motor would produce enough torque to tear the entire drivetrain out of the car.

When the controller's logic center determines the car has attained sufficient speed, a relay clicks the system into the second phase called "bypass." This is the normal cruising mode. The electricity travels directly from the batteries to the motor, bypassing controller.

At the bottom of the accelerator pedal's travel, the controller cuts in the third phase. The controller reduces the electrical value of the motor's field coils, causing the armature to turn at an increased speed. In this "field weakening" mode, the motor, normally rated at 20 hp, can put out up to 120 hp – but

using American Motors' chassis filling out their line with a compact (Gremlin), a luxury car with power steering and air conditioning (Matador), and a truck (from the Jeep division).

EFP president Robert Aronson repeatedly insisted there is no formal agreement between his company and American Motors. He said EFP uses American Motors cars because AMC is more optimistic about the future of electric cars than its competitors. The question has obviously come up before. When I asked AMC, the public relations department pulled an official statement about the two companies' relationship out of their files. The statement acknowledges the first Hornet was given to EFP for "experimental work," the second Hornet was sold to EFP, and that "EFP's experiments are being followed with interest by AM engineering." Both companies deny that AMC owns a piece of the action but are vague about a future acquisition. I caught myself wondering if the free television sets AMC gave away with each new car was really a test of the public's reaction to electronics on the showroom floor?

being just what our name says; a producer of electric propulsion systems not a car manufacturer." Yet when he takes a potential customer or visiting journalist on a company tour, they always end up in what EFP employees call "th dream room" where the company's electric car of the future lies in state.

Del Coates, a former Ford stylist, was hired to design a body. This was to be a pure electric car from the ground up. EFP would be able to engineer a drive train without the compromises forced on them when they converted internal combustion cars. This car (called Voltair) will have about a dozen special, low profile batteries and the onboard fuel cell recharging process they have been experimenting with. The top speed is expected to be over 100 mph with a projected range of 300-500 miles between recharges.

Coates' drawings were sent to a professional fiberglass company which made a mock-up, female molds, and produced one body which looks like a Peugeot 504 after an updating session in the Citroen styling studios. It sits on a hastily welded angle iron chassis in "the dream room."

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because the power draw is so great, it is only used for passing or hill climbing.

EFP completes the conversion by installing a Stewart-Warner gasoline heater originally designed for Volkswagens and a chromed one-gallon go kart gas tank. Beefed-up suspension is installed front and rear to support the extra weight and Michelin 195 x 14 tires are mounted on the stock Hornet rims. Radials were chosen because they possess a high capacity for weight, low rolling resistance and have excellent braking characteristics.

At present, the EFP company stable consists of two operating electric cars – the Hornet and an old Mars II, an electrified Renault 10 the company built its reputation on. Between 1967 and the end of 1969, EFP built and sold 42 Mars II's to electric power and utility companies.

In the future EFP plans to continue

The bulk of EFP's sales will be to electric power and utility companies for quite a while. Power companies are in about the same position now as they were in after World War II. At that time they were selling kilowatts to every household, but the demand for quantities of power was low because most families had gas stoves and refrigerators. To increase power sales, the utilities bought carloads of electric appliances and resold them almost at cost to the consumer, allowing him to put the payments on his monthly electric bill. Now they've got us hooked on total electric living and their power sales have leveled off. They need us to accept electric cars and the easiest way to do that is to give us "test rides" and expose us to electric cars until we take them for granted.

EFP president, Robert Aronson, can't seem to make up his mind about the company. He says, "We're interested in

The molds are stored on the roof of the building and Electric Fuel Propulsion Inc. is out about $100,000 for the initia phase of a project Aronson admits will cost about $2 million just in legal fees and engineering time to pass the government's safety regulations.

In the executive office five minutes later, Jack Hunter tells me the company will have to keep selling its cars in the five figure price range. "We just can't raise enough capital to buy components in quantity. For example, our drive motors are custom made to EFP specs at $745 each because we order one at a time. If we could afford to order 500 motors, the price would drop to $300 each," he said.

In this era of caution and uncertainty for many of the world's auto makers, EFP's future looks particularly good. The nation's power companies, which buy about 40,000 cars a year are a captive market. The government has asked to lease an EFP electric for study and testing and a major car rental company has made initial inquiries about a fleet of electrics.

EFP engineers (probably the best collection of electric car talent in the country) have brought the electric car from the Baker Electric era to the late 1940's in half a decade. At this rate by 197 EFP should be building pollution-free electrics to compete directly in the mass market. But it may never happen if EFP can't get its corporate head together and solve its present administrative and financial problems. /MT

status as any other serious new-car program. An awesome assortment of divisions and corporate staffs is involved, all pulling together to bring both a practical electric car and a commercial vehicle to market as soon as they can, possibly by late 1985.

GM's first marketable electric car will look a lot more like the Design Staff's wedgy clay model than the stuffy little Electrovette we drove. It will be a ground-up EV design (not a conversion), a little fwd commuter with good comfort for two and cargo space for four or five grocery bags. It will weigh about a half-ton less than the Electrovette thanks to aluminum body panels, plastic side and rear windows, less massive bumpers, and a liberal use of high-tech plastics, and will have a drag coefficient in the low .30s to help it part the air with minimum wasted power.

To aid replacement, the batteries will be housed in a removable tray inside the central tunnel that forms the chassis's structural backbone. Electrical accessories (windshield wipers, blower motors, etc.) will be handled by an auxiliary battery pack (recharged along with the propulsion pack), and heating and AC energy will come from a small amount of on-board liquid or gaseous fuel. Current goals are 60-mph top speed, 80-mile range, 30,000-mile battery life, and purchase and—most difficult of all—operating costs competitive with those of conventional small cars.

It's a tall order, but GM is already well on the way to pulling it off. Whether the buyers will be there, however, is a question GM is still struggling to answer. —*Gary Witzenburg*

Witzenburg is a freelance automotive journalist who frequently contributes to Playboy, Popular Mechanics, *and United Airlines'* Mainliner.

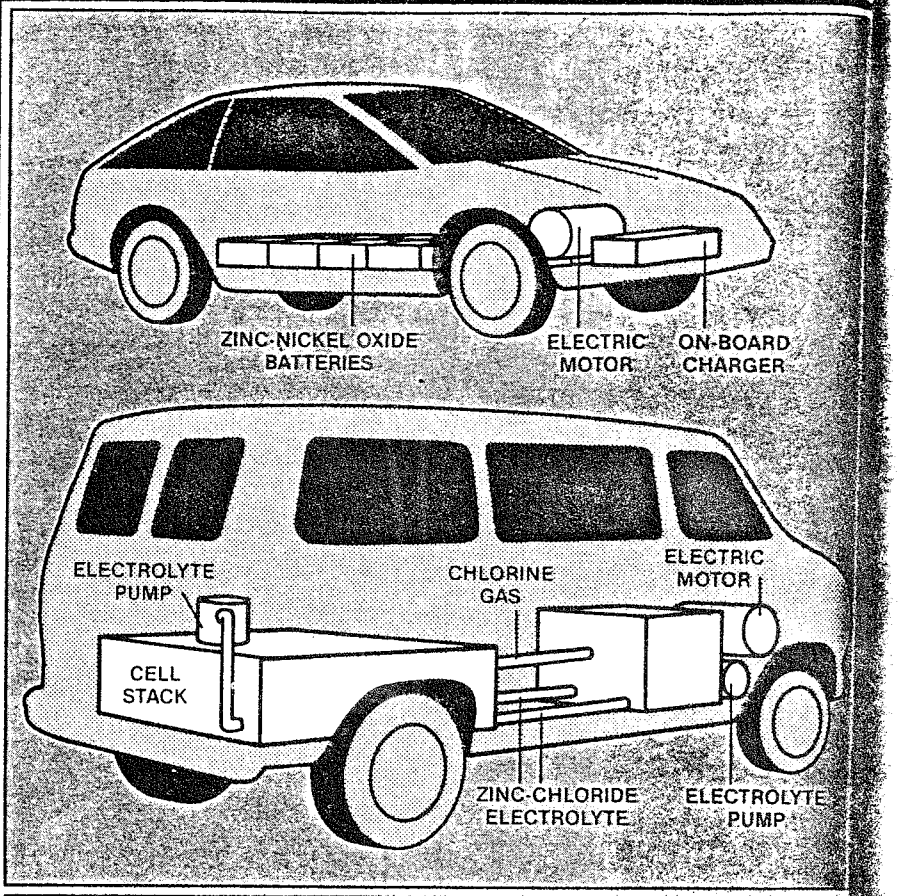
GM ELECTROVETTE

Vehicle type: front-engine, front-wheel-drive, 2-passenger, 3-door sedan

Motor:	Delco Products DC shunt type with separate armature and field excitation
Power rating	18 bhp
Redline	7000 rpm
Battery pack	150 Delco-Remy nickel-zinc cells, 240 volts
Auxiliary power	8 Delco-Remy nickel-zinc cells, 12.8 volts
Battery weight	780 lbs
Speed control	GM Research Labs solid state
Wheelbase	86.2 in
Length	150.9 in
Curb weight	3450 lbs

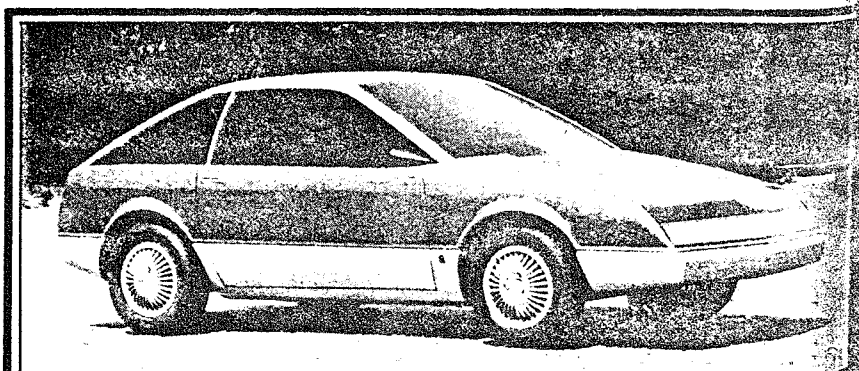
Performance (manufacturer's goals):

Acceleration, zero to 30 mph	7.5 sec
Top speed	60 mph
Range, city	60 miles
Range, highway	85 miles
Battery life	30,000 miles



Most Likely to Succeed

GM's nickel-zinc battery and Gulf & Western's zinc-chlorine storage system will probably both see production in the near term. The GM battery (top) is a more powerful version of conventional automotive storage cells. GM's EV will use a removable pack of nickel-zinc batteries replenished by an on-board AC-to-DC charger. The G&W system (bottom) is more like an on-board power station. Pumps circulate a slushy electrolyte (b cool by an on-board refrigeration un from a separate storage tank through t battery stack and back again. The G system must be recharged by a station charger. Because it is both powerful bulky, it will likely find its way into li duty electric trucks. GM favors its co compact, but very expensive, system automobiles.



What a Body

GM's first electric car will be anything but a sardine can on wheels, if this early de study is any indication. Careful attention will be paid to aerodynamics, and po sapping weight will be kept down with aluminum bodywork and plastic side wind

Rev Apr 1984

FVEAA

fox valley electric auto association inc.

MEMBERSHIP

A membership in the Fox Valley Electric Auto Association (FVEAA) is open to everyone. Currently there is only one grade of membership regardless of the members degree of participation in association activities. Membership in the FVEAA is contingent upon payment of the annual membership fee. The membership fee can only be waived by special vote of the Board of Directors. Each member in the FVEAA receives a copy of the FVEAA Newsletter each month. They are also entitled to attend and vote at all association meetings.

All memberships in the FVEAA run from November 1 to October 31 of the following year. The dues are $15.00 per year payable at the November meeting. New members joining after November shall pay $1.25 for each month remaining before the following November.

The following form may be used to apply for membership or to renew one.

Date _____

APPLICATION FOR MEMBERSHIP OR RENEWAL

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐ Just interested in Electric Vehicles
☐ I have an Electric Car
☐ I wish to build an Electric Car

Amount enclosed $ _____ for _____ months.

Mail to: Mr. Jack T. Cahill, FVEAA Tres.
1 S 736 Vista Ave.
Lombard, Il. 60148