F.V.E.A.A. NEWSLETTER

APRIL 1991

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Newsletter items should be submitted to the Editor by the first friday of the the month

Nonmembers are always welcome

NEXT MEETING
APRIL 19th 7:30 P.M. SHARP
Room 157, doors open @ 7:00
Use Northeast entrance of
Building K, College of DuPage
22nd & Lambert, Glen Ellyn

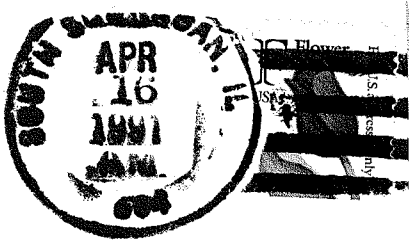
THE PREZSEZ

A number of inquiries about the FVEAA resulted from my letter to the Chicago Sunday Tribune. It was published in the March 24th issue and is included in this Newsletter. I answered 36 letters in the first week. It emphasizes the hazard of becoming too successful. There is a lot of interest in electric cars and we can be overwhelmed with inquiries when more people find out about us.

Among the response letters was an invitation for the FVEAA to see the electric motor production facility of Warfield Electric Motor Company in Frankfort. Their letter shows they plan to be a factor in the electric vehicle business. I believe this would be a worthwhile special activity for the FVEAA.

In addition to the above two subjects, we will also discuss plans for our participation in the Amherst Energy Fair, June 21-23. The technical discussion will continue with calculations for my Mazda conversion.

Bill



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FIRST CLASS

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Honda to enter special race for electric cars

By William R. Diem
Crain News Service

A battery-powered Honda CRX HF will carry a burden of 2,600 pounds and high hopes in an electric car race in Phoenix, Ariz., next month.

Decisive victory in the April 7 Solar and Electric 500 would bring zinc-air batteries from nowhere to the head of the line of practical alternatives to liquid fuel. That would be a great boon to the developer, Dreisbach ElectroMotive Inc. of Santa Barbara, Calif., known as DEMI.

Firm's debut

And the race marks the first presence of American Honda Motor Co. Inc., the U.S. sales arm of the Japanese company, in the emerging electric car industry that has thus far been dominated by the Big 3 and European carmakers. Two other Honda electric projects are its No. 2 finisher in Australia's World Solar Challenge in November, and an electric motorcycle project announced early this year by Honda Motor Co. President Nobuhiko Kawamoto.

American Honda called DEMI's technology "intriguing and forward thinking" and said it was providing "parts, loan vehicle and technical support." Honda racing experts are tuning the suspension on the car, which DEMI bought from a dealer. DEMI's two principle sponsors are electric utilities: Southern California Edison and Arizona Public Service Co.

Early successes

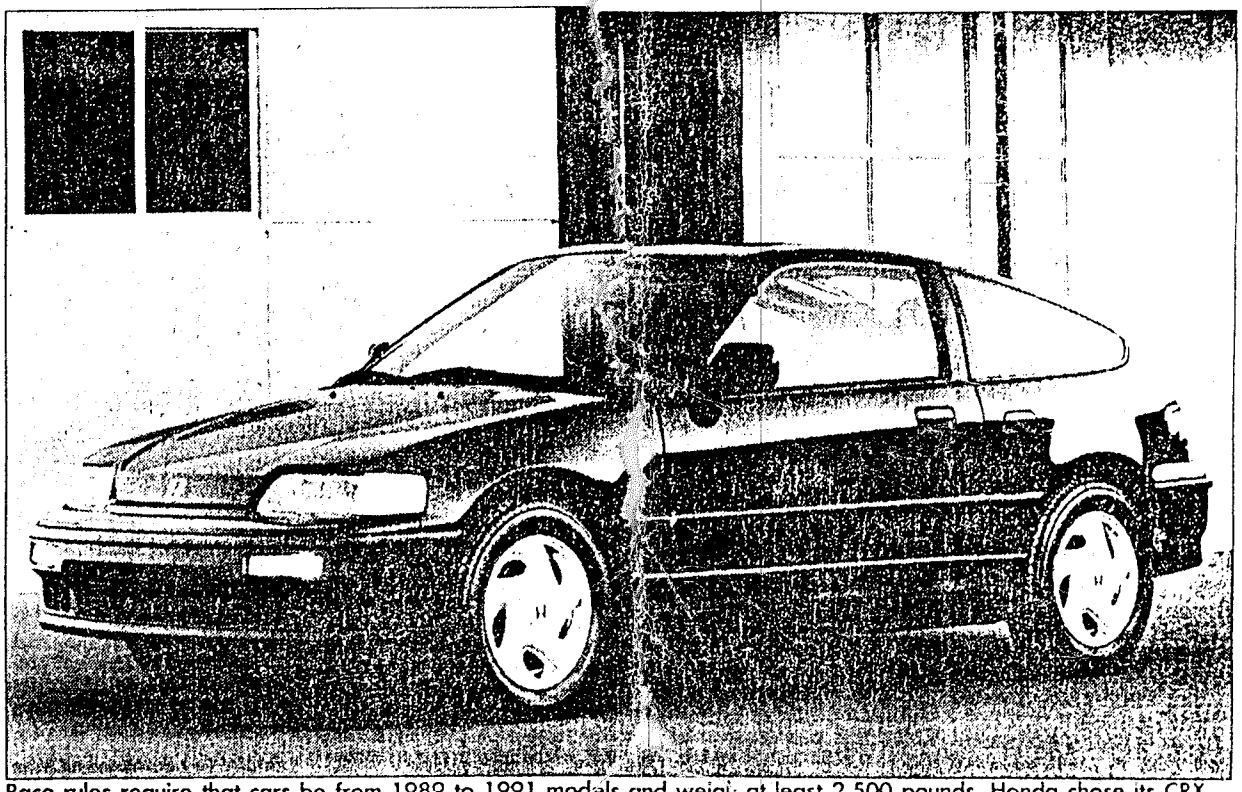
DEMI has achieved success with its battery before. Powering the experimental one-person X1 vehicle, it set speed records eight years ago, doing a quarter mile in 14.7 seconds and reaching 147.9 mph at the end of standing mile, said Len Danczyk, the director of market development.

One day last November, the company drove a zinc-air Plymouth Voyager minivan 122 miles on a suburban route including old Highway 1, the Rincom Parkway, near Ventura, Calif. DEMI will continue to road-test the CRX and minivan this spring, said Danczyk.

The CRX drivetrain will include a DC motor, stock 5-speed manual transaxle, 132 zinc-air battery cells providing 67 horsepower, and a nickel-cadmium battery for "passing power and peak speeds," said Danczyk. The Voyager tested earlier used a lead-acid battery pack for acceleration.

Special equipment

The extra "battery flywheel" has been required because zinc-air batteries didn't discharge fast enough for good acceleration. But in the last few months, said Danczyk, researchers have doubled the effective power output of the zinc-air cells.



Race rules require that cars be from 1989 to 1991 models and weigh at least 2,500 pounds. Honda chose its CRX.

In papers delivered to the Society of Automotive Engineers and the California State University annual battery conference, DEMI said the batteries are environmentally safe, have an energy density eight times that of a lead-acid battery, and can be recharged overnight with standard household current. Danczyk said he expects the batteries to achieve a life of two years or 35,000 miles, which would make the cost of operating battery cars comparable to regular cars when gas is $1.25 a gallon.

Factory support

Ernie Holden, president of the Solar and Electric Racing Association that is sponsoring the 500, said the CRX is the only car with factory support entered so far among the 20 electric stock cars.

Race rules for the electric stock cars specify that they be converted from a 1989 to 1991 production passenger car chassis, weigh a minimum 2,500 pounds and use tires approved for highway use. Cars can be recharged during pit stops, but battery packs cannot be replaced.

NASCAR race cars on the oval Phoenix track typically qualify at more than 120 mph. Danczyk said he expects the CRX to average at least 85 mph. "It's a lot peppier than the gas-powered version" of the two-seat CRX HF, he said. That car, powered by a 62-hp four-cylinder engine, weighs 1,987 pounds.

The inaugural Solar and Electric 500 won't have the national television audience the Phoenix CART race will have two weeks later, but it will have its share of fans. Among the most interested will be DEMI President Charity Cheiky and her office parrot, Tweedledum. For a peanut, it will recite an electric car speech that ends with DEMI's hopes: "Zinc-air batteries are the way to go."

In this part, the power required under various operating conditions will be calculated.

Power is required to sustain a speed after a car is accelerated. In Part II, the accelerating force for my Mazda was calculated to be 730 pounds to go from 0-30 mph in 6 seconds. Added to this will be the rolling resistance and aerodynamic drag.

Rolling resistance is caused by friction of bearings, gears, and other moving parts. The most significant resistance is caused by the tires. Rolling resistance is a constant times the car weight. It can be determined in several ways; determining the grade which will cause a car to roll down an incline with no change in speed, measuring the towing force as the car is moved over a smooth, level surface at a constant speed, or a coast down test.

Since the Mazda is now partially dismanteled, an estimated factor will be used. Similar cars have been found to have a rolling resistance factor of 0.015. Since car weight is expected to be 3200 lbs, the rolling resistance will be:

Fr = (Resistance Constant)(Weight) = (0.015)(3200) = 48 Lbs.
This is small compared with the accelerating force of 730 lbs.

Aerodynamic drag is caused by moving the car through the air. It increases as frontal area becomes larger and as velocity increases. It is influenced by car shape. Drag force is determined by:

Fd = (Drag Coefficient)(Frontal Area)(Velocity) (Air Density)

Representative Fd values for a 3280-lb Vega with 20 square feet of frontal area are given by Bill Palmer as:

	Speed in MPH				
	20	30	40	50	60
Drag force (Fd) lbs.	12	27	48	75	180

The Mazda frontal area is 21.65 Sq Ft but it is more aerodynamic than a Vega so use of these values should be ok. Anyone wishing to pursue this subject further may refer to SAE Paper # 720099.

Hill climbing is the final force to consider. This is not too important around Chicago but there are occasions where it can become a factor, such as a parking garage ramp with a 30 degree slope. The force needed to move the car up the ramp is:

Fh = (Car weight in lbs)(Sine of inclination angle)

= (3200)(Sine 30) = (3200)(0.50) = 1600 lbs

A top speed selection must be made to calculate the power to overcome the Mazda rolling resistance. Fifty Mph was chosen because the car will be driven primarily in an urban environment. Fifty Mph is equivalent to 73.3 feet per second.

Power (Pr) required to overcome rolling resistance @ 50 Mph is:

Pr = (Fr)(Velocity)/550 Ft-lbs per minute per Horsepower
= (48)(73.3)/550 = 6.4 Hp (4.8 Kw)

Power required to overcome aerodynamic drag @ 50 MPH (Using the Palmer Factors) is:

Pd = (Fd)(Velocity) /550
= (75)(73.3)/550 = 10 HP (7.5 Kw)

Adding Pr + Pd, we find that 16.4 Hp (12.3 Kw) will keep the Mazda rolling on a level surface at a steady 50 Mph. A 12.3 Kw electric motor will require 205 amps with a 60-volt supply.

At a 60 mph speed the power increases to 18.6 Kw and current to 310 amps. At 40 Mph, the power requirement drops to 7 Kw with a 116 amp current. The battery rating is 75 amps.

Calculations in the first 3 parts of the FVEAA manual can provide an estimate to answer the question most-frequently asked, (How fast will it go?")

A design iteration was introduced at this point. Adding two 6-volt batteries would increase power system voltage to 72 volts and add 125 pounds. Would this be a worthwhile change?

The car would still be within the 3400 lb vehicle maximum, but would require suspension changes. Steering might be adversely affected unless the added batteries are placed in the rear. The present coil springs in the rear can be replaced with ones suitable for the increased load. Space is available to accomodate seven power batteries in the rear area.

With this change, steady-state power for the heavier car increases a bit, but the current at 50 Mph will be reduced to 170 amps. The accelerating current will drop to 385 amps, allowing use of a 400-amp controller. Battery cost will be about $ 130 higher with this change. At 72 volts, the main contactor must be equipped with magnetic blowout coils. Aircraft-type contactors rated at 28 volts with no magnetic blowout should not be used. This will also increase costs. Interconnecting cables should be adequate to carry 200 amps continuously.

The change was adopted after consideration of all factors.

W. H. Shafer 4/2/91

GM at work on electric car

More than 200 are assigned to develop marketing plan

By Phil Frame
Crain News Service

DETROIT — General Motors is building a strategic business unit — which now includes more than 200 people — to market a line of electric vehicles.

The formation of GM Electric Vehicles — a stand-alone group that includes engineering, product planning, market development, marketing, sales and service personnel — has never been announced by the company. No timetable for the start of production of the electric car has been announced, but there are reports that it will be sold as a 1994 model with production beginning in 1993.

To avoid tipping its hand to competitors, GM is highly selective on the information it releases about its electric-vehicle program. Employees at GM Electric Vehicles — known internally as GMEV — have been told not to discuss their work with outsiders. GM will acknowledge the group's existence only if asked.

Engineer is chief

The manager of GM Electric Vehicles is Kenneth Baker, who was director of advanced vehicle engineering at the Chevrolet-Pontiac-Canada Group and head of the GM Service Technology Group before being appointed to his current post in June 1990, said GM spokeswoman Toni Simonetti. GM Electric Vehicles is part of the advanced engineering staff under the direction of GM Vice President Donald Runkle and Vice Chairman Robert Schultz.

In 1980, Baker was chief engineer of the GM electric-car project that involved converting Chevrolet Chevettes to electricity. That project never got off the ground, and Baker moved to Buick.

Former GM Chairman Roger Smith said in April 1990 that the company was committed to producing an electric car based on the Impact concept vehicle introduced at last year's Los Angeles auto show. Last week, GM President Lloyd Reuss said the initial production site for the car will be the Reatta Craft Centre in Lansing, Mich., which will be renamed Lansing Craft Centre. Room for the electric car was created when the Buick Reatta was canceled.

Reatta dropped

GM has scrapped the Buick Reatta, the handcrafted, luxury two-seater that was introduced barely three years ago.

Buick sold 17,900 Reattas in three model years — 3,000 in 1988, 7,900 in 1989 and 7,000 in 1990. When production ends May 10, only 1,500 of the 1991 models will have been built at the Reatta Craft Centre.

Just last September, Buick General Manager Edward Mertz said the division had plans for the Reatta at least through 1998.

"The two-seat luxury market did not continue to grow as we expected," said Darwin Clark, Buick general marketing manager.

At one time, Buick thought the niche for luxury two-seaters would support 15,000 to 20,000 Reattas per year, Clark said.

Different name

A source at GM Electric Vehicles said that while the new electric car will be based on the Impact, it will not be called the Impact when it reaches the market.

The car probably will look much like Impact and its mechanicals will be based on the concept car, but developments since the Impact's debut will make the production car different, the source said.

There had been speculation that the Van Nuys, Calif., assembly plant would be a logical place for production because California clean-air laws require zero-emissions vehicles in the 1998 model year. Van Nuys now can be considered for another project in the works: A hybrid minivan that would meet California standards for ultra-low emissions, required in the 1997 model year.

Prototype shown

GM Electric Vehicles has been working on engineering, production and marketing plans for some version of a hybrid vehicle that would result from Project Freedom. One such vehicle, dubbed HX3, was shown earlier this year in Detroit.

The Freedom vans — still far from final form — are four-wheel drive or all-wheel drive. As in the Impact, separate electric motors power each drive wheel. The motors get power from batteries, which are recharged with a generator driven by a 906-cc gasoline engine. No plans to produce Freedom vans have been announced.

Simonetti said there are no plans for GM Electric Vehicles to be a separate marketing division for electric cars.

"Certainly, we plan on having our existing dealers involved in this," she said.

Meet the electrics

Folks interested in converting a car to electric power may want to check out a Fox Valley group that can offer advice and experience. Page 6.

Solar Mazda is shown

By Mary Ann Maskery
Crain News Service

TOKYO — Mazda Motor Corp. last week unveiled a solar-powered rooftop energy pack that industry sources here say will be installed as standard equipment on the company's long-expected, but not yet confirmed, U.S.-bound luxury sedan.

Mazda officials, declining to identify what cars the 11-watt solar unit is earmarked for, said it is designed to ventilate a parked vehicle in the summer and re-charge the battery in the winter.

The amorphous silicon unit, which was jointly developed with Sanyo Electric Co., is attached to the curved glass of a sunroof. In hot weather, it activates and powers a ventilation fan to cool the interior of cars parked in direct sunlight. During winter weather, power generated by the solar pack is automatically diverted to the battery for recharging.

According to sources here, the new unit will be standard on Mazda's forthcoming luxury car, which is widely expected to debut in Japan in May under the name of Sentia and to come to the United States as the Pegasus.

The new model, which Mazda has never confirmed, reportedly is a European-styled wide-bodied sedan in the 2.5-to-3-liter range.

It reportedly will be priced in Japan at the equivalent of $23,700 to $33,500.

Chicago Sunday TRIBUNE
March 24, 1991, Page 5
Transportation
Section

One aspect wasn't mentioned in your electric car story: the recycling and repowering of conventional cars for electric propulsion. In the Chicago area, there are over 100 members of the Fox Valley Electric Auto Association who are quite familiar with the construction and operation of electric cars, but few people are aware of our existence. Our cars have the limitations you mentioned, but we find more than 50 percent of our trips are under five miles, and the limited-range electric works well for these missions. A conventional car with a blown engine but good body can be converted to electric drive for $3,000 to $4,000 in about four months with some guidance from association members who have built such cars. William Shafer, FVEAA president, Oak Park.

Thanks for the letter. Those interested in learning more about electric vehicles from those who own one can write the club at 308 S. East Avenue, Oak Park, Ill. 60302. The club meets at the College of Du Page.

ST 3/25/91

Debate on oil alternatives heats up in gulf aftermath

By Donald Woutat
Los Angeles Times

DETROIT—The Persian Gulf war, in which oil supply was a central issue, has rekindled debate over what to do about the internal combustion engine, which accounts for 40 percent of the United States' oil consumption.

Automobiles' energy consumption is seen by a top General Motors engineer as a serious enough problem to warrant an effort on the scale of the moon landing program, combining the resources of U.S. industry and the government's network of 720 research labs to find breakthrough technologies by 2000.

"These issues are not going to go away," Donald L. Runkle, GM vice president for advanced engineering, said this year. "They cannot be swept under the rug, and they will not yield to the conventional rhetoric that has surrounded them for the last 20 years."

But so far, government and business have only tinkered with the automobile and the oil-based economic system in which it operates.

"It's not the engineers who design cars, it's the people," said Paul MacCready, a pioneer in wind and solar technology whose Monrovia, Calif., company, AeroVironment Inc., developed an electric car for General Motors. "If there's a political will, these goals are very reachable. But oil is so cheap that trying to conserve it is absurd."

Whether or not the Persian Gulf war leads to meaningful political action to curb oil use by cars and trucks, environmental concerns seem sure to make a difference.

By requiring a "zero-pollution" car in 1998, California's clean-air standards effectively are forcing the first marketplace production of the electric car in modern times. And they have touched off a competitive free-for-all—and a lobbying war—among oil, natural gas, methanol and other producers, all scrambling for a share for their fuels.

The ripple effect from California's actions is broad. The German automakers Volkswagen, Mercedes-Benz and BMW are trying to figure out ways to meet the California emissions standards.

"We believe it will become the world standard," an Audi spokesman said.

The research includes methods for squeezing still more efficiency from the internal combustion engine, refining battery technology, developing solar add-ons for an electric car and experiments with hydrogen auto fuel.

But much of the immediate action is in fuels that can displace oil. Some of the alternatives are in themselves less efficient than gasoline and their chief energy advantage is that they are not oil. Their advantages and drawbacks reflect not just technology, but also politics and economics:

- Methanol, said to cut emissions by half, can be made from natural gas, coal or decaying organic matter. The auto industry is gearing up to produce "flex-fuel" cars to handle gasoline or methanol. However, methanol threatens the oil industry, is toxic and would require new refineries.
- Compressed natural gas, cleaner than methanol, can use the existing production and pipeline infrastructure. But it requires cumbersome fuel tanks.
- Ethanol, like methanol, an alcohol fuel, is produced with the help of some much-criticized U.S. subsidies won by the corn lobby. Service stations in the Midwest routinely sell an ethanol-gasoline blend. The Bush administration's National Energy Strategy talks optimistically of research breakthroughs that will slash ethanol's costs.

At the moment, methanol is expensive compared with gasoline, natural gas is cheap and ethanol's true price is buried somewhere under the subsidies.

A new factor that also will be taken into account is the increasingly detailed knowledge of regional air-quality problems and of engine emissions. Some talk about developing not just "Los Angeles cars," but "Denver cars" or "Phoenix cars" or "New York cars"—all calibrated and fueled to address local environments.