

FVEAA NEWSLETTER
September 1995

President	Vice President & Editor	Secretary	Treasurer & Librarian	Director	Director
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NEXT MEETING - September 15 at 7:30 PM

Will be in Room 1046 in the Student Resource Center at the College of DuPage,
southeast corner of 22nd Street & Lambert Road

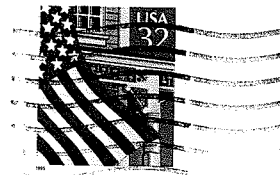
DISCUSSION TOPICS- 1) Changing the annual membership fee; 2) A report by the COOP design team; 3) Member John Emde will present a slide show on his Suburau conversion.

MEMBERSHIP INFORMATION

Any person interested in electric cars is welcome to join the FVEAA. The cost for a full year's dues is \$15 which will entitle the member to receive our monthly Newsletter which contains useful information about electric car components, construction, policies, and events. Dues for new members joining in September will be \$ 2.50

FOX VALLEY ELECTRIC AUTO ASSOCIATION

308 South East Avenue
Oak Park, Illinois 60302-3512



First Class

John Emde
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Downers Grove IL 60516 -2919

ADDRESS CORRECTION REQUESTED

MINUTES OF AUG. 18 MEETING

The meeting at the College of DuPage was called to order by President Woods at 7:40 PM. One guest and 19 members attended. There was no treasurer's report.

Dale Corel's 1990 Nissan Sentry was examined by FVEAA designated inspector Ray Oviyach and found in good condition for conversion. There are minor defects that can be readily corrected. Motion to purchase for \$ 550 was passed.

Member Mock played the video he made at the Cleveland Grand Prix, including interviews with participants. He particularly noted that all cars used battery systems producing up to 390 volts and they all had motor ratings of about 100 Hp. The cars are built by teams of students from participating Universities. All cars used the same platform and body. One group built their own controller, another the transaxle they used. Project financing was by corporate sponsors.

Member Barrett played a video of a Ford pickup conversion by Electric Vehicles of America. It is a very clean project with three, 36-volt battery packs each isolated from the others. Two packs were under the pickup body. In his narration, Bob Batson stressed the safety features of the conversion. Additional information on the project can be obtained by calling (508) 897- 9393.

The FVEAA has proposed an EV seminar at Argonne Labs that would cover three topics: 1. A slide presentation of a Mazda RX-7 conversion. 2 Operating experience and cost data for FVEAA cars. 3. A suggested marketing plan for electric cars that does not depend on mandates. The idea was approved.

The COOP project was discussed. Member Oviyach will get a shop manual for the Sentra. Member Meyer will weigh the car with his aircraft scales. Member Shafer will secure Advanced DC motor application information and cost estimates. An ad-hoc preliminary design committee consisting of members Meyer, Mock, & Munroe (3Ms) will present recommendation for components.

The meeting was adjourned at 10:41PM

Dave Aarvold
Secretary

VEEPSEZ

Ken Woods had a 911 call to his house just at the time he was scheduled to prepare his PRESEZ article for this issue. He is recovering from an incident of low blood sugar. He asked me to substitute.

The important subject of FVEAA annual dues will be discussed at the September meeting. It has been \$ 15 since the organization was founded in 1975. Newsletter preparation and mailing expenses require an increase.

There are two proposals. The recommended alternative proposes to raise annual dues to \$21, an increase of 50 cents/month. The pro-rated monthly fee for new members would go up from \$ 1.25 to \$ 1.75. The second proposal is to set the annual fee at \$ 18 making the monthly cost \$ 1.50.

Members will discuss and choose an alternative at the September meeting, in time for it to be effective in November.

Bill Shafer

RECENT EV ARTICLES

EV market limited - Reuters, 8/11/95. GM believes California will modify or eliminate its mandate for zero emissions. This was an observation made at an automotive seminar at the University of Michigan in Traverse City. "You can't mandate a sale" said GM VP Dennis Minano. A successful EV industry needs a blend of entrepreneurial methods and spirit

California Lawmakers are trying to decide the fate of the 1998 ZEV mandate - Reuters, 9/22/95 by Andrea Orr. The American Automobile Manufacturers Association, the Western State Petroleum Association, and the California Manufacturer's Association have all hired public relations firms to encourage opposition to the 1998 ZEV mandate. These campaigns allege that the mandate will increase costs of all cars to cover the expense of building electrics. Dan Pellissier of the California EPA said, "We don't want to force a rudimentary technology on the market". There is a confusing mass of conflicting data to sort through.

A Move Reminiscent Of The Old Soviet Union - Forbes, 8/28/95, page 28 (Comment by Malcom S. Forbes Jr.). The California mandate that orders manufacturers to offer electric cars is a tactic worthy of the central planning of the old USSR. Few people are going to buy electric cars that have higher sale price and limited performance compared with new petrol fueled vehicles. There are other practical ways to reduce automotive emissions, such as junking cars produced before 1970. Ten percent of the dirtiest cars produce 50% of pollution.

EV mandate upheld - Chicago Tribune 7/23/95. Automakers failed to persuade key Northeast regulatory coalition to end the ZEV mandate. The mandate is the same as the one adopted in CA.

Imported car bodies for EV conversion arrive in the US. AP 8/21/95. BAT is importing pickup and minivan bodies from China Motors in Taiwan for EV conversion and sale in CA.

Saturn designated as marketing organization for GM electric cars - Chicago Tribune 8/16/95. Besides this assignment, the Company will also be GM's flag bearer for their planned assault on the Japanese market. Will these tasks spoil the original success?

Mercedes gets closer on fuel-cell car - Chicago Tribune 8/16/95. Data gathered from the first experimental van will be used in a second research vehicle. A joint effort with Canada's Ballard Power System identified problems with the equipment size and cost. The fuel cell uses methanol to obtain hydrogen the system requires. The system may be later installed in the Mercedes A-Class van due out in 1997-8.

Argonne: Fuel reformer brings practical electric cars closer - Naperville Sun 8/16/95, page 32. The Argonne Lab has developed a fuel cell system for use in electric vehicles. The device uses methanol to produce hydrogen required by the fuel cell. The weight and volume of onboard storage of hydrogen are eliminated by the Argonne onboard reformer.

RECENT EV ARTICLES - Continued

The case for electric cars by (FVEAA Member) Steve Leisner. Date and publication unknown. The Carnegie-Mellon study that concluded EVs would produce more lead emissions than conventional cars did not consider all the pollution that results from oil drilling, transportation, refining, and distribution of gasoline. Electric cars have their applications. Editor's note - Steve regularly drives his converted VW Rabbit on urban, short-range trips.

Environmental Concerns Drive Advanced Battery Research - R&D Magazine, June 92 Page 56. There is more battery research in progress now than any other time in history. Work by the Advanced Battery Consortium, a joint endeavor by the Big 3 auto manufacturers, DOE, and EPRI (electric utilities); the Advanced Lead-Acid Battery Consortium; private companies, and National Laboratories are all working on battery development. A \$108-million, 10-year battery development program is underway in Japan. Battery development is crucial, but is only one part of electric car R&D. Development of other components such as motors, AC systems, and chassis design are also underway. Kenneth Baker, Manager of GM's EV Division observed, "Electric vehicle range is not limited by the technology of the power source - it's determined by the distance between refueling opportunities".

EV Watch - IEEE Spectrum September/95, pages 72-75. Three subjects are covered in this 3-part article; California considers hybrids, Hybrids go on sale in Sweden, and report of a road test of the GM Impact by Michael Riezenman, Senior Editor of Spectrum. Hybrids are being considered as a modification of the CA ZEV mandate. Eight categories of ZEV credit ranging from 1.0 to 0.44 are proposed for hybrids. The HEV category is determined by emissions. The Swedish Solon hybrid weighs 2540 pounds, has a 15kw (40 kw peak) ac induction motor, 12 Optima batteries, and either a 3-cylinder diesel or 2-cylinder gasoline engine. The Solon costs \$ 28,000. The road test concludes that a likely price tag for the Impact will be \$ 40-50,000.

Events

November 12-14. S/EV at the Rhode Island Convention Center. This is the seventh annual renewal of an event that features electric car development discussions, workshops, and exhibits. Individual registration is \$ 395. For information by mail: NESEA, 50 Miles Street, Greenfield MA 01301. Phone (417) 774-6051. FAX (413) 774-6053.

December 12-14. North American EV & Infrastructure Conference in Atlanta, GA. Organized by the E V Association of the Americas. Exhibits & discussions. For info call Pam Turner at (415) 855-2010 or write to SH0 Inc., 444 Castro St. # 1015, Mountain View CA 94041.

FROM OTHER EV NEWSLETTERS

AVEA (The Aussies) in their July Newsletter noted that the French Government is considering a measure that would subsidize EVs to stimulate sales in that country. French automakers Peugeot and Renault agreed that a \$ 5000/car subsidy would be adequate to cover the cost difference between an EV and conventional car. A two-page ad from Powertrol describes their controller for DC permanent magnet motors rated 24 volts, 70 amps. The publication now includes an item, "EVs on the Internet" which is a handy thing for the Aussies. They list articles from Internet's World Wide Web by searching using the key words "Electric Vehicles" and got over 200 hits. (Editors' note - could this be the successor to mailed monthly newsletters?) To subscribe to an EV discussion list you can get it with the following message - **LISTSERV@SJSUVMML.SJSU.EDU**. (Someone at San Jose State University is really interested in EV's) The issue also contains Part 3 of Paul Weller's description of his EV conversion.

EVOSC (The Southern CA Organization) in their August Newsletter included Jamison Handy's observations about electric cars early this century. He still drives his Detroit electric. They also note that the U.S. Postal Service is requesting bidders for conversion of the Grumman Postal Van vehicle on a Chevy S-10 chassis. These will be used for additional testing by the Service. They note that GM-Hughes probably has the inside track on this project. Ken Koch returned in this issue with his TechniCorner feature on the **Battery Blaster** reproduced in this FVEAA Newsletter. Welcome back Ken!

EEVC (The Eastern Group) reports on the fourth annual EV Expo at the Pocono racetrack on July 30. I suggest that FVEAA members check out our library copy and read about the event because there is too much information to be summarized here.

The Circuit (A Newsletter by the Notre Dame Irish Racing Team) found its way to the FVEAA. The team participated in three events, the APS Electric in Phoenix, the Richmond Grand Prix in Virginia, and the Cleveland Grand Prix. They acknowledge the season got off to a rocky start. Their car uses a 138hp Delco AC propulsion system and production type lead-acid batteries. The student's effort has 18 corporate sponsors. More information about the program can be obtained by writing the Irish Racing Team, 275 Fitzpatrick Hall, Notre Dame, IN 46556 Phone (219) 631-6102, FAX (219) 631-4393. They will particular welcome additional sponsors.

SEVA (Sacramento Club) in their August Newsletter had an interesting article about solar-powered electric lawnmowers. They also have a club car, a 1960 Renault (Editor's note - I think it was originally dubbed the "Henny Kilowatt" by its builder). Their display of electric cars at the Davis (CA) Whole Earth Festival was well received. They report that on July 16 the South Coast Air Quality Management District approved a \$7-million EV rebate program for an estimated 1200 electric cars. Newsletter Committee Chairman, Tony Cygan, concluded his account of converting a Porsche 914 to electric power. He decided to use the new 8-volt batteries rather than the 12 volt gel cells that would not give adequate range.

FROM OTHER EV NEWSLETTERS - Continued

World Electric Transportation (Clarence Eller's Newsletter from Yachats, OR) August issue cover feature was Chrysler's Patriot, a turbine powered race car with a flywheel to store energy. He reports the Horizon battery energy storage is 18.9 wathours per pound. One page features the VOLVO Environmental Concept Car (ECC). He believes the Swedes are the worlds best engineers and mechanics. The ECC tends to support that view. It is a realistic family car with full-time electric drive from batteries or a turbo-generator.

COOP CONVERSION PROJECT REPORT

The ad-hoc design task force went to Dale Corel's place where the Nissan is stored. They put the car on Ed Meyer's aircraft scales and found the curb weight to be 2185 lbs with 61% on the front wheels and 39% on the rear. The car has a 95.6" wheelbase and a center of gravity 36.5" from the front axle. We received a \$1614 (FOB Syracuse NY) cost estimate from Rod Antrim, the Advanced DC Motor Distributor in Palatine, for a 9", FB-1 DC series-wound motor. An 8" motor costs about \$ 200 less. President Woods is working to find a conversion site. Call him if you have anything to offer.

THE USED EV MARKETPLACE

There seems to be an unusual supply of used electric cars available this month. Perhaps it's the end of the summer driving season. There is an insufficient supply to really set a market so a sale ends up with the buyer and seller agreeing on a used EV value.

1. Ed Ahern got one inquiry about his 1974 Fiat last month. He is reducing the asking price for the car from \$ 1900 to \$1400 and will still negotiate. As noted in the August FVEAA Newsletter sale notice, this might be a good candidate for upgrading, if a parts supply for the chassis can be found. Ed lives in Wheaton. If you are interested, call him at (708) 260-3712 between 4-8PM. Secretary Dave Aarvold has a similar Fiat.

2. President Woods got a call from Jack Brodiske who lives in New Lenox and wants to sell for \$ 500 his 1975 Citicar that has 491 miles of use. He hasn't driven it for three years and the 48-volt system will require new batteries. You can call him at (815) 485-8940. Jack's address is 315 Carol Road in New Lenox, IL 60451.

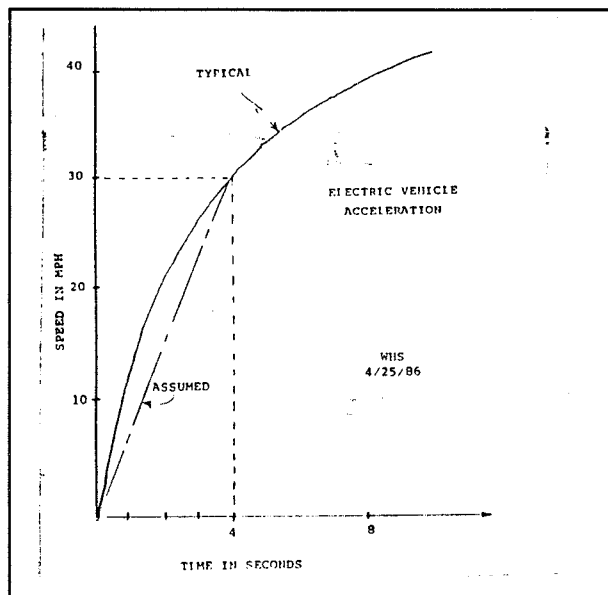
CALCULATIONS FOR COOP CONVERSION OF THE FVEAA SENTRA

Now that we have a 1990 Nissan Sentra for our COOP project I thought it would be useful to present preliminary calculations that can define the major components. The ad-hoc design task force will be doing something similar. This article is based on the April, 1986 series "Putting Performance In Your Electric Car" that was published in FVEAA Newsletters that year. Another source for information on this subject may be found in Chapter 6 of Bob Brandt's book, "Build Your Own Electric Vehicle".

Most early conversions used aircraft starter-generators, had 48-volt systems that developed about 14 kw. This combination generally produced unsatisfactory acceleration and left the owners looking for something better. Any car salesman knows that the vehicle performance in the first few seconds of driving is crucial to a sale. Torque sells cars and is important in EV design.

There is a weight limit for lead acid batteries. A typical conversion uses 16 deep discharge batteries each weighing 70 pounds (including battery racks and cables) for a total of 1120 pounds. The electric motor will add 145 pounds and other miscellaneous items another 135 for a total added of about 1400 pounds. The car's weight has been measured at 2200 pounds. the converted curb weight will be 3200 pounds, subtracting 400 lbs of removal and 1400 lbs of additions. Batteries usually make up one-third of the converted curb weight.

Conversion are designed for urban driving, not tooling along the Interstate at 70 mph for an extended time. Acceleration is important in urban traffic. There are two ranges that need to be considered; the time to go 0-30 for urban driving and 30-60 for traffic merging.. In this exercise, we want the EV to have 0-30 time of 3 seconds. 0-30 requires an **average acceleration** of 10 mph each second. In that time the car will travel 66 feet Refer to the velocity figure and note the average acceleration is given by the equation: $\text{Distance} = (0.5) * (\text{time}) * (\text{final speed})$. If you want to get a more elegant solution, use calculus to determine the area under the curve.



The next item to consider is the torque required to meet the acceleration parameters chosen. This requires converting the weight into its mass, a simple calculation that divides the curb weight by 32 (the acceleration of gravity). The converted Sentra will have a mass of 100 We now can use Newton's famous equation: $\text{Force} = (\text{Mass}) * (\text{Average Acceleration})$. $F = (110) * (10) = 1000$ pounds. A half-ton of force must be applied to the wheels by the drive system to achieve 0-30 in 3 seconds and 0-60 in 6 seconds. Merging into traffic above 30 mph will require some shifting.

CALCULATIONS FOR CONVERSION OF THE FVEAA SENTRA - Continued

Now carry the process one step further and calculate the kw power level required for the acceleration. A 1000 lb force will be applied over a distance of 66 feet for 3 seconds . Combining the factors to determine the power level we apply the following calculation:

$$\text{Power (P) for 0-30} = (1000) * (66) / 3 = 22,000 \text{ ft-lbs/second}$$

One horsepower equals 550 ft-lbs per second. The power is $22,000/550 = 40$ horsepower

And one horsepower equals 746 watts so the power equals $(40)*(0.746) = 30$ kw.

The armature current with a 96-volt system will be $(33000)/96 = 310$ amps.

With these parameters, we can select the drivetrain major components; the battery system, motor and controller. Sixteen GC-2 (Golf Cart) batteries are proposed. If we choose Trojan T-105 batteries that will deliver a constant 75 amps for 105 minutes, the system will store 16 kwh of energy. The FVEAA experience shows that our cars use an average AC input of 0.5 - 0.7 kwh/mile of travel in urban driving. The converted Sentra has an expected range of about 30 miles. An Advanced DC 9-inch FB1-4001 motor that weighs 143 pounds can develop 52 kw peak should be able to achieve the desired 0-30 acceleration in second or third gear. A Curtis 1221C controller that is designed to limit peak current to 500 amps is suggested. All these components are commercially available at a reasonable cost.

These calculations do not include other factors that should be considered during the design phase of a project. These include hill climbing, rolling resistance aerodynamic drag, drive train efficiency and other minor factors. The measured AC input mentioned in the preceding paragraph includes all of these. If you own a racehorse you could be concerned with the animal's knee joint resistance, efficiency of food conversion, and a lot of other factors - or you could just measure how much oats you feed him. That is what we have done.

Anyone wanting to undertake a conversion project should first buy and read a conversion manual. The one mentioned here is Bob Brandt's book that is published by McGraw Hill (Tab Books) and available from bookstores for a modest price. For the more technically-inclined or specific illustrations of the conversion process get a copy of Clarence Eller's manual or Mike Brown's manual or videotape. On pages 130 and 263 of Brandt's book are flow charts that can give an individual confidence that you don't have to be a rocket scientist to do a conversion. It is a rewarding endeavor for the converter. That is the principal reason that Bob Munroe, our COOP Project Manager, proposed our project. **GO FOR IT !**

Bill Shafer
8/28/1995