F.V.E.A.A. NEWSLETTER

MARCH 1986

MEETING NOTICE

THE NEXT MEETING WILL BE FRIDAY MARCH 21st, at MID AMERICA FEDERAL SAVINGS 250 E. ROOSEVELT RD. WHEATON, ILLINOIS. - TIME - 7:30 P.M.

HAMFESTS 1986 LIST

INCLUDED THIS MONTH IS A PARTIAL LIST OF HAMFESTS AND ELECTRONIC FLEA MARKETS IN OUR AREA. IN THE PAST AND PROBABLY IN THE FUTURE, THE CLUB HAS SOLD MANY DONATED ITEMS AT THESE EVENTS TO RAISE CLUB MONEY. WE NEED VOLUNTEERS TO CONTINUE THIS EFFORT.

NEWSLETTER ITEMS & DEADLINE

ANY CLUB MEMBER WISHING TO SUBMIT ARTICLES, DRAWINGS, WANT ADS, EDITORIAL COMMENTS, SPECIAL NOTICES, ETC. SHOULD MAKE SURE IT REACHES ME NO LATER THAN 2 WEEKS PRIOR TO THE NEXT MEETING (about Apr. 7th) IN ORDER THAT IT BE PUBLISHED IN THE APRIL NEWSLETTER. SEND TO: John Emde FVEAA Editor, 6542 Fairmount Ave. , Downers Grove, Ill. 60516

FOX VALLEY ELECTRIC AUTO ASSOCIATION
624 PERSHING ST. WHEATON, ILL. 60187

FIRST CLASS

ADDRESS CORRECTION REQUESTED

HAMFESTS 1986

This is a list of Hamfests that I received flyers for. If you know of any others in the area, let me know so that everyone will know. (editor)

March 23 LAMARFEST 1986 Lake County Fairgrounds
Grayslake, Ill. 312 255-0642 8:00 AM $3.00

May 3 SWAPFEST Circle B Rec. Center Hwys. 60 & County I
Cedarburg, Wisc. 414 284-3271 8:00 AM $3.00

May 4 DEKALB HAMFEST Sandwich Fairgrounds Suydam Rd. North of Rt. 34 Sandwich, Ill. 8:00 AM $3.00

May 4 HAMFEST Kankakee County Fairgrounds Rt. 45 South
Kankakee, Ill. 815 933-1942 8:00 AM $3.00

May 18 HAMFEST Palace Hall Central & Cermak
Cicero, Ill. 7:00 AM $3.00

June 8 29 ANNUAL HAMFEST SantaFe Park 91st & Wolf Rd.
Hinsdale, Ill. 6:00 AM $3.00

July 12—13 INDIANAPOLIS HAMFEST Marion County Fairgrounds
I-465 & 174 Indianapolis, Ind. 6:00 AM $5.00

July 13 HAM & COMPUTERFEST American Legion Ogden & Saratoga
Downers Grove, Ill. 312 964-5529 8:00 AM $3.00

July 27 BELVIDERE HAMFEST Boone County Fairgrounds
Belvidere, Ill. 8:00 AM $3.00

Sept. 14 B.A.R.S. HAMFEST SantaFe Park 91st & Wolf Rd.
Hinsdale, Ill. 312 985-0527 8:00 AM $3.00

Sept. 20—21 SUPERFEST 86 Expo Gardens W. Northmoor Rd.
Peoria, Ill. P.O.Box 3461 Zip 61614 $4.00

Sept. 27—28 RADIO EXPO Lake County Fairgrounds Rt 45 & 120
Grayslake, Ill. 6:00 AM $4.00

Oct. 12 SWAPFEST Waukesha County Expo Ctr. Hwys. FT & J
Waukesha, Wisc. 8:00 AM $3.00

Oct. 18--19 CONVENTION/HAMFEST Norris Sports Center
St. Charles, Ill. 8:00 AM $4.00

Times are when gates open to the public. Prices are 'at gate' prices and may or may not include both days on two day events. Some advance ticket sales may be discounted.

COMPUTER PROGRAM FOR CALCULATING ELECTRIC CAR PERFORMANCE

by Bill Palmer

Do you wish you could predict the performance of your electric car before you build it or before you actually make changes you may be planning? I did. I wanted to change the differential ratio and the number of batteries in my Vega. I hoped to increase motor speed in each gear to increase torque multiplication through the gears and decrease motor current. So, I put the car data and performance formulas into a spreadsheet program on my computer. The printout on the next page shows the Vega performance after the changes. The values before the change show slower motor speeds, less acceleration and more current. The shaded areas require motor speeds higher than the maximum, so the car will not operate on its own power at those speeds in those gears. Negative accelerations on grades mean the car speed will decrease under those conditions.

The input data are listed in the upper left corner. The values on the rest of the sheet are calculated by using the input data in the formulas shown for each set of calculations. So, calculating the effects on performance of any changes in a car that change the basic data can be done extremely easily and quickly - once you know all the necessary data. All you need to do is change one or more input data values and the program automatically recalculates all of the resultant values.

Most of the data values are easily determined such as weight, frontal area, wheel diameter, gear ratios and maximum battery voltage. The rest of the data values may require some research or work or both. Maximum motor armature current probably is limited by the speed controller. The rolling resistance factor (KRR) can be measured by towing the car at low speed in both directions (to cancel out wind and grade effects) on as smooth and level a road as you can find. With a spring scale in the tow line, measure the force necessary to keep the car moving at a constant speed. Then divide the average force by the car's weight.

The aerodynamic drag factor (KAD) can be determined by towing the car in a similar manner but at various speeds. Subtract the rolling resistance force from the total force measured at each speed and divide the remainder by the frontal area times the speed squared to get the aerodynamic drag factor.

Motor torque per ampere (TA) and speed per volt (SV) can be determined from the speed/torque / voltage/current curves for your motor, such as the one shown below. They are available from the motor manufacturer. Pick a few torque and speed values and divide each respectively by its corresponding current and voltage value. Use the averages for the values of TA and SV. Note that the values vary slightly with speed and load.

If you can't get curves for your motor you can make the measurements yourself. To measure torque clamp the motor to a bench, so it cannot move, and clamp an arm a little more than a foot long radially to the shaft. Couple a spring scale, rated at least 50 lbs, at a right angle to the arm exactly 12 inches from the shaft center and anchor the other end of the scale. Measure torque at several values of armature current up to the maximum your car's electrical system can supply. Divide each torque reading by the corresponding current value and average the results to get a pound-foot per ampere rating for your motor. For shunt motors, be sure all measurements are made with rated current flowing in the field.

You can measure motor speed vs. voltage (SV) by applying various voltages up to full battery voltage and measuring speed at each voltage. Again, shunt-field current should be at rated. Be sure a series motor is loaded. If you don't have a tachometer, drive the car at various speeds and carefully record the voltage and gear at each speed. Calculate motor shaft speed from speedometer readings using wheel size and gear ratios. Divide each speed by the voltage that produced it and average the results for a representative RPM per volt (SV) rating for your motor.

If any of you are interested in the same kind of calculations for your car, I will run them for the first ten people who send me the data on their cars. If any of you have computers with "Supercalc" and want to run the program yourself, I will send a program listing to the first ten who request it. Please send a long, stamped, self addressed envelope. If you would like the program on a diskette, tell me what computer and operating system you have and I will format a disk for your system (if it's one of the 25 or so that "MediaMaster" covers), copy the program to it and send it to you for $10.00. My address is 44 Dior Terrace, Los Altos, CA 94022.

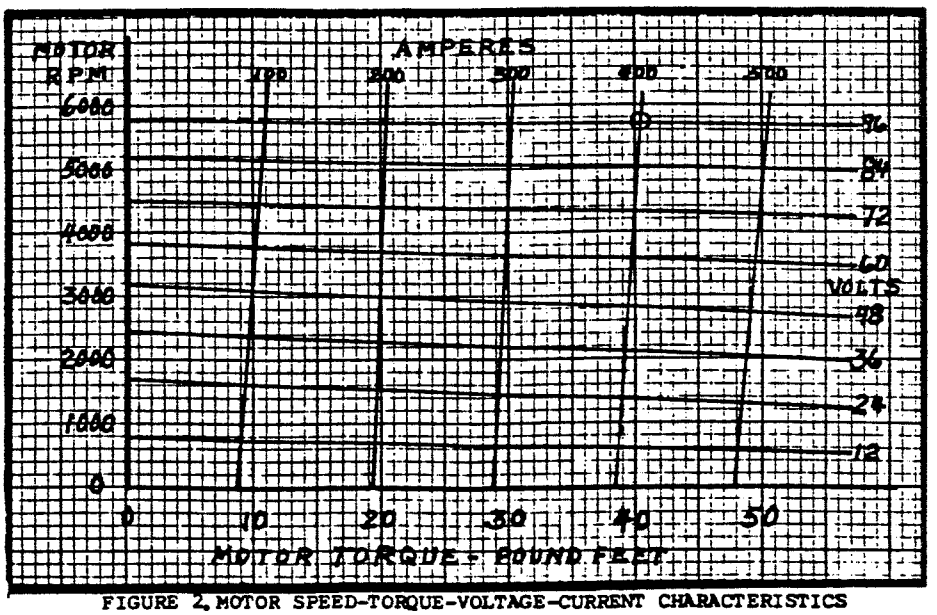


FIGURE 2. MOTOR SPEED-TORQUE-VOLTAGE-CURRENT CHARACTERISTICS

ELECTRIC VEHICLE PERFORMANCE

----------DATA----------	
Vehicle owner:	PALMER
Vehicle make:	VEGA-2
Weight,pounds(WT):	3280
Frontal area,sq.ft.(FA):	20
Wheel diam.,ft.(WD):	1.854
Differential ratio (DR):	4.1111
Gear ratios (GR1):	3.4167
(GR2):	2.0167
(GR3):	1.3333
(GR4):	1
(GR5):	0
Rolling Res. Fctr.(KRR):	.015
Aero.Drag Fctr.(KAD):	.0015
Max.Motor Current (IM):	400
Max. Voltage (VM):	96
Motor lb.ft./amp.(TA):	.1
Motor rpm/volt (SV):	60

RETARDING FORCES:

ROLLING RESISTANCE: RR=WT X KRR= 49.20 pounds

AERODYNAMIC DRAG at several speeds:

AD = FA x SPD^2 x KAD pounds

MPH:	20.00	30.00	40.00	50.00	60.00
AD pounds	12.00	27.00	48.00	75.00	108.00

PERFORMANCE:

WHEEL RPM per MPH: WS=5280/WD*3.1416/60= 15.11

MAXIMUM MOTOR RPM (powered): MS = VM X SV = 5760.00

MOTOR RPM vs CAR SPEED in each gear:

MS = DR x GR x WS x MPH = MOTOR RPM

MPH:		20.00	30.00	40.00	50.00	60.00
GEAR:	1	4244.41	6366.61	8488.81	10611.02	12733.22
	2	2505.25	3757.88	5010.50	6263.13	7515.76
	3	1656.30	2484.44	3312.59	4140.74	4968.89
	4	1242.25	1863.38	2484.51	3105.63	3726.76
	5	.00	.00	.00	.00	.00

MAXIMUM CAR SPEED IN EACH GEAR:

SM = VM x SV / DR / GR / WS MPH

GEAR:	1	2	3	4	5
MPH:	27.14	45.98	69.55	92.73	.00

ACCELERATING CAPABILITY, on level road, in each gear and speed at maximum current:

A = IM x TA x DR x GR x WD/2 - RR - AD / WT x 32.2 MPH per SEC.

MPH:		20.00	30.00	40.00	50.00	60.00
GEAR:	1	4.51	4.37	4.16	3.89	3.57
	2	2.42	2.27	2.06	1.80	1.47
	3	1.39	1.25	1.04	.78	.45
	4	.90	.75	.54	.28	-.05
	5	.00	.00	.00	.00	.00

HILL CLIMBING ABILITY: acceleration in each gear and speed for several grades: AG = A - % GRADE x 32.2 MPH PER SEC.

GRADE= 5%

MPH:		20.00	30.00	40.00	50.00	60.00
GEAR:	1	2.90	2.76	2.55	2.28	1.96
	2	.81	.66	.45	.19	-.14
	3	-.22	-.36	-.57	-.83	-1.16
	4	-.71	-.86	-1.07	-1.33	-1.66
	5	.00	.00	.00	.00	.00

GRADE= 10%

GEAR:	1	1.29	1.15	.94	.67	.35
	2	-.80	-.95	-1.16	-1.42	-1.75
	3	-1.83	-1.97	-2.18	-2.44	-2.77
	4	-2.32	-2.47	-2.68	-2.94	-3.27
	5	.00	.00	.00	.00	.00

CRUISING CURRENT (level): I=(RR+AD)/TA X DR X GR X WD/2 AMPERES

MPH:		20.00	30.00	40.00	50.00	60.00
GEAR:	1	47.00	58.52	74.65	95.38	120.73
	2	79.63	99.15	126.47	161.60	204.54
	3	120.44	149.96	191.29	244.43	309.38
	4	160.59	199.95	255.05	325.90	412.49
	5	.00	.00	.00	.00	.00

CAR BODY SHOPS

Finding One that Will Do The JOB RIGHT at the RIGHT PRICE

Your chances of being involved in a car accident this year are one in four. Even if you beat those odds, sooner or later your car may need body work to eliminate rust damage and help assure a longer life. Here's how to find the best body shop around for quality work at a fair price.

1. Get recommendations

Talk to friends and relatives and any mechanic you trust. Also contact state, local, or national automotive trade associations. Members of such associations as Automotive Service Councils, Inc., and the Independent Automotive Service Association are expected to maintain high standards. Then check customer complaint records with the Better Business Bureau.

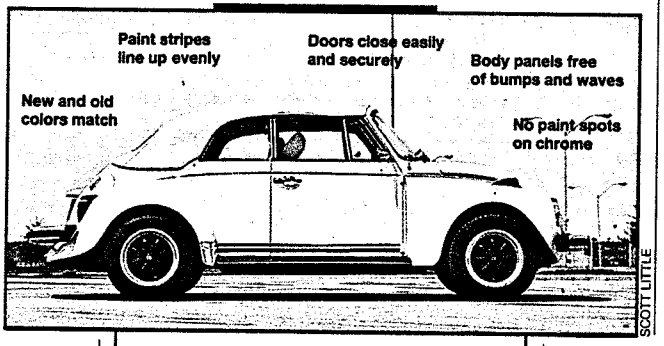
2. Watch the shop in action

- Is the lot fenced in to prevent theft? Do signs indicate membership in a reputable association and employment of certified mechanics? Look at the type and extent of damage on cars waiting for work—a clue to the kind of work the shop can handle.
- Is the shop relatively clean and organized? Are precautions taken such as having the painting booth well removed from the sanding area to prevent paint contamination?
- Ask the manager about what equipment is used. If your car needs major collision work, the shop should either do or sublet frame straightening, front-end alignment, and glass installation. Such full-service capacity saves time and money and allows the shop to control every phase of repairs.

3. What techniques assure that you'll get quality work?

A good shop won't use body putty for major dents; they'll either pound out the dent or replace the part. As a rule for dings, hammer and dolly marks, and other minor damage, body fillers should not exceed ½ inch.

The shop should use sandblasting, not just grinding, to eliminate rust effectively. The best treatment for bare metal uses metal conditioners to prevent moisture and air from causing premature rust. Areas to be painted should be sanded first and covered with a primer or sealer so that the paint will adhere properly.



HOW TO CHECK OUT A FINISHED JOB

The best indication of quality work is the finished product. If you don't have the opportunity to look over repairs on other cars before you leave your car for the job, at least know what to check on your car before paying the bill. Some clues:

- The chrome should show no signs of paint. If it does, the car wasn't properly masked.
- New and old colors should match when an automobile has had a partial repainting job.
- Surfaces should feel smooth and hide sanding or grinding marks.
- Doors that have been repaired should close easily and securely.
- Paint stripes and moldings should line up evenly. Also check gaps between doors and panels to see that they're relatively equal.
- Body panels should be free of bumps and waves in the metal.

4. Get a detailed estimate

There's a lot of guesswork involved in trying to restore damaged areas to the original contours of your car. To be on the safe side, and to help in comparison shopping, ask for a written estimate itemizing parts and labor costs and clearly identifying used parts. Make sure the shop will notify you before continuing work if costs look as though they'll exceed the estimate.

Written warranties aren't common for body work, but there's no harm in asking. A 90-day written warranty on paint is a reasonable request. For replacement parts like shocks and ball joints, ask for an itemized listing of manufacturers' warranties, too.

5. Talk with the manager

The shop's job is to put your car back into preaccident condition. If you expect more, you'll either have to pay more or go to an automobile restorer.

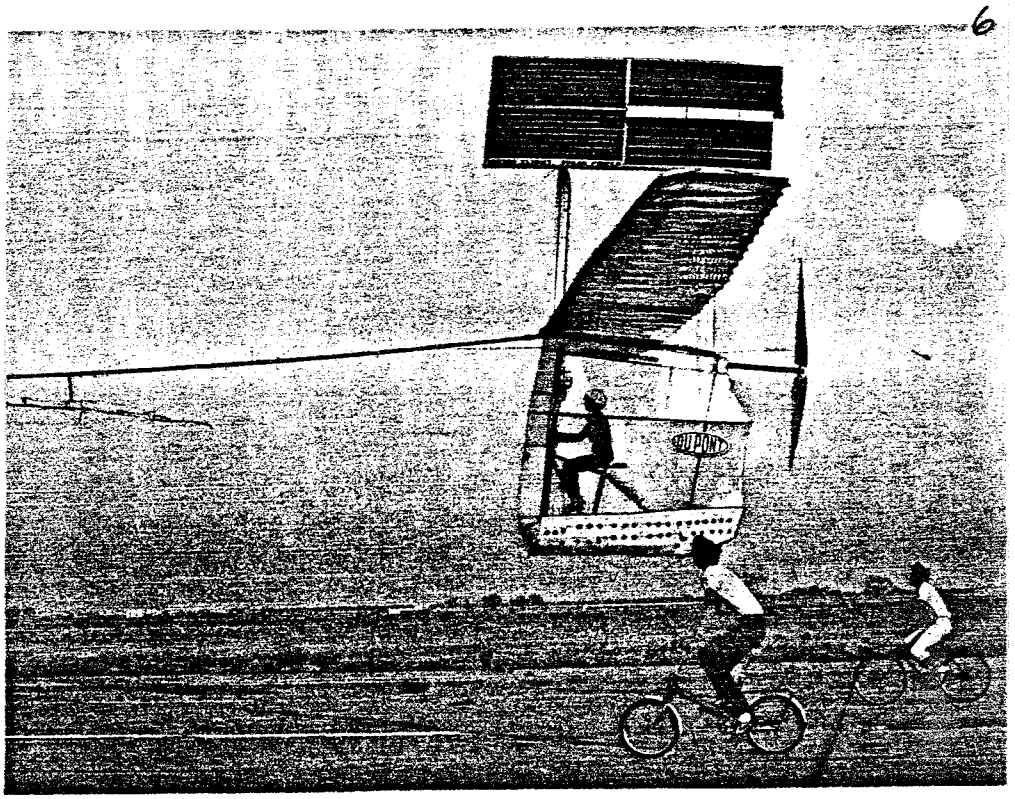
When you're not happy with the repair job, talk to the shop manager. A good body shop will do everything within reason to make you a satisfied customer. If they don't cooperate, follow through with the Better Business Bureau or other consumer agencies.

—By Walter Watt

Editor: Margaret Daly

F.Y.E.A.A.

ELECTRICITY FROM THE SUN



ONE SENSES THAT maybe, just maybe, a solar revolution is brewing. The photovoltaic, or solar electric, cell could turn out to be the joker in the global energy deck, the breakthrough that could help disperse the gloom from our energy horizon. One must be cautious. It is easy to be overenthusiastic about these safe, nonpolluting energy producers. But in solar circles optimism runs high that we will be creating electricity from the sun sooner rather than later.

Solar cells work. They were developed to help power the United States' space program and have performed impressively. Last year in California they powered the maiden flight of the "Gossamer Penguin" (**facing page**), the world's first piloted solar airplane. But they have been exorbitantly expensive, and while costs have dropped sharply, the price of producing electricity with photovoltaics is still more than ten times as high as average utility rates. Many industrial and utility officials doubt it can be made cheaply enough to have much impact in this decade.

On the other hand, high-priced oil is changing the economics of energy production dramatically. In the United States, Europe, and Japan solar firms are pressing hard on photovoltaics, using technology similar to the kind that made the mini-computer available to everyman. The Department of Energy's photovoltaic program director, Paul D. Maycock, believes the cost of photovoltaic electricity could drop enough to make solar cells competitive with conventional sources of electrical power by the mid-1980s.

Federal regulations require public utilities to buy electricity from qualified independent producers at a price roughly equal to the cost the utilities would have incurred in producing it.

By 1985, predicts Solar Lobby chairman Bruce Anderson, homeowners will begin putting panels of solar cells on south-facing roofs and walls. "The solar energy striking a home," says Anderson, "can generate more electricity than the owners need, even for charging an electric car. The rest can be sold for a profit to the utility."

Phoenix builder John F. Long has produced such a house. A major Japanese electric firm has built three model solar homes. The company says the homes are far more efficient than conventional houses and use less than a third as much power. More testing is needed, but such homes may be available in Japan within a decade.

Major American photovoltaic firms have been bought by oil companies, a further indication that photovoltaics could indeed become an important energy source.

Affordable photovoltaics could significantly alter the current energy distribution network, particularly as cheaper batteries become available that can store the excess electricity generated on sunny days. These batteries, charged by solar cells or by wind, could make each home its own electrical generator and filling station.

How does a solar cell work? When photons, which are energized particles of light, strike certain specially prepared layers of semiconductor materials, their energy knocks electrons loose. The electrons then begin to flow into connecting wires, becoming a current of electricity.

Today's thin, brittle photovoltaic cells are made from silicon, the second most abundant element on earth after oxygen. Individual cells are mounted on a panel, wired together and covered with a protective layer, usually glass. Since a typical three-inch cell yields at most about half a watt, it would take at least 6,000 cells to supply the average American home with electrical needs exclusive of heating and cooling.

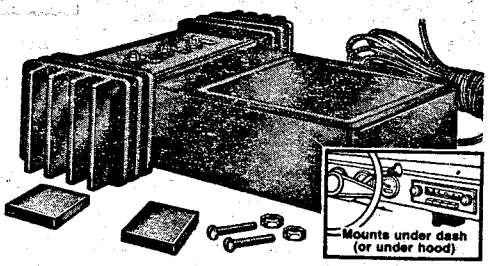
Currently most solar cells are made from crystals of high-purity silicon, grown through a time-consuming process. Diamond-edged saws then slice the crystals into wafers, wasting at least half the material. The expected price breakthrough will come when the crystals no longer have to be grown and cut so laboriously. Techniques are already being perfected that cast polycrystalline silicon from molds, draw silicon into thin ribbons, and grow thin films from a variety of materials. These ribbons, films, and cast materials require less time and promise to be more economical.

EXTEND THE LIFE OF YOUR CAR UP TO 75%

ELECTRONIC RUST CONTROL

The same technology that today protects ocean-going vessels, underground pipelines and offshore oil rigs against corrosion/rust is now available for your car, RV or pickup!

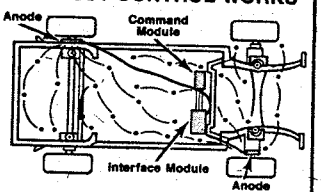
- ★ **Revolutionary electronic system uses your car's battery to fight corrosion 24 hours a day... super low current draw**
- ★ **Retards the formation of corrosion and rust on NEW and OLD cars**
- ★ **Protects the ENTIRE body, outside and inside—helps stop rust-in and rust-out**
- ★ **More effective than spray-on rustproofing systems**
- ★ **The ONLY corrosion inhibitor that can be transferred from one vehicle to another**
- ★ **Easy to install—no spray guns... no mess... no need to crawl under your car... no periodic touch-ups**
- ★ **More than pays for itself—saves on costly repairs... helps reduce expensive paint jobs... assures higher resale value at trade-in time**
- ★ **Dramatically improves corrosion protection on vehicles treated with spray rustproofers**



THE NEED FOR CORROSION AND RUST PROTECTION HAS NEVER BEEN GREATER! Corrosion-causing agents are everywhere! In road salts, industrial pollutants and acid rain. In mud, sea spray and even in the ordinary tap water you use to wash and preserve your car's finish. Pollutants have increased while, over the years, the thickness of sheet metal used in the manufacture of car bodies has steadily decreased. Consequently, your car has become increasingly vulnerable. That's why today, more than ever before, it needs the best possible rust protection!

WE BELIEVE THIS AMAZING ELECTRONIC SYSTEM IS THE BEST RUST INSURANCE YOU CAN BUY! The principle of "cathodic" rust protection is not new. It's been used for years to protect underground pipelines, ocean-going vessels, reinforcement bars on bridges, water towers, all types of high-cost equipment in the shipping, petroleum and construction industries. **It's even been used to extend the service life of vehicles and equipment used in the salt-mining industry!** At last, after years of development, the same kind of remarkably effective and ongoing protection can be yours!

HOW ELECTRONIC RUST CONTROL WORKS



Salt and other pollutants can combine with water/humidity to create a kind of dilute "battery acid". When this "acid" comes in contact with the metals in your car, an electrical imbalance occurs, and your car becomes a "miniature dry cell". This imbalance forces electrons to migrate from the "anode" portions of your car's metal parts to the "cathode" portions. Positive ions (electrically charged atoms) of metal are left behind. These positive ions of metal unite with negative oxygen ions to produce corrosion and rust. The process will continue until there are no more positive ions (metal parts) left. By that time, your once-beautiful car will have been transformed into an ugly hulk (similar to a dead, corroded flashlight battery). Electronic Rust Control restores the electrical balance. **With this amazing new system, your car's battery—not your car's metal parts—supplies the electrons needed to prevent the separation of metals into positively charged ions and negatively charged ions.** The metal's electrical charge remains neutral. There are no free metal ions to oxidize. And... your car remains virtually rust and corrosion free!

A SMALL PRICE TO PAY FOR THE COMPLETE PROTECTION YOU GET! This Electronic Rust Control protects your car (concealed underbody and frame panels as well as painted outer surfaces) against corrosion. It protects against the obvious forms of corrosion that can turn small stone chips into ugly, cavernous holes, make edges around mouldings, trim and bright parts look old before their time and cause painted finishes on restored vehicles to blister and bubble. It also fights hidden corrosion—the kind that forms in underbody fender wells where mud, road salt and moisture collect, in metal parts subjected to stress, movement or vibration, in highly vulnerable welds and joints, in panels that are bent, nicked or scratched by pebbles, rocks, slight bumps, etc. It even combats the rust that can result from the structural composition of steel itself. The benefits of this Electronic Rust Control are endless! New vehicles stay new looking longer. Years of life will be added to older models. Restored vehicles maintain their restored look longer. **Electronic Rust Control could extend the life of your car's body by up to 75%! That means the average body life of 8 years could be lengthened to an incredible 14 years!** There are other advantages to this system. The cost of owning your vehicle will be kept down. (It's estimated that by 1988 a professional repaint job will exceed $1500 even on smaller cars.) Plus, your vehicle, old or new, will bring in more money at resale or trade-in time. **You can't afford not having an Electronic Rust Control installed in your vehicle today!**

BETTER THAN SPRAY RUSTPROOFING! This revolutionary electronic breakthrough is far superior to even the most sophisticated spray rustproofers. Designed with state-of-the-art integrated circuits and silicon chips, it monitors and responds to the most subtle changes in humidity plus all the other factors that can lead to the formation of corrosion and rust. No spray-on coating can do this! (How this amazing Electronic Rust Control works is described at left.) Spray-on rustproofers also can be difficult to apply, leaving many inaccessible areas untreated. The Electronic Rust Control installs easily (see below) and leaves no spot in your vehicle unprotected! Corrosion, after a time, can begin to form **under** spray-on protective coatings to cause devastating damage. This is an impossibility with Electronic Rust Control. Rustproofings need periodic touch-ups to maintain their effectiveness. Using your vehicle's battery, Electronic Rust Control provides total protection year after year. Finally, and best of all, this Electronic Rust System can be easily transferred from one vehicle to another. It's the only PORTABLE rust inhibitor you can buy! **(Note: The Electronic Rust Control is compatible with all spray-on coatings and can be used as the foolproof back-up for any other rustproofing method.)**

EASY TO INSTALL. Compact command and interface modules mount easily under dash. Install anodes in front and rear of vehicle and wire to command module. Hook up one wire from module to 12-volt power source (fuse box terminal or other power source); ground the last wire. Command module features Operate/Off/Check switch plus LEDs to indicate system/power status. Some drilling required to install. Low current draw: driving your car 100 miles or more per week will allow battery to recharge.

Electronic Rust Control System for cars. Includes command and interface modules, 2 anodes, mounting hardware, electrical connectors, mounting fluid and instructions.

12—6201U— 1-Kit **$149.95**

Heavy-duty Electronic Rust Control System for pickups, RVs or any vehicle subjected to extremely severe corrosion-causing conditions. Same components as kit above, except includes 4 anodes for greater current dispersion.

12—6240B— 1-Kit **$179.95**

J. C. Whitney & Co. • P.O. Box 8410 • Chicago, IL 60680

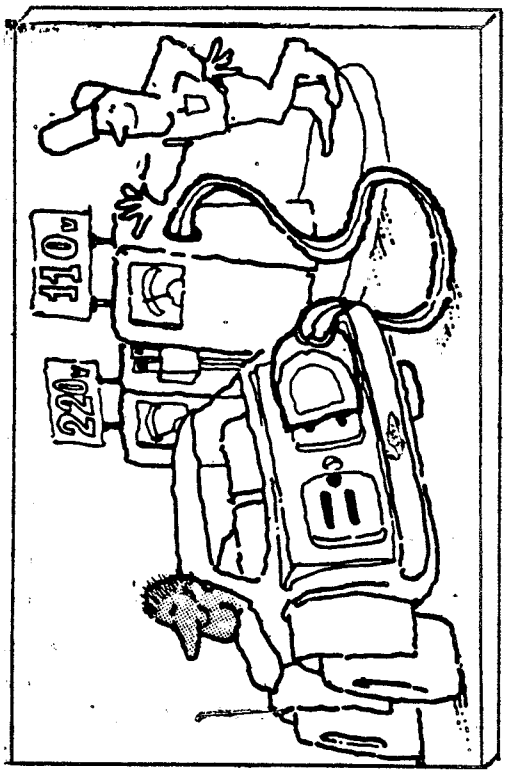
Chicago Tribune, Sunday, February 23, 1986

Discoveries

New battery could lead to electric cars

Development of a new kind of glass at Argonne National Laboratory southwest of Chicago may lead to batteries that could store energy much more efficiently than existing technology. Such batteries should encourage production of automobiles that run on electricity. The key lies in a new glass electrolyte that conducts a current of sodium ions 10 times better than any other advanced glass electrolyte previously used.

Jon Van



WANTED

SMALL LIGHT-WEIGHT BOAT TRAILER FOR A 12' TO 14' ROWBOAT. ALSO ELECTRIC TROLLING MOTOR. MUST BE REASONABLE. JOHN EMDE 968-2692

ELECTRIC VEHICLE USER TASK FORCE
PRODUCT IMPROVEMENT TEST AND EVALUATION PROGRAM

@ The following product reviews are from the Feb. 85 Summary Report to the U.S. D.O.E. from THE AEROSPACE CORPORATION as part of the ELECTRIC VEHICLE USER TASK FORCE, PRODUCT IMPROVEMENT TEST AND EVALUATION PROGRAM.

Subject: The Grumman-Olson Kubvan made by Grumman Olson Division, Grumman Allied Industries, Inc., 445 Broadhollow Rd., Melville, New York 11747 (516) 454-8228

The vehicle, called the Kubvan, is a front-wheel drive, all-aluminum body, 3200 lb GVWT truck rated for 400 lb payload. It features a removable battery tray for 14 ALCO 2200's, a PMC 96-v controller, and a Prestolite MTC 4001 motor with a Volkswagon 4-speed transaxle.

The Long Island Lighting Company which has been testing six Kubvans since May 84, reports that it is very pleased with the capabilities of the vehicles, although the top speed is only 53 mph with fully charged batteries. The removable battery tray makes servicing very convenient. One vehicle is being used for mail delivery and logs over 30 mi per day.

Subject: Battery Watering System made by Turbo-Electric Corporation, 1000 East Campbell Rd, Suite 120, Richardson, Texas 75081

The Water Wand battery watering system consists of a hand-held nozzle with a trigger, connected to a source of ordinary tap water through a deionizer unit. The fill level can be adjusted via a rubber grommet on the nozzle that limits the penetration depth. Built-in LED and sonic alarms indicate when the electrolyte level in the cell being watered has reached the preset maximum level and the soleniod has shut off the water flow. The wand nozz[le] can then be moved to the next cell to b[e] watered. Specially designed Aqua-Quick battery caps permit insertion of the nozzle without removing the caps.

The deionizer unit uses a commercial-grade, mixed-bed resin to replace metallic ions in tap water with hydroxyl and hydrogen ions, which are harmless to the battery. A neon indicator light remains on while the resin is active and goes off when the resin needs replacement. The unit is rated for flow rates of up to one gal/min.

Arizona Public Service (APS), which has been testing the units, reports that familiarization with the system's operation is resulting in progressively shorter battery fill time periods. For a pack of 24 Alco 2200 Batteries on Jet 1000P trucks, they report a watering time of only 6 min total or 15 sec. per 6V battery when the starting water level was 1/4 inch or less below the fill line and only 14 min. 21 sec. (or 36 sec/6V bat) when the starting level was a fat 3/4 inch low. These times include setup times. The stop poi[nt] accuracy of filling was judged to be 1/16 in. No battery top cleaning or drying i[s] generally needed after the filling operation. APS estimates that this represents a reduction of battery maintenance costs by 30 percent. ...PB...

Edited By Paul Brash

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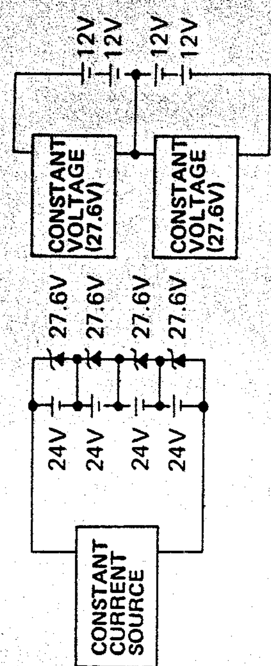
1. Use type "A" Gel/Cell batteries.
2. Use Gel/Cells of the same age.
3. Avoid installation near hot spots (e.g. heat sinks and power resistors).
4. Charge the string in 24 volt battery groups with a constant voltage of 2.25 to 2.30 volts per cell.

Typical charging techniques which have been utilized involve either individual constant voltage chargers connected in series or a constant current source with appropriate zener diode regulation across individual batteries or battery groups.



Use 7.5 Volt Zeners for 6 Volt batteries.

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FROM YOUR DRIVE BATTERIES
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