



SODIUM-SULPHUR BATTERY IMPACT ON EVs Editorial by Paul Brasch

ENERGY DENSITY

According to the DOE report in the May EAA News the energy density of lead/acid batteries was 13.6 watt hours per pound [wh/lb] or 30 wh/kg in 1977 and today's best are 18 wh/lb (41 wh/kg). Thus currently available lead/acid [pb/a] is perhaps 14-18 wh/lb.

This compares with a usable estimated energy density of 54 wh/lb (120 wh/kg) for sodium-sulphur [s-s] as reported in the June EAA News page 3. Although the individual cell energy density is reputed to be 90 wh/lb (200 wh/kg), the addition of the enclosure box and other needed ancillary equipment drops this to an estimated 54 wh/lb. Comparing this with pb/a gives a range of 3-4 times more. Lets use 3.5 as a midpoint. This means that at the same weight as your present battery pack, you would get 3 1/2 times the driving range. Or at about half of your present weight you would double your range.

VOLUME

Now lets consider volume. By measuring the outside dimensions of a 220 amp/hour EV battery which has about 1 Kwh of recoverable energy in it, I calculate an energy to volume density of about 1.36 wh/in³. By calculating the volume of a single s-s cell, we get 4.58 wh/in³ or 3.37 times better. But that is a cylinder volume and when these cells are packed together a lot of space is lost. If the square dimensions are used, then we get 3.6 wh/in³ or 2.64 times better. However we still need an insulated box so lets subtract 5%. This now brings us to about 2.5 times better volumetric efficiency than pb/a. Another way to look at it is that the equivalent battery weight would be only about .4 times the volume of a pb/a pack.

This means that we could use the same weight of batteries as we do now and have it be less than half the space and give us 3-4 times the range. Or we could use about half the weight and get twice the range in about 1/4 the volume. Think of it! The backseat and trunk could be useable again and a 100 mile car of today would also get a 200 mile

range. And with 1/2 the battery weight, the acceleration would increase and stopping distance would decrease.

PRICE

The price presently is terrible, but they are not delivering full production units yet. The June article hopes that the then present (spring) price of about \$250/Kwh can be cut to < \$70/Kwh in production, putting them in the pb/a ballpark. Remember that these battery packs should last a bare minimum of 1250 cycles and are more likely to run 3,000-5,000 cycles while giving you the above mentioned range and a full recharge time of only 5 hours.

FUTURE APPLICATIONS

A different method of estimating EV range that I determined is to multiply the weight of our battery packs by a factor that gives us the observed range. For pb/a this is about .11. For example, a typical car from our rallies may have 10 batteries at about 55 lbs each totaling 550 lbs. and travel about 60 miles. $550/60 = .11$. Or a car might have 20 batteries and go 121 miles. $1100/121 = .11$.

This .11 factor can be used to estimate the range of a normal good operating EV $\pm 10\%$. If yours is below this then something is amiss. Only the most efficient are higher, but usually no more than .12.

Now if this .11 is the pb/a factor and s-s is 3-4 times the energy density then the s-s factor should be .33-.44 with .385 the midpoint. [Use one of these numbers to estimate the new range of your present EV with whatever weight you choose to carry].

If a more efficient motor and controller were used, the chance of reaching .5 for a mileage factor is high. What more efficient motor/controller am I referring to? The super motor/controller of Unique Mobility. (See Aug. 86 Popular Science pgs. 76-79 [A MUST READ]). In the P.S. article they are talking hybrid systems, but if the weight of the gas engine/generator, flywheel and gimbles, fuel tank and gas, pump and yes

the starter battery were removed, I estimate 550 lbs would come out. Why not install 550 lbs of sodium-sulphur battery pack and get the same performance for $550 \times .5 = 275$ miles or add a mere 250 lbs (the weight of two lightweight passengers) for a small performance decrease and get a 400 mile range with 5 hour recharge? For all but continuous cross-country driving this sure beats the hybrid all to heck to my way of thinking.

SUMMARY

I think that the combination of supermagnets in supermotors with superbatteries supplying power controlled by better computerized controllers to more aerodynamic and lighter weight car bodies will result in a SUPER EV that is literally HOT STUFF. -PB-

HOT TIME IN NOVATO

On June 21st, the North Bay chapter held its first EV rallye. Our rallye was designed with three courses. One was to be strictly inner-city driving; that is very short lap size (only about 3 miles), and no speed zones over 30 mph. This was intended to be used by vehicles designed as "urban" cars. The second course was representative of inter-urban driving without the use of freeways. This course was about 6.5 miles long, with a maximum speed of 45 mph. The final route was similar to the second except that it was longer, about 9.25 miles, and it contained a 2.75 mile freeway section. Those choosing this route were required to be

capable of maintaining a minimal acceptable speed while on the freeway of around 48 mph. All laps were timed and penalties assessed for speeding or going so slow as to impede other traffic on the road.

Eight cars participated in the event which featured very scenic routes and 100+ temperatures. Four drivers chose the "freeway" route, and four chose the inter-urban one. None chose the "urban".

A good time was had by all, and except for the rallyemaster's use of his electric for only one pace lap, everyone turned in some very good distances. -Reported by Mike Callahan-

Electric Automobile Association
North Bay Chapter

June 21, 1986

Rallye results - by mileage

Freeway Route

Single Lap Mileage 9.22

Car No. Owner	Vehicle make/model	Curb Wght	Area Sq-ft	No Batts	Tot Volts	Amphr Rat	Tot Laps	Total Penalties	Net Mileage	Watt-hr per Ton-Mile
3 Russ Kaufmann	81 Special Construct	2300	20.00	17	102	240	9	1.52	81.46	231.17
2 Fred Schiller	77 VW Rabbit	2330	18.33	16	96	217	8		73.76	214.78
5 J. Margaret Milton	75 VW Rabbit	2780	19.00	17	102	217	6		55.32	259.81
6 Chuck Olson	65 Saab 96	3000	19.00	18	108	240	3	1.52	26.14	600.96

Local Route

Single Lap Mileage 6.48

Car No. Owner	Vehicle make/model	Curb Wght	Area Sq-ft	No Batts	Tot Volts	Amphr Rat	Tot Laps	Total Penalties	Net Mileage	Watt-hr per Ton-Mile
7 Ed Suchecki	74 Toyota	2500	20.00	18	108	220	8	1.05	50.79	334.15
1 Scott Cornell	73 Chev Vega	3600	21.00	18	108	220	7		45.36	268.62
4 John Wasylina	83 Renault Alliance	2500	25.00	10	120	150	6	0.30	38.58	333.26
25 Mike Callahan	73 Mazda Rx3	2550	17.92	14	84	217	1		6.48	1974.01

Rallye results - by efficiency (Watt-hrs per Ton-mile)

Car No. Owner	Vehicle make/model	Curb Wght	Area Sq-ft	No Batts	Tot Volts	Amphr Rat	Total Mileage	Total Penalties	Net Mileage	Watt-hr per Ton-Mile
2 Fred Schiller	77 VW Rabbit	2330	18.33	16	96	217	73.76		73.76	214.78
3 Russ Kaufmann	81 Special Construct	2300	20.00	17	102	240	82.98	1.52	81.46	231.17
5 J. Margaret Milton	75 VW Rabbit	2780	19.00	17	102	217	55.32		55.32	259.81
1 Scott Cornell	73 Chev Vega	3600	21.00	18	108	220	45.36		45.36	268.62
4 John Wasylina	83 Renault Alliance	2500	25.00	10	120	150	38.88	0.30	38.58	333.26
7 Ed Suchecki	74 Toyota	2500	20.00	18	108	220	51.84	1.05	50.79	334.15
6 Chuck Olson	65 Saab 96	3000	19.00	18	108	240	27.66	1.52	26.14	600.96
25 Mike Callahan	73 Mazda Rx3	2550	17.92	14	84	217	6.48		6.48	1974.01

IN MEMORIUM:

It is with deep regret that we note the passing of Cecil H. Kenney of the East Bay chapter who served as the editor and publisher of this newsletter for many years in the early days of the EAA. The entire membership is indebted to him for his contributions and support. -Ed-

SYMPATHY:

It is with the deepest sympathy and shock that as this issue was going to press we learned of the sudden death of Chuck Olson's wife Joyce. They had just returned from participating in the EXPO Show. Chuck is the S.C. chapter president. We all feel your loss with you Chuck. -Ed-

THE EAA SYMPOSIUM

From Curtis/PMC :

Ric Barline will discuss controllers and his new, simplified regenerative braking system for series motors.

Sunday September 21

From NASA :

James Casting will report on CO2 & the greenhouse effect. What are the trends and what does it mean for life on this planet?

RALLY VEHICLE CONFIGURATION REQUIREMENTS

The EAA can neither sponsor nor condone the competition or operation of illegally configured vehicles. In order to qualify for competition in the Sunnyvale EV Rally, vehicles must be able to pass a safety and roadworthiness inspection. They must possess a current valid California registration.

Vehicles must have:

adequate tires and brakes
windscreen and wipers
rear-view mirror
backup capability
*fenders

turn signal and brake lights
seatbelts
headlamps
a positive power disconnect
*working doors

*if these items were original equipment on the vehicle

In addition, all four-wheeled vehicles are required to have at least one passenger seat and to carry a passenger on every lap of the route in order to compete.

In the interest of maintaining a safe minimum road speed, a Maximum Lap Time Rule has been established. The maximum lap time will be the length of time required to complete one lap of either course at 75% of the posted speed limit, plus the time required to sit through one complete cycle of every stoplight on the course. A minimum of 45 mph is required on the freeway portion of the Long Range Course. Any laps that exceed the maximum lap time will not be counted.

THE SUNNYVALE RALLY WANTS YOU. . .

. . .TO BE A JUDGE. JUDGES ARE URGENTLY NEEDED. THE WORK ISN'T HARD. NO EXPERIENCE NECESSARY. THE HOURS ARE REASONABLE: FROM 1:00 TO 4:30, PLUS ABOUT A HALF HOUR EACH BEFORE AND AFTER THE RALLY FOR JUDGES' MEETINGS. THE PAY IS SOMETHING YOU CAN REALLY SINK YOUR TEETH INTO: A CATERED DELI LUNCH AND COLD DRINKS ON SAT., AND A FREE TICKET TO THE AWARDS BRUNCH ON SUN.

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Peninsula chapter will be at the Fair in San Bruno Park (Crystal Springs & Cypress) on Sept. 13, from 10 AM to 4 PM. Don't miss this event! It is well worth your time. Members: help hand out flyers to advertise the 14th EAA RALLYE to be held the next Saturday. Info. 415-589-5461

ECONOMICAL & EXOTIC

ELECTRIC VEHICLES

14TH ANNUAL E.V. RALLY

Sponsored by the ELECTRIC AUTO ASSOCIATION, Santa Clara Chapter

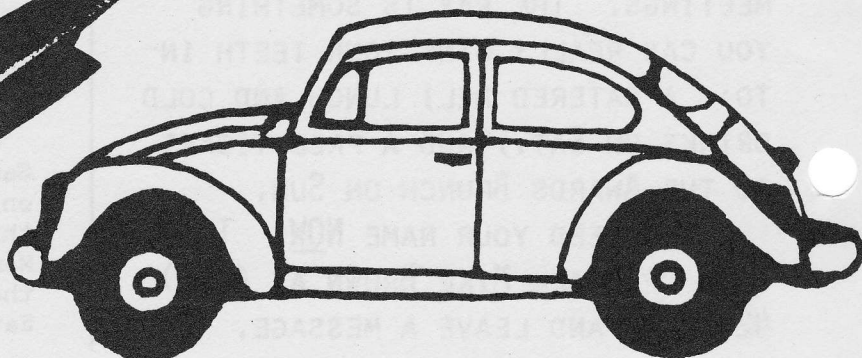
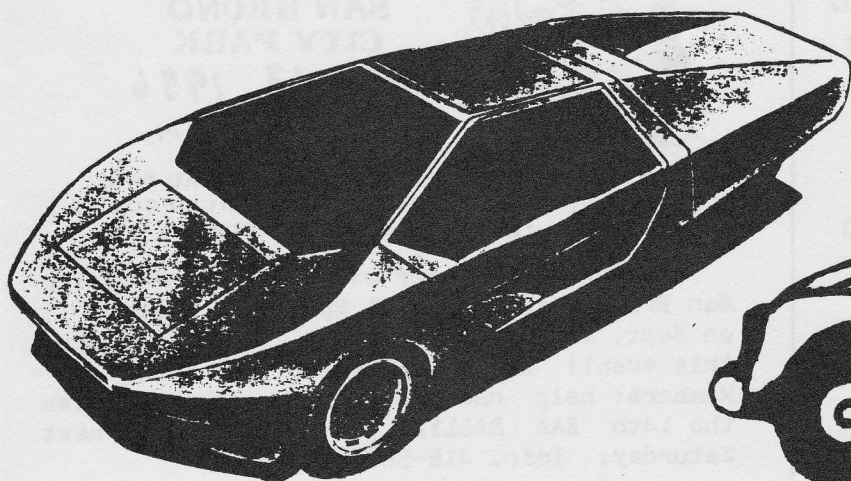
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20TH

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1:00 PM TO 4:30 PM -- RALLY
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Editors note: if you are on our newsletter mailing list, you will be receiving the above mentioned brochure. There is just too much to list here. ASSET SERVICES is paying the costs of our mailing them to you.

ADS must be received with payment by the 10th of the month, for the following month's issue. AD rate is min. 1 to 5 lines \$5.00. 1/4 Pg. \$15, Full Pg. \$50.00, Full Pg. 2 sides \$80.00, WANTED - TRADE - FOR SALE, etc. Mail to EAA 1249 Lane St. Belmont, CA 94002

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FOR SALE: Willey Model 7 controller asmbld,
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FOR SALE: (3) 2CM77 Aircraft Motor-Generators
\$225 each or all three for \$600/best offer;
two ring adapters included. -Also a 1965
Fiat Station Wagon (no motor) FREE, FREE.
Al Harris 415-967-6738

WHATS HAP'N

- SEPT. 2 -Seattle chapter meeting
- SEPT. 6 -Peninsula chapter meeting
- SEPT. 8 -LA:Burbank chapter meeting
-Washington: EVA/DC chapter meeting
- SEPT. 11 -NJ:Moorestown chapter meeting
- SEPT. 13 -San Jose, East Bay, North Bay chapter meet
-Peninsula chapter at San Bruno City Park Fair
- SEPT. 16 -Denver meet
- SEPT. 18 -Tokyo International EV Forum
- SEPT. 19 -Milwaukee, Fox Valley meetings
- SEPT. 20 -Sacramento, Fontana meetings
-14th ANNUAL SANTA CLARA CHAPT. EAA RALLYE
- SEPT. 21 -Santa Clara Chapt. EAA SYMPOSIUM and Awards Brunch
- SEPT. 27 -Phoenix chapter meeting
-DEVC Rallye
- SEPT. 30-Oct. 3 WESCON in Los Angeles

EAA CHAPTERS

Call the contact person for meeting times and places.

ARIZONA: Phoenix Chapter
Greg Whitney 602 978-3380
ARKANSAS: Little Rock Chapter
B.S. Boykin 501 562-0252

CALIFORNIA:

Bakersfield Chapter
James Peters 805 393-1749
Concord: Contra Costa Chapter
Max Rosenstein 415 229-3469
Los Angeles: Burbank Chapter
Il. Weiss 213 849-7632
Oakland: East Bay Chapter
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Weldon Martell 916 726-6257
San Bruno: Peninsula Chapter
Mae Benson 415 992-5453
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Bill Marquardt 415 586-6987
San Jose Chapter
Roy Paulson 408 269-7937
San Rafael: North Bay Chapter
Gordon Schaeffer 415 456-9653
Santa Clara Chapter
Lee Hamstreet 415 493-5892

DISTRICT OF COLUMBIA:

Washington: EVA/DC Chapter
Charles Dammers 301 439-1365

MARYLAND: Baltimore Chapter

D. Michalski 301 289-7896

NEW JERSEY: Moorestown Chapter

Sid Kreitsberg 609 829-2445

OKLAHOMA: Tulsa Chapter

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Albany: Linn Benton Chapter
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TEXAS: Houston Chapter

Robert Nixon 713 668-4214

WASHINGTON: Seattle Chapter

Steven Lough 206 325-2600

WISCONSIN: Milwaukee Chapter

David Perez 414 481-9655

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EVENTS. ARTICLES - COMMENTS etc. all correspondence to address below.

**Electric
Auto**



NEWS

SEPTEMBER 1986

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