F.V.E.A.A. NEWSLETTER

December 1991

P ident
D Marsh
336 McKee Street
Batavia, IL 60510
(708) 879-8089

Treasurer
Dale Corel
595 Gates Head North
Elk Grove Village, IL 60007

Secretary
William H. Shafer
308 South East Dr.
Oak Park, IL 60302
(708) 383-0186

Director
Kenneth Woods
1264 Harvest Court
Naperville, IL 60565
(708) 420-1118

Director
John Emde
1264 Fairmount
Downers Grove, IL 60516
(708) 968-2692

Director
John Stockberger
2S643 Nelson Lake Rd.
Batavia, IL 60510
(708) 879-0207

Editor
Richard Sachtschale
1018 Jackson Street
Aurora, IL 60505
(708) 898-6403

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

Next Meeting
December 20th7:30P.M.'Sharp'
Room 157; doors open @ 7:00
Use northeast entrance of
Building K, College of DuPage
22nd & Lambert, GlenEllyn

Nonmembers are always welcome

The PREZSEZ

I want to start by thanking Bill Shafer for his 6 years as president of the FVEAA. His dedication to electric vehicles is obvious as former president, but also are his efforts to keep E.V.s in the fore front. Bill will discuss and show slides of his recent project to update his vehicle at the Dec. 20th meeting.

I am honored to have been asked to serve as president of the FVEAA. Particularly at a time when legislation around the country may very well force open a market for electric vehicles. The California legislation that h haken up the automakers around the world dictates that 2% of the vehicles sold by each manufacturer in th state must be Zero Emission starting in 1995. Now Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Virginia, and Washington D.C. have adopted the same legislation. Effectively forcing 70,000 electric vehicles to be sold in 1995, with numbers increasing each year, reaching 70% by the year 2008. I believe that we as anorganization will play an increasingly more important role in response to this activity.

welcome any suggestions or comments about meetings, the newsletter, the organization, etc. Do not hesitate to contact me at anytime during the day or evening at (708) 879-8089.

Doug

Fox Valley Electric Auto Association
1018 Jackson Street
Aurora, IL 60505

FIRST CLASS

ADDRESS CORRECTION REQUESTED

John Emde
6542 Fairmount Avenue
Downers Grove, IL 60516

OTHER PURCHASE OPPORTUNITES

In the past month, two persons contacted the FVEAA to advise they wish to sell their electric cars:

Walter Breitinger at 255 Park Avenue in Valpariso, IN 46383 (Phone 219-462-5821) has two Citicars for sale. The first was in good condition with 1-year old batteries in the 48-volt system, new brakes, and tires prior to being "sandwiched" in an accident. It is licensed in Indiana for 1991. The second is a "parts car" that he purchased to repair the accident damage that has a complete electrical system but no batteries. He would like to get $700 for the two.

Larry Weinstein at 125 Waller Avenue in Lexington KY (Phone 606-278-6804) has satisified his curiousity about electric cars and doesn't have garage/driveway room for his 1891 Mercury Lynx (Escort) that was converted by Jet Industries. The car has 6300 miles on it. The original controller has been replaced with a Curtis MOSFET 400-amp controller. The original power transistor controller is included in the package. It is equipped with a 240-volt Lester battery charger that provides a quick recharge capability. He has found the single-charge range to be about 50 miles. The car has a state-of-charge meter and is equipped with a petroleum-fired heater. The 96-volt 1983 batteries will require replacement. He is asking $ 5000 for the package.

It should also be noted that Member Harris' Honda is available for a mere $ 2500. This car is in really fine shape. Member Nikolich has not yet scrapped his rolling chassis noted in a previous issue of this Newsletter for which he is asking $ 1000.

TREASURER'S NOTE

Membership dues for 1992 are now due. $15.00 for the year.

Thank you

EDITOR'S NOTE

I would like to take this time to apologize for the absence of the last two Newsletters and my absence from meetings as well. I have spoken with Doug Marsh our new President concerning my desires to resign as Newsletter Editor.

On Sunday December 16th after many long years of night school I received my Bachelor Degree in Electrical Engineering. Besides the attention of my three courses this semester, I have been traveling out of town for job interviews and attending Lamaze classes in preparation of our first child. The baby is due at any time now.

I do not see my schedule opening up in the near future. We may even need to relocate out of the Chicago area. I therefore feel it best that a new Editor be sought as soon as possible. Thank for your patience with me. I will do what I can to assist Doug and the rest of the members in the mean time.

To facilitate an efficient publishing process, any future Editor should have a home computer with a printer and a modem. If the computer is IBM compatible, there is a soft font package called Publisher's Powerpack by Atech, that is inexpensive and will generate high quality documents with a dot matrix printer. Also a modem is very helpful in transferring test files from the President and the Secretary. Doug and I have done this already and it works great.

Good luck to you all and have a very happy Holiday Season!

Richard J. Sachtschale

MINUTES OF FVEAA MEETING ON OCTOBER 18, 1991

The meeting was convened by President Shafer at 7:35 PM. There were 14 members present.

Treasurer Vana reported a balance of $ 968.55 in the savings account and $ 2104.11 in the checking account.

Vice-President Woods stated that an inoperative FIAT 125 Sport Coupe is available from a Chicago member for an electric conversion. Any member interested should contact him.

President Shafer noted that no one as yet has purchased the rolling chassis from Member Nikolich which was described in the last Newsletter.

Member Doug Marsh noted he would be attending the Solar & Electric Vehicle Symposium in Boxborough Mass. October 26-27. He will give a report on this event at our November meeting.

President Shafer noted that November begins the new year for the FVEAA. This means that annual dues of $ 15 will be payable next month. Election of new officers will also be held at the November meeting.

Member Shafer, who has served as President for the past 6 years, announced he will not seek another term because he has been nominated for president of another organization. President Shafer stated he would contact other members to see who would be willing to serve an an officer or director of the FVEAA.

Treasurer Vana also announced he would not seek to continue as Treasurer.

The features of a Lithium-Polymer batttery was brought up. It was noted that this is one of a number of experimental battery types which are being investigated. For the hobbyist, the lead-acid, golf-cart type is the only one commercially available at an affordable cost. A future newsletter article was suggested on various types of batteries.

Member Steve Clark reported on difficulties he experienced with a Unique Mobility car purchased from an individual in Denver. The batteries were 4 years old and trouble might originate with these. There is a possibility of damage during shipping involving the front-end battery contact assesmbly. Another item might be corrosion of these contacts during an extended period of non-use. Members volunteered to help him discover the source of the trouble on the day following the meeting.

Submitted by

W. H. Shafer

William H Shafer
For Secretary Harris

MINUTES OF FVEAA MEETING
11/15/1991

The meeting at the College of DuPage was called to order by President Shafer at 7:30 PM. 15 members and two guests were present.

Treasurer Vana reported a balance of $ 1206.34 in the checking and $ 1973.77 in the savings account. There were no questions.

Member Steve Clark gave an update report on the Unique Mobility car he purchased and moved from Denver to here. He thanked members who assisted him on the day following the October meeting. The trouble turned out to be one failed 6-volt, 4-7 year old battery in the 96-volt system. It was replaced and the car is now operational.

The FVEAA has been asked to consider participation in the celebration of Engineer's week, February 21-22 at the IIT West campus. One or two cars were suggested for display these two days. Participation was approved. Member Clark indicated his car would be available. Member Krajnovich stated his car might also be available, if upgrading work was not in-progress at that time.

President Shafer noted the FVEAA was advised of a solar/electric car rally to be held May 29-31 in Quebec. He has material if anyone is interested in attending. Registration closes on April 30, 1992.

The possibility of another group purchase of batteries was discussed. Members Clark, Krajnovich, Shafer, and Vana indicated interest in this endeavor which would involve 54 batteries. Member Krajnovich reported the best price might be obtained from EZ-Go, a north side golf cart firm. He agreed to call them for a quote. Member Clark reported Illinois Battery Distributor's price was $56 each (delivered) or $50 (picked up).

Vice-President Woods reported he has been contacted regarding the purchase of a working electric car. Member Harris' Honda was suggested.

The following officers were elected for 1991-2:

President	Doug Marsh
Vice-President	Ken Woods
Secretary	Bill Shafer
Treasurer	Dale Corel
Director	John Emde
Director	John Stockberger

Member Marsh gave a report on the Solar/Electric Vehicle Symposium and Trade Show held October 26-27 in Boxborough, Mass.

The meeting was adjourned at 10:30 PM.

Submitted by
William H. Shafer
William H Shafer
Secretary

ELECTRIC POWER RESEARCH INST. (EPRI) MAY, 1991

THE STORY IN BRIEF

The widespread success of electric vehicles depends primarily on the development of advanced batteries that can deliver improved driving range and performance. While the earliest EVs on the road are likely to operate on large packs of conventional lead-acid batteries, researchers are exploring advanced batteries based on sodium-sulfur, lithium–metal sulfide, and even more exotic electrochemical combinations; the goal is to commercialize the most successful of these later in the decade.

Thomas Edison and Charles Steinmetz—the greatest electrical geniuses of their time—are said to have tried and given up on developing high-power, long-life, inexpensive batteries that would enable EVs to squarely compete with gasoline-powered vehicles. Then, as now, the only commercially available battery technology suitable for EVs was lead-acid, and though modern versions may last longer and cost somewhat less than those at the turn of the century, the performance and range afforded by lead-acid batteries have not improved much.

Battery makers and other technology companies (including several with support from EPRI) have been working on an array of new materials and types of batteries for over 25 years. But in the absence of established market demand for such advanced batteries, those efforts have not been sufficient to overcome the technical, manufacturing, and economic barriers to truly practical EV battery. Many interested parties are counting on the recently formed U.S. Advanced Battery Consortium to marshal technical and financial resources for a focused, collaborative R&D program to identify and develop several mid- and longer-term EV battery technologies later in this decade. Some of the ongoing battery R&D sponsored by the Department of Energy and EPRI could become part of the USABC program.

From more than half a dozen candidate battery technologies, the apparent consensus among USABC sponsors is to focus on demonstrating the feasibility and capability of processing and producing sodium-sulfur batteries at pilot plant scale by 1994. By then, the consortium also wants to have demonstrated, with a full-size experimental battery, the feasibility of designing a plant to manufacture the even more advanced lithium–metal disulfide and lithium-polymer batteries.

Future batteries

Today lead-acid battery packs limit an EV such as the G-Van to about 60 miles on an 8-hour charge. With advanced design and materials for maximum aerodynamic efficiency, General Motors' Impact concept car manages to stretch the projected range of its one-third-lighter battery pack to 120 miles. A nickel-iron battery offers one and a half to two times the vehicle range of lead-acid, but at an increased cost. And such a battery is not expected to be commercially available until 1993 or 1994.

According to Robert Swaroop, project manager for EV battery systems at EPRI, "Battery cycle life is the key trade-off with other performance factors." The benchmark lead-acid batteries of today will last for about 30,000 miles with deep discharging cycles and even longer with light use and frequent opportunity charging. The cycle life of today's lead-acid batteries is about 750. A battery with a design target of 1000 operating cycles might power an EV for 60,000 miles before requiring replacement. All of the advanced technologies offer significantly greater performance over lead-acid in terms of energy and power, and the best projections of operating life for most of them also exceed lead-acid's life.

Another key consideration for EV batteries is maintenance. Lead-acid batteries can be made maintenance-free, like those found today in many gasoline vehicles, and such batteries may soon become available for near-term EV application. EPRI is testing maintenance-free, sealed lead-acid batteries from the German manufacturer Sonnenschein at Argonne National Laboratory. Nickel-iron batteries must include a system for regular watering and the removal of hydrogen gas generated during recharging. There is a novel

but promising bipolar version of a sealed lead-acid battery under development by ENSCI, Inc., with support from the Jet Propulsion Laboratory and Southern California Edison. Compared with nickel-iron, it offers improved efficiency and performance.

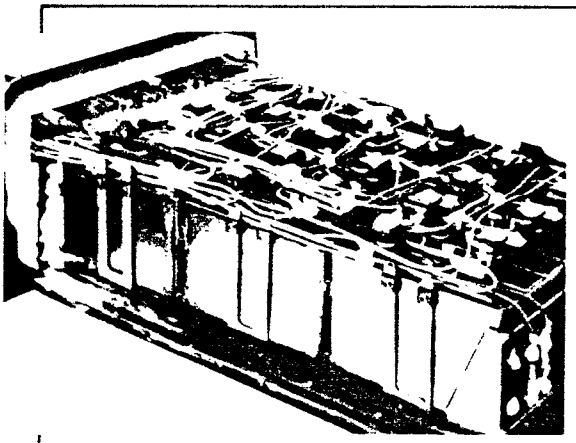
In addition to lead-acid and nickel-iron, relatively mature battery technologies include nickel-cadmium, on which Japanese and European manufacturers are known to be working. A nickel-cadmium unit made by the French battery maker SAFT is under test at Argonne, but such batteries are expected to remain prohibitively expensive for EV application, and there are disposal issues associated with cadmium's toxicity.

Developmental batteries

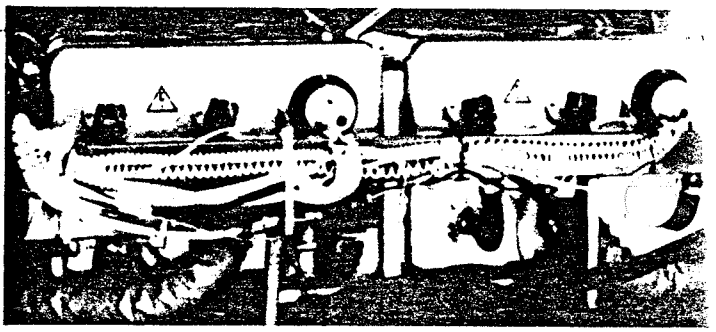
To achieve significant gains in EV rang batteries must be made from mu ior energetic electrode materials than lead c iron. The electrochemical couples of s dium and sulfur (Na/S) and lithium-alu minum and iron sulfide ($LiAl/FeS_x$) hav the desired specific energy, but both mus operate at high temperatures.

How Advanced Battery Technologies Compare With Lead-Acid

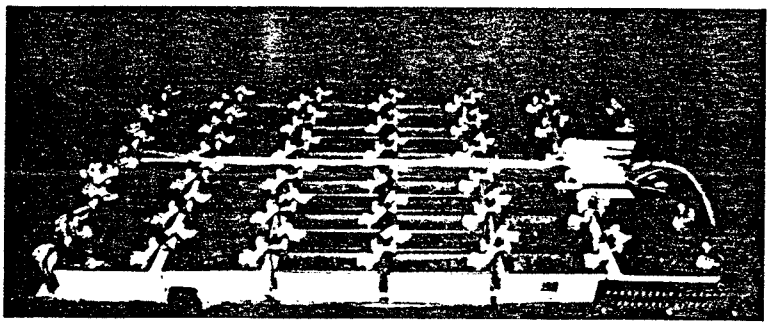
Researchers state the potential vehicle range and acceleration power of advanced battery systems under development in relative terms to today's conventional lead-acid batteries. Depending on the vehicle, the number of batteries it is designed to carry, and the driving duty, lead-acid batteries can power EVs for 50–100 miles on a single charge and can provide acceleration that approaches that of conventional gasoline vehicles. At high-volume production, some of the advanced battery technologies are expected to approach lead-acid batteries in cost. Numerous test EVs have already run on prototype nickel-iron and sodium-sulfur batteries, which are now at the pilot plant stage of manufacturing development. Multicell modules of lithium–iron monosulfide batteries have been made, but researchers say it is the disulfide version of the technology—still at laboratory scale—that offers the potential for an EV driving range of over 300 miles. Potentially lighter-weight, solid-state lithium-polymer batteries are also under development.



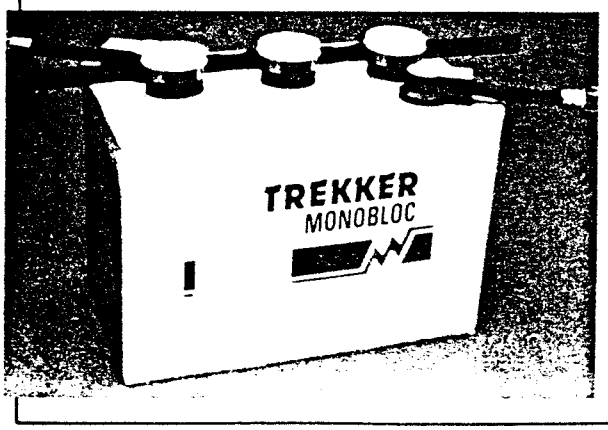
Lithium–iron monosulfide subbattery pack



Developmental sodium-sulfur battery pack



Nickel-iron battery pack



Lead-acid battery such as used in the G-Van

Lead-acid	1.0	1.0	Now
Nickel-iron	1.5×	1.3×	1993
Sodium-sulfur	2–3×	2.5×	1995–2000
Lithium–iron monosulfide	2–3×	1.8×	1995–2000
Lithium–iron disulfide	3–5×	6–7×	2000+
Lithium-polymer	3–5×	3–4×	2000

Researchers believe that Na/S batteries offer the best hope of providing EVs a potential range of 150–175 miles by the end of this decade. Developed originally by General Electric in the 1960s and later, in the 1970s, by Ford Motor Company, the Na/S battery uses a ceramic beta-alumina electrolyte tube with sodium negative and molten sulfur positive electrodes on opposite sides within a sealed, insulated container. The battery pack itself is further insulated, since Na/S modules operate at 350–380°C (662–716°F). Because of both the operating temperature and sodium's reactivity, the batteries must be designed with a high degree of ruggedness and safety.

The two principal developers over the last two decades have been Britain's Chloride Silent Power, Ltd., and the Swedish-Swiss conglomerate ABB Asea Brown Boveri (including its Canadian subsidiary, Powerplex). ABB has a pilot plant in Germany, and Chloride has formed a joint venture with the German utility RWE for a pilot plant in Britain to manufacture Na/S batteries.

Several test vehicles, including experimental Ford electric vans and a fleet of German passenger cars, have been running on batteries from these suppliers. DOE and EPRI have supported development work at Chloride and are testing Na/S batteries at Argonne and the Electric Vehicle Test Facility in Chattanooga, Tennessee.

Although they currently cost at least four times as much to produce as nickel-iron batteries, Na/S batteries have low projected volume production costs—thanks to inexpensive materials—and a long projected service life. Only ABB's battery has yet demonstrated over 1000 operating cycles for full-size modules, however.

Argonne National Laboratory originally developed the LiAl/FeS_x system in the early 1970s. Using more-expensive but nonreactive materials, the battery's key advantage over Na/S is greater safety. It uses a porous magnesium oxide or boron nitride separator and a potassium and lithium chloride electrolyte, and it maintains the electrodes at an operating temperature of 400–450°C (750–842°F). SAFT America, a subsidiary of the French battery company, is the leading developer of this technology today and is being funded by DOE and EPRI to scale up the Argonne technology, which has received considerably less R&D support than Na/S.

Researchers are particularly interested in a disulfide version of the LiAl/FeS_x battery for its potential to boost the range of EVs to over 300 miles. "But that's at least 12 years away," says EPRI's Robert Swaroop. "First we have to solve the problems of lithium monosulfide batteries, which today are cycle life and calendar lifetime." Lithium batteries are widely used in a number of special military applications, "but it will be tough to make them big and powerful enough for EVs," adds Swaroop. Researchers hope to see a few proof-of-concept lithium monosulfide EV batteries by 1993 or 1994.

EV batteries for the long term

Perhaps the ultimate, 300-mile-plus, rechargeable EV power supply envisioned by some researchers would be the lithium-polymer battery, operating from ambient temperature to 120°C (248°F) and easily manufactured in versatile thin films usable in a variety of configurations. Recent advances in the new materials science of conducting polymers are incorporated in the form of a plastic-like solid electrolyte. Such solid-state batteries are at a very early stage of development and are presently being made in small sizes and low power ratings.

One of the leading efforts on lithium-polymer batteries is a joint venture recently formed between Canada's Hydro Québec and Japan's Yuasa Battery Company to develop the technology to full scale. A small, laboratory-scale version of the battery has recorded more than 500 operating cycles over two years. Swaroop says a major challenge in scaling up lithium-polymer batteries is to find a way to dissipate the heat generated during charging and discharging without causing long-term damage to the polymer electrolyte. Other groups in Britain, Japan, and the United States are working on lithium-polymer technologies. EPRI supports a small part of some of this work in connection with its long-term R&D program for EV batteries. ■

R&D Consortium for EV Batteries of the Future

U.S. automakers Chrysler Corporation, Ford Motor Company, and General Motors Corporation have formed the U.S. Advanced Battery Consortium as a collaborative R&D venture to identify and develop the most promising advanced battery technologies for future electric vehicles. The USABC is soliciting support from the government and the electric utility industry for what it hopes will become a $100-million-a-year effort by 1993. The U.S. Department of Energy is expected to provide a major portion of the program's funding support. EPRI expects to support the USABC and participate in the research consortium on behalf of electric utilities through a cooperative agreement.

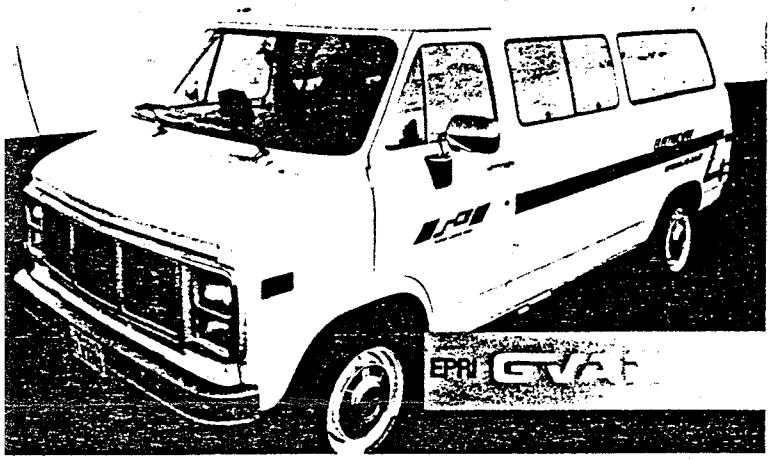
USABC UNITED STATES ADVANCED BATTERY CONSORTIUM

This article was written by Taylor Moore. Technical information was provided by Robert Swaroop, Customer Systems Division.

VANS - US

The G-Van: Blazing the Trail for Fleet Service

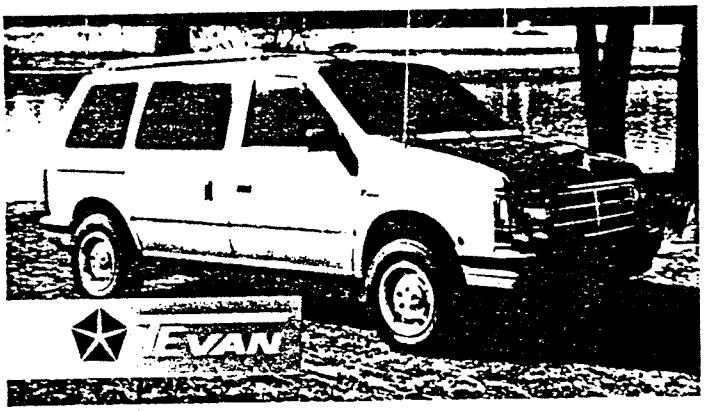
Commercial production of the 1-ton G-Van was begun last year by Vehma International, culminating a four-year, EPRI-led development program involving Vehma (a unit of Magna International), Chloride EV Systems of Britain, and General Motors Corporation, with additional support from Southern California Edison Company. The full-size electric cargo or passenger van is being marketed to electric utilities for fleet use and will eventually be sold to commercial fleet operators through GM dealerships. While the G-Van now runs on lead-acid batteries, more-advanced batteries may be incorporated as they become available.



G-Van Specifications	Range on full charge: up to 60 miles
Top speed: 52 mph	Recharging: 8 hours on 240-volt outlet
Acceleration: 0 to 30 mph in 13 seconds	Payload: 1550 pounds cargo or 5 occupants
Batteries: 36 6-volt lead-acid	Energy consumption: 1 kWh per mile

The TEVan: An Electric Minivan for the Consumer Market

Under a two-year agreement with EPRI, Chrysler Corporation is developing a number of engineering prototypes of the TEVan—an electric minivan based on the company's popular Dodge Caravan and Plymouth Voyager models—that could lead to commercial production. The work builds on the development of four concept electric TEVans by Chrysler subsidiary Pentastar Electronics, with support from EPRI, Southern California Edison, and California's South Coast Air Quality Management District. The TEVan's increased performance and styling are expected to appeal to a broad consumer and light fleet van market. Its prototype nickel-iron batteries are lighter and provide more energy than lead-acid.

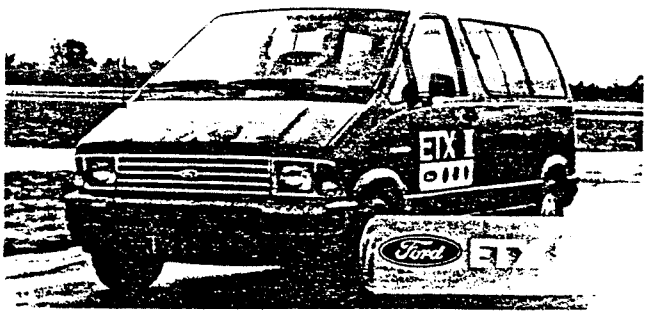


TEVan Specifications	Range on full charge: >100 miles
Top speed: 65 mph	Recharging: 8 hours on 220-volt outlet
Acceleration: 0 to 50 mph in 14 seconds	Payload: 5 occupants
Batteries: 30 6-volt nickel-iron	Energy consumption: ~0.5 kWh per mile

EVs From Ford Motor for Demonstration and Development

Ford Motor Company plans to produce, beginning next year, a demonstration fleet of 70 to 100 electric Escort compact vans for fleet use and evaluation. The vans will incorporate many of the features Ford pioneered in EV development work supported by the U.S. Department of Energy. These include advanced sodium-sulfur batteries for extended EV driving range and lighter, less-expensive ac drivetrains for vehicle propulsion. One product of the DOE-sponsored work was the ETX-II, a modified Ford Aerostar minivan. Ford has not announced plans to mass-produce the electric Aerostar, but it is continuing R&D with DOE support to develop modular power train components for several vehicles, including the Aerostar.

Escort Van Specification Targets	Range on full charge: 100 miles
Top speed: 70–75 mph	Recharging: 6 hours on 220-volt outlet
Acceleration: 0 to 50 mph in 14 seconds	Payload: 750–1000 pounds total; 2 occupants
Batteries: sodium-sulfur	Energy consumption: not available



ETX-II Specifications	Range on full charge: 100 miles
Top speed: 65 mph	Recharging: ~8 hours on 220-volt outlet
Acceleration: 0 to 50 mph in 20 seconds	Payload: 1100 pounds total; 7 occupants
Batteries: sodium-sulfur	Energy consumption: not available