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# F. V. E. A. A. NEWSLETTER

## DECEMBER 1989

### MEETING NOTICE

The next FVEAA meeting will be **DECEMBER 15th** at Cragin Federal Savings & Loan 333 W. Wesley st. Wheaton, Il Time - 7:30 P.M. sharp. Guests are welcome and need not be members to attend the meeting.

***DEADLINE*** for newsletter *STUFF* - in my hands the friday before the next meeting. Editor

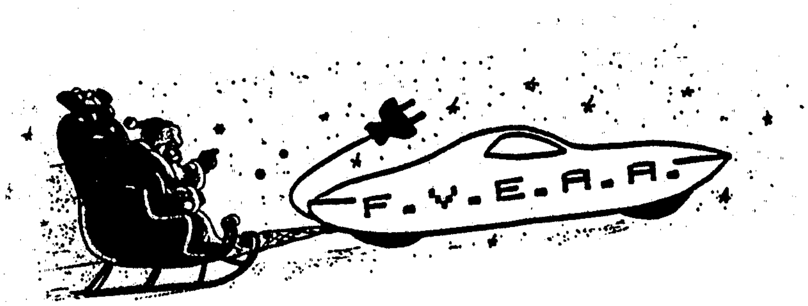
## THE PREZSEZ

We all share Member Ken Meyers loss of his wife, Virginia. We know how important an understanding spouse is to our electric car hobby. Thanks to members who were able to attend the memorial service for her on November 25th.

The electric cars of most members are now inactive with the coming of cold weather. December and January are good times to consider our 1990 club projects. At the December meeting, I propose we discuss the following:

1. A 1990 Rally.
2. Participation in the 20th anniversay of Earth Day.
3. Our Declaration of energy independence.
4. Exhibiting cars at major shopping centers.
5. Production of the long-delayed video.

Bill




FOX VALLEY ELECTRIC AUTO ASSOCIATION
6542 Fairmount Downers Grove Il 60516

FIRST CLASS

ADDRESS CORRECTION REQUESTED

MINUTES OF THE FOX VALLEY ELECTRIC AUTO ASSOCIATION
November 17, 1989

The meeting was called to order by President Shafer at 7:38 PM. Twelve members and one guest, Mike Thums of LaGrange, were present.

Treasurer Vana reported $ 1187.11 was in the NOW checking account and $ 872.12 was in the savings account, for a total of $ 2059.11. The October receipts included return of our $35 check by Clarence Ellers for his electric car conversion manual which he furnished to the FVEAA at no charge, Mr Ellers was complimented by the membership for this donation. The membership also noted this meeting marked the return of our Treasurer after bypass surgery.

The annual election of officers was held with the following persons selected to serve for 1990:

| | |
|---|---|
| President | William H. Shafer |
| Vice President | Kenneth Woods |
| Secretary | Paul Harris |
| Treasurer | Valdimir Vana |
| Director | John Emde |
| Director | John Stockberger |

Member Emde, in addition to serving as a Director, also agreed to continue to assemble and mail the monthly Newsletter of the FVEAA. He requested that members who might find articles of interest to the organization please furnish him a copy for inclusion in future issues.

A general discussion of individual electric car matters was held by the members present during the coffee break.

The meeting was adjourned at 9:45.

Submitted by
William H Shafer
William H Shafer
Secretary, Pro-Tem

TROPHY PRESENTATION
Trophies were awarded for participation in the Brookfield 4th of July Parade this last summer. Presenting the awards is event chairman Henry Se' (left). Accepting is John Stockberger (center) a... aul Harris (right) for George Krajnovich (unable to attend the meeting).

## THAT'S WHAT CLUB MEMBERS ARE FOR !

The other day FVEAA member Dick Ness called me to express a desire to thank other club members for their help on his electric bike. As all of us know, it's not possible to know everything. We've all been stumped at one time or another on what to do or where to get hard to find items. Dick has spent a lot of time looking for parts to no avail. Members to the rescue. Especially Ken Meyers and Les Stone. They came up with parts and ideas that got Dick out of his predicimemt. So, if any of us need help on our electric vehicles, let it be known to the rest of the club. Either at the meetings or by way of this newsletter. A personal thanks from Dick Ness and all the rest of us for everyones help.


**Electric bike**

Throw a switch on this experimental bike and a tiny 0.3-hp battery-powered motor provides electric assistance on hills or in crosswinds. The motor, which runs only when a rider pedals, drives an auxiliary sprocket through gearing. Lucas in England developed it.

## SO YOU THINK THAT'S FUNNY DEPT.:

They must be running out of ideas. Every year, carmakers spend big bucks trying to come up with vivid, exciting names for their exterior colors. A car isn't white, it's "Alpine White."

One car company is offering new colors for 1990 including Dusty Rose, Light Champagne, Light Spectrum Blue, and Medium Tundra. Medium Tundra?

Intrigued and slightly confused, we looked it up. Our dictionary defines tundra as: "a treeless plain consisting of black mucky soil and a permanently frozen subsoil, supporting a dense growth of flowering dwarf herbs."

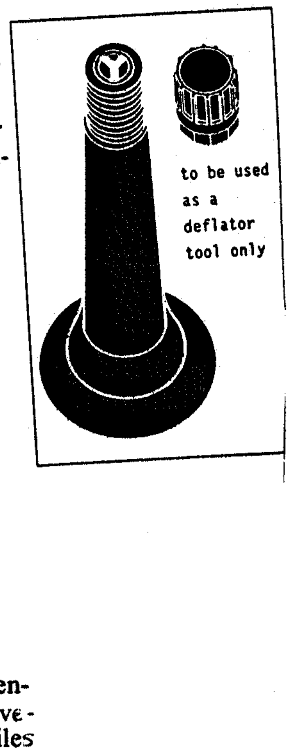
Somehow, we don't think that's what they had in mind.

## DON'T TOUCH THAT CORE

The days of the Schrader tire valve may not be numbered, but there is a new tire valve on the market with a non-removable valve core. The Rubber Manufacturers Association reports that the valves can be visually identified from the top by a three-pronged white plastic core that will not accept a valve core removal tool.

The valve maker, Piedmont Manufacturing (804/369-4741) supplies a red deflator cap tool, which must be screwed onto the valve to deflate the tire.

The snap-in valve may be removed after deflation by forcing it into the wheel cavity. Normal inflation and pressure checking remain the same as standard Schrader tire valves.




## Fast? Neigh, neigh

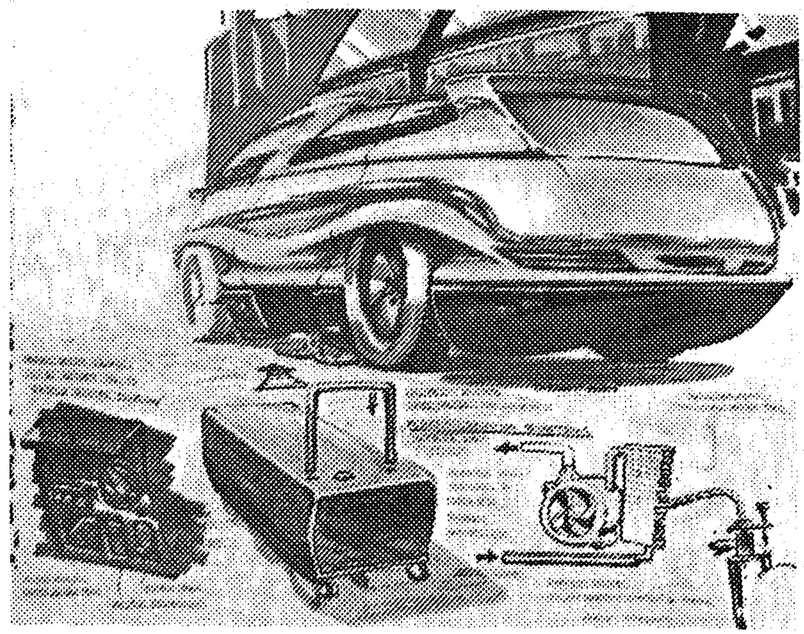
Thought for a modern era: In central London, the average speed of vehicles has been clocked at 10 miles per hour—only 3 miles an hour faster than in 1912, when traffic was horse-drawn.

SunWorld / Volume 13 / Number 3 / 1989

# THE EQUINOX
## Instant Electric Refueling

by Bruce Severance

*In January of 1989, Los Angeles, USA, Councilman Marvin Broudy spearheaded a proposal to improve air quality in the south coast basin. With the combined support of the Edison Company, the Department of Water and Power, and the South Coast Air Quality Management District, a request for proposals was sent to various corporations asking them to joint venture, manufacture and deliver 10,000 electric vehicles by 1992. Bruce Severance, a transportation designer from Art Center College in Pasadena, developed the Equinox electric mini-van to meet the requirements of a service and commuter vehicle. The Equinox features a battery exchange system which will allow refueling in less time than it takes to fill a gas tank. The design addresses the major pitfalls of electric vehicles today: short range and long charging periods.*



The aim behind Equinox was to design an electric van that could be readily refueled by one person in less time than it takes to fill a gas tank. This design objective proceded from the assumption that only rapid battery pack exchange without special equipment (such as carts, dollies, jacks or hoists) will make electrics as convenient as internal combustion vehicles.

Over the years, various exchangeable battery packs have been designed and produced for electric vehicles. Most are designed to slide out sideways onto a cart designed to receive the pack. Such designs usually require two or more men to move the packs, and support equipment which occupies garage floor space.

The need for extraneous equipment makes the development of service station infrastructure less likely as commercial garages and gas stations are not inclined to purchase such hardware for the occasional EV customer desiring a battery exchange. The less capital investment required, the more likely specialized battery pack service stations will spring up around the globe. The integrated jacking system illustrated here facilitates the development of service station infrastructure. Consequently, it increases the prospects for EV market penetration.

The integrated jacking system offers ease of exchange, whether at a fleet service station, or at home, adding to the marketability of Equinox for both fleet and personal use. While Equinox is on the road packs may be charging at fleet service stations, and exchanged as necessary. Because the jacking system is integrated, packs may also be readily exchanged at home without duplication of costly and bulky exchange equipment.

The integrated jacking system also makes stationary solar recharging an alternative to plugging into the utility grid during peak demand hours. As opposed to mounting expensive, high-efficiency solar panels on the vehicle, stationary solar arrays can consist of a greater surface area of less efficient, and less expensive, solar cells. One pack may be charged by such an array while the other is used for commuting. For evening excursions, the depleted pack may be exchanged with the fully charged pack.

Given current lead-acid technology, an integrated jacking system makes it possible for an individual to drive 113 km round-trip to work, and another 97 km after sundown. If the second pack is too depleted for the next days' commute, it may be plugged into the utility grid to charge during off-peak hours, or it may be charged by a third stationary reserve pack charged by the solar array and powering the house as well. However, it should be noted that the kilowatt hour cost of solar is still considerably higher than that of electricity generated from oil. The falling cost of solar may not meet the rising cost of oil until the mid to late 1990's.

I envision solar parks, the electric refueling stations of the future. Such parks would distribute packs through a battery reserve system. Credit card purchases from automated dispensers would include testing of spent packs for a credit on the charge remaining.

If packs are easily exchanged, there is little cause to build cars that run directly on solar energy. Such vehicles must be extremely light weight and aerodynamic and require high efficiency solar cells that are currently produced at prohibitive costs. Although they may be an appropriate solution for well-to-do sports car enthusiasts, they compromise passenger comfort, crashworthiness and affordability for less limited range.

However, even the most efficient solar-electric race cars cannot operate at 97 km/hr all day long. At highway speeds they must periodically stop to recharge their silver-zinc batteries which cost in the neighborhood of forty thousand dollars per vehicle with a life expectancy of 15 to 30 cycles. Obviously, such technology will neither be soon affordable, nor practical for production vehicles. An integrated battery jacking system offers the most viable solution to put electric vehicles on the road in mass with existing battery technology.

In any event, electric vehicles would make more efficient use of power available from the utilities and result in net decrease of air pollution because they would make use of off-peak energy surpluses by charging at night. Extensive studies to verify this claim have been conducted jointly by Stanford University, the California Institute of Technology and the California Energy Commission. A second study due for release next year, is now underway.

For more information contact:
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Altadena, CA 91001, U.S.A.

# ELECTRIC VEHICLES ON THE HORIZON?

## Electric van promotes energy independence, cleaner air, and better power load management

Design News/10-3-88

Lyle H. McCarty, Western Editor

G-Van is modified GMC van that employs 2000-lb lead-acid battery pack (visible amidship) to haul 1800 lbs of cargo at speeds up to 53 mph.

At the turn of the century, most of the then-existing U.S. automobiles were electric. But as improved roads linked widely separated communities, the internal combustion engine's performance and range-capability thrust it into the lead. By 1920, the electrics were all but gone. Ironically, the electric starter played a pivotal role in the conversion by making the gasoline engine easier and safer to use.

But now, as we approach the close of the century, the proliferation of the IC engine in the U.S. poses some special problems. In the intervening decades, we've sucked up much of our indigenous petroleum resource and find ourselves dependent to an unacceptable degree on the whims of politically unstable nations. Air pollution, much of it generated by automobiles, chokes our population centers.

The Electric Vehicle Development Corporation (EVDC), Cupertino, CA, hopes to help solve these problems. Working with the nation's electric utilities, and its three major auto manufacturers, EVDC has outlined a program that could lead to the widespread use of electric vehicles in the future.

The most recent step in the program is the introduction of the G-Van, a product of cooperative activity among General Motors, Chloride EV Systems, and Conceptor, Inc., an upfitter that makes necessary modifications. Twenty-five of the vehicles have been assigned to U.S. utilities for field-testing this year; full production will begin when the 1990 model is introduced next year. The vans will be made available and warranted through GM dealers, with ordering arranged by EVDC.

### System analysis

Modified to accept a 2000-lb, 216V, 205 A-hr battery pack consisting of 36 lead-acid batteries produced by Chloride EV Systems, the G-Van is a standard GMC van and chassis. The battery pack powers a 56-hp dc motor that propels the 8600-lb gross weight vehicle from zero to 30 mph in 12 sec, and to a top speed of 53 mph.

Range, depending upon speed and other factors, is about 60 miles. Typical energy consumption is 1.0 kwh/mile, measured as AC input to the battery charger. Depending on where you live, this equates to a fuel (electricity) cost of 4 to 10 cents per mile.

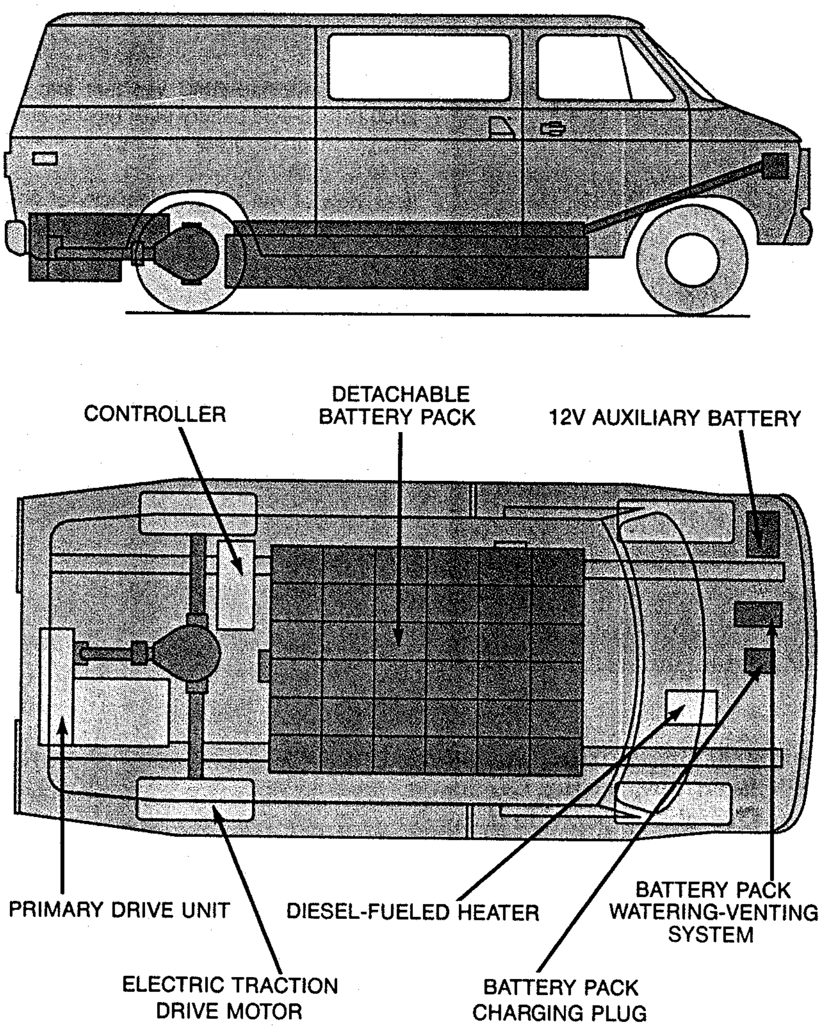
For a comparison of overall efficiency, a typical IC-powered van that delivers 10 mpg consumes 14,000 Btu/mile (using 140,000 Btu/gallon as the higher heating value of gasoline), while the G-Van consumes 3413 Btu per mile. If the central power station that produced the electricity for the G-Van is 40% efficient, the G-Van turns out to be 1.64 times as efficient as its IC-engined counterpart.

This editor had an opportunity to drive a G-Van at EVDC's introduction of the vehicle in Long Beach, CA, earlier this year. It's a pleasant vehicle to drive, more responsive than I anticipated, and uncannily quiet. You feel the presence of that 2000 lbs of batteries, but they're placed low, so the CG location is favorable. Operation is extremely simple because the controls consist of a direction lever (parked, reverse, neutral, and forward), an accelerator, and a brake pedal, plus a steering wheel, of course. No starter, although there is an on-off switch with a key.

Limitations of the G-Van are those of any electric vehicle—range, acceleration, hill-climbing, and a lack of air conditioning.

With a 60-mile range, EVDC feels the G-Van will be useful for many daily delivery tasks in a metropolitan area. Studies indicate that electric vehicle penetration of the automotive market is a function of range more than any other consideration. For that reason, EVDC's program will progress from lead/acid batteries in the G-Van to nickel/iron-sulfide batteries in the upcoming TEVan (with a projected range of 110 miles), and then on to lithium/metal-sulfide and sodium/sulfur batteries. These latter

## G-VAN SYSTEM DIAGRAM




advanced developments should bring vehicle range up to 150 or 200 miles, depending on vehicle size—adequate for almost all metropolitan area driving.

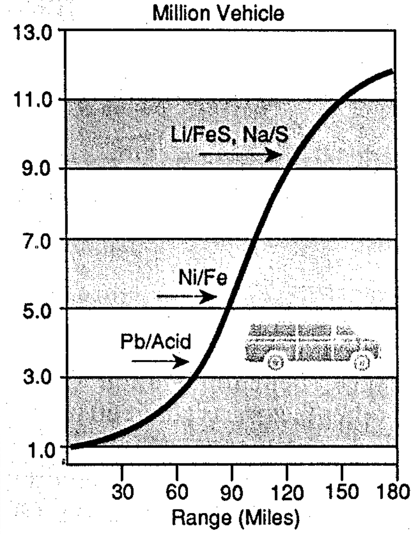
### Team effort

Basic technology employed by the G-Van resembles that used in other current electric vehicles. The big difference lies in the institutionalization and infrastructure EVDC brings to the party. With top automakers, battery suppliers, and the U.S. electric utility industry involved, the purchaser is assured of performance, service, warranty-protection, and the availability of replacement parts.

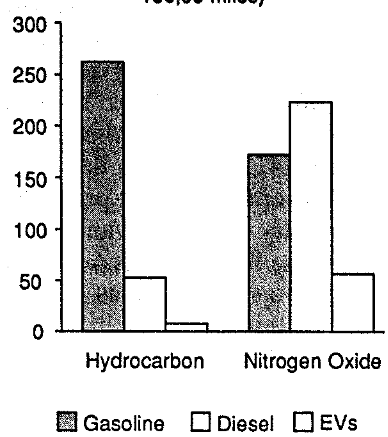
Utility interest in the electric vehicle is prompted by its potential, in widespread use, to substantially increase electricity sales with no increase in generating facilities. Because the batteries of electric vehicles would be charged at night, central power stations could be operated closer to full capacity around the clock.

Electric vehicles have the potential to substantially improve air quality, especially in areas like greater Los Angeles. Two-thirds of the air pollution there can be traced to mobile sources—primarily trucks, cars, and buses. Even when emissions from the electricity-generating power plant are factored in, an electric vehicle produces an almost negligible amount of hydrocarbon emissions compared to IC-engined vehicles. And nitrogen-oxide emissions are reduced by more than a factor of two. These facts explain the interest of air-quality groups, such as the Los Angeles Department of Water, Air & Power, in EVDC's program. □

**PROJECTED EV GROWTH**
Million Vehicle




**COMPARISON OF PASSENGER CAR EMISSIONS**
(Pounds/ 100,00 miles)



# DETROIT'S BIG WORRY FOR THE 1990s: THE GREENHOUSE EFFECT

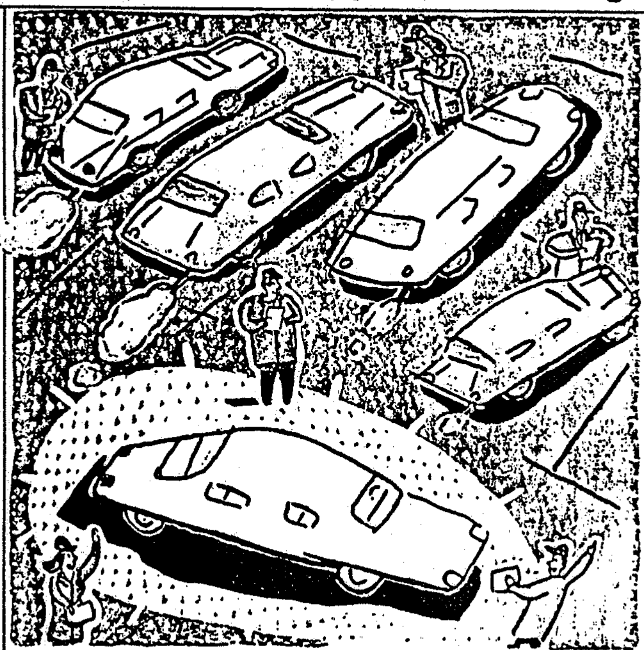
## Once again, the pressure is on to tackle the costly problem of lowering emissions

With the 1990 models about to debut, Detroit is still catering to America's appetite for big, fast cars. But now that policymakers from California to Washington are taking aim at air pollution and the global warming caused by the greenhouse effect, the auto companies—hard at work on their mid-1990s designs—are suddenly shifting their focus. "The party's over," says Robert A. Lutz, president of Chrysler Motors Corp. "We are making a mess out of our environment, and the sooner we clean it up, the better."

Cleaning up the mess won't be easy. While today's cars are a vast improvement over the gas-guzzlers of the 1960s, progress has stalled in the late 1980s. Lulled by the earlier plunge in oil prices and the hands-off environmental stance of the Reagan Administration, auto makers focused on making cars fun and powerful once again. Detroit pressured Washington to relax fleet fuel economy standards and met the looser goal only by spending billions of dollars to lure young, first-time buyers to small cars—all the while churning out big cars for all the other buyers who wanted them.

**TALL ORDER.** Now, manufacturers realize they'll have to resume work they began during the Energy Crisis of the 1970s to make cars cleaner and more efficient. This time, though, they face twin challenges, each requiring a different solution: reducing pollutants responsible for urban smog and improving fuel economy to cut emissions of carbon dioxide, a major contributor to global warming. That will be a tall order for U. S. carmakers who have been slower than their Japanese and European rivals to embrace some of the most promising technology.

Yet, political momentum is building for stringent new fuel economy standards. Senator Albert Gore Jr. (D-Tenn.) wants Congress to require the fuel economy standard to rise from a 27.5 miles-per-gallon average now to 45 by 2000. "It's not realistic," complains David L. Kulp, manager of fuel economy planning and compliance at Ford Motor Co. "The family car as we know it would not exist."



### A PEEK AT TOMORROW'S CLEANER CARS

| Improvements | Projected results* |
|---|---|
| **Engines** | |
| Reduced friction and improved combustion for existing designs | 8% to 10% better fuel economy |
| New multivalve designs | 5% to 10% better fuel economy |
| Two-cycle engines | 20% to 40% better economy; also allows smaller, lighter cars |
| **Transmissions** | |
| Electronic four-speed automatics | Extra 1 to 2 miles per gallon |
| **Body and styling** | |
| Sleeker undercarriage, rear end | Extra 2 to 3 miles per gallon |
| Lightweight plastic and metal panels and structures | Each 250-pound reduction saves 1 mile per gallon |
| **Catalytic converters** | |
| Metal replacing ceramic honeycomb, addition of electric preheaters | 30% less hydrocarbon emission, 10% less nitrogen oxide, 60% less carbon monoxide |
| **Fuel tank** | |
| Improved canisters for trapping vapors | 15% to 20% decline in gasoline vapors |

*Better fuel economy lowers $CO_2$ emissions

DATA: BW

Just as in the 1970s, Detroit's first target is cutting weight to reduce fuel consumption. So, auto makers are once more turning to aluminum and plastics. For instance, Cadillac's new aluminum V-8 engine is 100 pounds lighter than the cast-iron version. Other components such as suspension springs, oil pans, and fenders will increasingly be made of lightweight plastic composites. General Motors Corp.'s new minivan uses plastic body panels that are glued to a lightweight metal frame. The technique is much stronger than engineers expected and should yield significant weight savings in future models.

**TWO-CYCLE SWITCH.** More efficient engines are also on the way. Detroit is just now turning to engines with four valves per cylinder instead of two, an approach that can boost economy 5% to 10%. Such engines are standard on many Japanese cars, but GM is the only American company making a multivalve engine, a $660 option on some Oldsmobile and Pontiac models. Ford has boosted capital spending 30% to replace its entire engine lineup with improved designs in the next five to seven years.

The push for greater fuel economy and lower emissions may eventually bring a switch to two-cycle engines, long used in lawn mowers and motorcycles. The design produces 20% to 30% better fuel economy than conventional four-cycle engines. Though high emissions have long been a problem, Orbital Engine Co. of Australia says it has overcome it and will build two-cycle auto engines in an idled GM plant starting in 1993. GM plans to offer an Orbital-equipped model in the late 1990s. Ford is expected to make a similar move.

Electronic four-speed automatic transmissions that can be programmed to shift at the optimum engine speed and load can save one to two miles per gallon over conventional three-speeds. Another variety, the continuously variable transmission, uses a belt and pulleys to keep the engine working efficiently, regardless of the car's speed. Ford sells a version in Europe, and Subaru offers it here on its Justy car.

Auto makers also continue to improve aerodynamics: Chrysler designers are focusing on undercarriage obstructions—which account for a surprising amount of drag. The Eagle Premier, a boxy luxury sedan, has a smooth belly that greatly reduces drag.

**LOVE AFFAIR.** Tinkering with cars' smog-fighting technology will also help. Preliminary tests of an improved catalytic converter developed by the Environmental Protection Agency cut tail-pipe hydrocarbon emissions by 30% and nitrogen by 10%. And the Bush Administration's proposed revision to the Clean Air Act calls for better systems to trap evaporating gasoline and reroute the fumes to the engine for burning.

Older, poorly maintained cars will continue to be a major problem, however. About 10% of the cars on the road release half of the emissions, says the EPA. Usually, their catalytic converters have failed, overheated by something as simple as a misfiring spark plug.

The problem of old, heavily polluting cars prompted President Bush's call for manufacturing 1 million clean-fuel cars a year by the late 1990s. U. S. carmakers have built successful prototypes and say they are able to mass-produce the vehicles—at a $300 to $500 premium over gas models.

The push for a cleaner environment is clearly gathering force—and the carmakers, long loath to disrupt America's love affair with big cars, are beginning to respond. Detroit will face difficult technological challenges, but the next generation of autos should help everyone breathe a little easier.

*By David Woodruff in Detroit*

# California Team Develops New Battery With Up to 30% More Power Per Ounce

By Amal Kumar Naj
*Staff Reporter of* The Wall Street Journal

Materials scientists at the University of California at Berkeley claimed a major advance toward a new kind of solid-state, rechargeable battery that could generate as much as 30% more power per ounce than batteries currently used.

The researchers predicted that smaller and lighter "coin cells," such as those used in watches, calculators and cameras, could be available in two years. More powerful rechargeable cylindrical batteries, such as those used in power tools and flashlights, could be available in three to four years, they said. Eventually, they asserted, the new battery could make electric vehicles practical.

Specifically, the California researchers said they had developed a plastic version of the positive terminal, or cathode, that is far lighter and more efficient than the metal cathodes used in current batteries. The new cathode uses a type of chemical reaction to produce electric current that hasn't been used before.

"This cathode represents a unique electrochemical breakthrough," said Steven Visco, a materials scientist at the university's Lawrence Berkeley Laboratory in Berkeley, Calif.

The new cathode opens the way to solid-state batteries in which all three elements of the battery—the positive and negative terminals and the electrolyte—are a sandwich of thin films, producing an ultra-thin battery. Such batteries could be layered one atop another in a battery for an electric car, for example, to produce, when heated, as much power as today's auto batteries with half the weight. Such solid-state batteries would compete with lithium coin cell batteries, which consist of lithium terminals and a liquid electrolyte, and also with nickle-cadmium alkaline batteries, the California researchers said.

The new solid-state batteries would work on the same basic principles as all batteries. When the two terminals are in contact with an electrolyte, chemical reactions begin in which electrons released from the negative terminal, the anode, are attracted to the positive terminal, the cathode. A flow of electrons, an electric current, begins when a switch is thrown completing a circuit between the terminals.

The new batteries would utilize existing "cutting edge" materials for two parts, lithium films for the anodes and a polyethylene plastic film for the electrolyte.

The key development by the Berkeley scientists is a new material for the cathode. It consists of disulfide polymers, long chains of organic molecules each containing sulfur atoms. The chains are linked to each other by chemical bonds between their sulfur atoms. When the two terminals are in contact with the electrolyte, electrons released from the lithium anode break the sulfur bonds of the cathode, unlinking the chains, or "depolymerizing" them, and creating a flow of electrons. The current will continue to flow until all the sulfur bonds are broken and the chains ar unlinked.

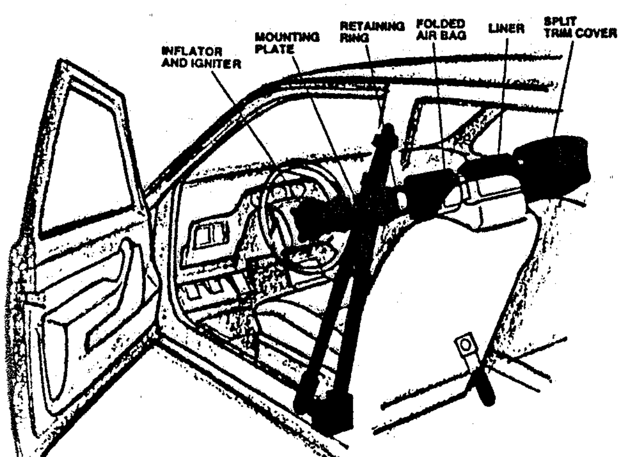
During recharge, when a current is applied from an external source, the electrons flow in the opposite direction, and the sulfur atoms rebond to each other, reforming the polymers. The researchers said this is the first time this depolymerization-polymerization phenomenon has been used in a battery, though it is a fundamental phenomenon in living tissues.

The new cathode enables a higher power output partly because the electrons can travel much faster between the terminals than they can when metal terminals and a liquid electrolyte are used.

Mr. Visco said another advantage of the polymer cathode is that the battery need not operate at high temperatures to deliver peak power. He noted that in electric vehicles, for instance, batteries must operate at 700 degrees Fahrenheit to deliver peak power. "Our battery needs only 176 degrees to 212 degrees to deliver peak power; that's below the boiling point of water," Mr. Visco said.

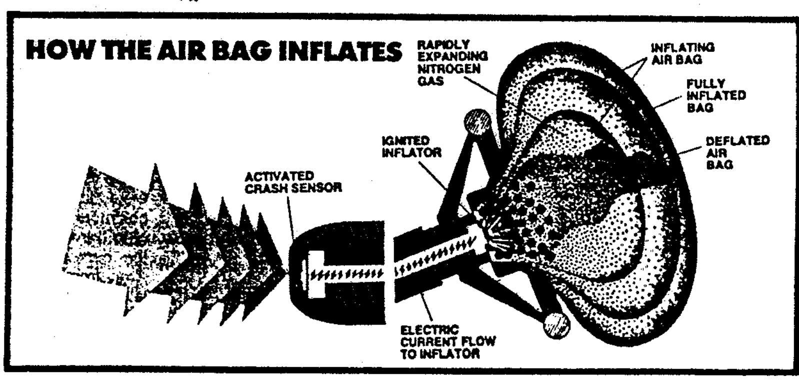
He also noted that unlike the materials used in current batteries, the materials used in the new battery aren't toxic and therefore pose less of an environmental problem. "That's important if we are going to have millions of electric cars one day," Mr. Visco said.

The solid-state batteries were invente by Lutgard C. De Jonghe and Mr. Visco, with assistance from other researchers.




## AIR BAG

This is the most publicized of all the passive restraint systems. In a collision, nylon bags stored in the steering-wheel hub and in a compartment in the dash inflate in a fraction of a second. Various sensors send electrical current to an igniter that produces enough nitrogen gas to instantly fill the bags. Driver's and passenger's heads are cushioned by the inflated bags. The bags then quickly deflate to allow the driver to maintain control of the car after impact. **Advantages:** Easiest system for the occupants to use; excellent protection in frontal collisions. **Disadvantages:** Poor protection in roll-overs, and secondary and side impacts; once used, the bag and igniter must be replaced.





## No pedalers

Juergen Brammer tests the solar-powered bicycle he developed with Paul Kunstmann in Kiel, West Germany. The bike, which requires no pedaling, can attain speeds of 28 miles an hour. Batteries give the rider three pedal-free hours on cloudy days.