

CURRENT EVENTS



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Promoting the use of electric vehicles since 1967

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NEW THIN VEHICLE TECHNOLOGY STILL UNDER COVER

Last year an amazing new electric vehicle technology came through Hangar 20 in Alameda. The EV design that we saw was so new that CE staff agreed not to divulge any details that were not already in the public domain. The design/inventor Rick Woodbury asked us not to write an feature article till he was ready to go public. That's alright with us, he promised to give use all the inside scup when the time is right. What we can do is give you a sneak preview based on what can be found on his own Internet sight (www.commutercars.com) and other public sources of information. The vehicle design is what is called Ultra Narrow Vehicle Technology. It is a freeway capable vehicle that can fit anywhere a motorcycle can. Ricks vehicle, called the Tango, has some of the feeling of the Corbin Sparrow but it goes one step further. The Tango is a four wheeled vehicle not a three wheeled motorcycle and it is designed to carry two passengers. The Tang is not just for commuting but also a performance vehicle. The key to the Tango is it's ultra low CG, you sit on top of the batteries. Ricks Tango is fast, his Web sight States that the Tango can accelerate through the standing 1/4 mile in 12 seconds at over 120 mph and travel from o to 60 mph in

under 4 seconds. The vehicles performance is also matched by an undisclosed high battery pack voltage. The idea is for the Tango to be fun to drive and also boost a high level of safety too. In fact the Tango's roll cage was designed to meet or exceed both SCCA and NHRA racing regulations. If what you are interested in is every day commuting you won't be disappointed ether. The Tango has a range of 80 miles on lead acid batteries and up to 150 miles on ad-

vanced batteries. When you get to your destination parking won't be a problem ether because the Tango has a foot print of only three by eight feet. So now you ask yourself if this car will ever get to market? Well unlike other "concept cars" the Tango will be first available as a Kit Car, this fact makes it much more likely that you will see it on the road soon. We hope we have caught your interest and you will be looking forward to our big feature article in the future.



In This Issue

- 1** Every now and then we come across a new direction in EV technology that can really change what we foresee will take place in the future. We at CE believe that Rick Woodbury's ultra narrow commuter car is just such a vehicle. Though we promised that we'd put off publishing our big lead story, we give you this sneak preview mostly derived from Rick's Home Page.
- 3** What CE readers want most is to hear about other members projects. The foundation of the EAA is members teaching members how to build EVs. Gary Dove's letter to the Editor is a good example of the EAA at work.
- 4** As a continuation of his ongoing column in CE Mike Brown shares with us part II of "What Kind of Car to Convert". As always Mike gets right down to the points that EAA members need to know most.
- 6** With a tribute most fitting for the beginning of the year, long time member Stan Skokan gives credit to those who have had a lasting impact in guiding the EAA. CE prints this article this month with the belief that the best way to understand what an organization is about is to know the people who have built it.
- 10** Always demonstrating the craft of writing in the best light, Bob Wing once again gives us his insight of past EV projects he has undertaken. Through the years his 1959 MGA was one of those cars that everybody dreamed of having.
- 12** Through the years the EAA has had it's share of controversy. It seems though that few topics stir debate as much as the practicality of solar powered cars. In his article "The End of OPEC ? " Jack Swartz lays the foundation to support his case for the solar powered commuter car.
- 14** While the solar powered everyday commuter car is not with us yet, the competition solar racer is. This month Charlie Garlow's article "American Solar Challenge is a call for EAA support across the country.
- 16** After an especially hard election EAA member Stan Skokan makes a plea to balance competition with co-operation. We hope as things settle down everyone will get a chance to read stan's article.
- 19** News in Brief - Seven more pages of the most interesting news releases we could find.
- 29** Member Want Ads - Why lease an expensive new EV when you can find a real bargain through our want ads?

PHOTO CREDIT - COVER

Rich Woobury's ultra narrow, freeway capable, commuter safty vehicle

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Letters to the Editor

Dear Editor:

I am an electronic manufacturer in San Luis Obispo. My company, Dove Systems, builds lighting control and other industrial control equipment. Several years ago I attended the Wescon electronics show in San Francisco. The EAA had a display of electric car conversions. Wow, I thought, this is really neat. I decided then and there to build an electric vehicle. I have always wanted a little sports car and the idea of having it be electric was perfect.

In December of 1994 I purchased a 1976 Fiat X-19 for \$100. I subscribed to Current EVents and purchased books and videos about EV's. Bob Schneeveis showed me his Fiat conversion. Since I am not an auto mechanic, I hired some engineering students from the local college to help me. They were race car enthusiasts, but interested in electric vehicles. We stripped down the Fiat to the bare body, and they made repairs to the frame. The brakes were reworked and battery compartments were built from fiberglass for eleven batteries. I ordered 12 lead acid batteries for 144 Volts, but they wouldn't all fit. An adapter plate and support was machined for the motor. I purchased the motor and batteries (Trojan SCS225) long before the car was ready for them. I was told that the batteries should be kept charged, however, they were not. They sat in a barn for two years while the car was being worked on. During this time the transmission was rebuilt with a new clutch, also added were new rims, new tires, and a host of hard-to-find parts, and the undercarriage was painted.

Finally, in December of 1999 my mechanics jumped one 12V battery directly on to the motor. They put it in gear, let out the clutch and drove around the block and up on to a flat bed trailer. We delivered my car to the auto-body shop for paint, molding, trim,

windshields, and more hardware and upholstery. On April 1, 2000 (my birthday) my electric blue Fiat was pushed down the street to my electronic shop, ready to be wired. For the next three weeks I wired all the controls. The motor controller, charger, circuit breakers, and assorted relays and indicators. The power control wiring was simple, but rewiring all the original car wiring was a challenge. I am a lights and gauges freak, so I rebuilt the dash panel with lots of gauges, lights, and switches.

On April 28th I flipped on the circuit breakers, stepped on the accelerator, and drove around our parking lot to the cheers of my employees. Registering the car at the DMV turned out to be easy until they asked to see the Federal Safety Sticker. I managed to find it finally in a pile of scrap parts. Then my Fiat became street legal.

I enjoyed driving around town and to work from home (15 Mi). My daughter drove the EV to her high school and demonstrated it to the auto class and her physics class. I even entered my EV in several local

car shows. At first I was not charging the batteries enough and not getting the performance I should. After several months even with a full charge I could not get much range before the voltage would drop and I would have to limp back home. I suspected the long storage period caused battery damage. I decided to replace all the batteries (now three years old) with a Sears Die Hard of similar size and rating. I now have much better performance and range. My next project is adding automatic shunt regulators on each battery to equalize the charge and monitor the voltage and temperature. I believe a converted electric car is the perfect commute vehicle. They are silent, fun to drive, inexpensive to operate, and, oh yes, I almost forgot, zero polluting.

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Continued on page 13



Gary Dove and his Fiat X-19 EV conversion.

CONVERSION WORKSHOP: WHAT KIND OF CAR TO CONVERT, PART II

BY MICHAEL P. BROWN

In the last installment of the Conversion Workshop, we started talking about choosing a car or truck to convert. In this installment, we will continue the process by discussing the make and model of the donor car, its age, accessories, and ease of conversion.

Make

The make of the donor vehicle has a lot to do with its suitability for conversion. Even though the conversion process eliminates most of the failure items in a vehicle by removing the gas or diesel engine and its support systems, there is still a need for replacement parts such as brake pads and shoes, brake cylinders and calipers, wheel bearings, and suspension parts.

Most of these parts can be bought from independent parts houses. Some can only be found at the manufacturer's dealerships. Having a dealership for your donor car in your immediate area is an important requirement for a conversion candidate. Just because Aunt Minnie has this Fiat behind the barn that she will give you doesn't make it a good choice for a conversion. When was the last time you saw a Fiat dealership? With no dealership representation, you are at the mercy of the mail order specialty parts houses, whose prices reflect the scarcity of the parts that they sell.

Model

Another factor in a car's convertibility, even if it was made by a major manufacturer with a dealer in your area, is the number of

that model that were sold. A high production, popular model is preferable to a model with low sales due to either limited production or unpopularity.

The reason for this concern with number of cars sold is simple: parts availability. The higher the number of cars of a certain model that are sold, the more likely the "aftermarket" parts manufacturers will tool up to supply the basic repair parts we men-

sive to buy new, or are unavailable due to the age of the car.

Also, the more cars or trucks of a suitable model that are sold, the bigger pool of potential donors you have.

The large number of imported cars sold in this country has led to the founding of auto repair shops that specialize in the service and repair of one or two makes of imported cars. These shops are a good source of information, parts, and service if your donor is one of the cars that they work on. They can also be the source of the donor itself because sometimes people give or sell a car to the repair shop rather than pay to repair or replace the engine. As I mentioned last time, this is also the place to take your donor car to be checked out for rust and mechanical condition.

Year

The age of a potential donor vehicle is important for a couple of reasons. In areas where rust is a problem, no vehicle lasts much longer than about ten years. This means that you won't have trouble finding parts for a converted car or truck simply because it is too old. The problem then becomes finding a rust-free car or truck, converting it, and keeping it rust free.

Where rust is not a problem, if you are converting a vehicle that is twenty to thirty years old, you should check availability of brake, chassis, and suspension parts and plan on replacing them because of the age of the car or truck. My parts suppliers tell me you can probably find parts for a thirty-year-



Electro Automotive's first Porsche conversion.

tioned earlier. The same is true for custom suspension parts, performance parts, and trim parts that might come in handy in the conversion process.

This numbers game also applies to the other source of parts, the junkyard-or, to call it by its new PC name, "the automotive recycler". The more cars of a certain model made, the more of them that end up being "recycled" through collision or failure of the engine or other expensive component. The recycler could be a good source of dealer-only parts that would be too expen-

old car if it was a popular model.

Unless you already own or are particularly attached to a certain older car, it is best to convert a vehicle that is no older than fifteen years old. There are several reasons for this. One is that it will be easier to find parts at reasonable prices, as discussed above.

Another reason is wear on the chassis, body work, and interior. A newer chassis will have fewer parts to replace prior to the conversion for safety and reliability. The cleaner a car is, the better the conversion will look without having to spend any money on paint and upholstery.

Perhaps the most important reason to convert a newer car is that the manufacturers are building better donor cars. Since 1985, manufacturers have had to meet the Corporate Average Fuel Economy (CAFE) standards. This means that in order to sell big gas guzzling cars without paying a penalty, they had to have a very fuel-efficient sub-compact car in their line to keep the fleet average within the standard.

In order to get the required gas mileage, in addition to tweaking the engine, a lot of attention was paid to things like air drag, rolling resistance, and brake drag. Pull out the engine and you have a very efficient donor chassis. In addition to the CAFE standards, better safety standards have improved the cars in the last few years.

Accessories

Another factor to consider when you are trying to determine whether a car or truck is a suitable conversion candidate is what accessories the vehicle has.

All cars and trucks are equipped with required items such as lights, windshield wipers, and turn signals. In a conversion, these are electrically powered by the auxiliary battery, which is kept charged by the DC-DC converter, which takes a minimal amount of current from the traction battery pack to do its job. Other electrically powered devices such as radios, tape decks, CD players, and even power windows can be accommodated.

With the maximum draw of these items known and the DC-DC converter and aux-

iliary battery sized to suit it, there is no reason for a vehicle's electrical needs to make it unsuitable for conversion.

Most of the cars and trucks that are suitable for conversion have power brakes due to the fact that they have disc brakes on at least the front wheels. This is good because of the battery weight we are adding to the car. This is easily accommodated with an electric vacuum pump, switch, and reservoir system.

Although the cars and trucks whose size and weight make them suitable for conversion don't need it, some of them come with power steering. This is usually done by the carmaker to add "content" to the car and justify a higher price for what is supposed to be an economy car.

There are two ways to go if your donor has power steering. The first way is to find a car or truck like yours in a wrecking yard with manual steering and buy all the parts needed to replace your vehicle's power steering.

The second way to is to keep the power steering and power it with an electric pump. Randy Holmquist of Canadian EVs has a kit developed to for this purpose. (You can contact him at 250-954-2230.)

Both options involve extra work and expense. The second option is more expensive, and also requires a second DC-DC converter to handle the extra amp draw of the pump. How you deal with power steering depends on you and your budget. Perhaps the best way is to pick a donor car or truck without it.

One of the most frequently asked questions we get when talking to people about conversions is, "What about air conditioning (AC)?" I realize that in some parts of the country AC is almost a necessity. However, the word on AC for the home built conversion is not good.

The single biggest problem is lack of space under the hood.

The second problem is the power required to run it. Whether you drive the AC from a second shaft on your drive motor, or from a separate motor, it will suck energy from your battery pack and greatly reduce range. This does not mean that you can't

have air conditioning in an EV. It has been done. It just means that you need to be prepared for the added complexity and loss of range and performance that go with it.

Converting a four-wheel drive (4WD) vehicle is a subject that comes up frequently. The problems with 4WD are increased weight and added drive train losses, both of which affect range and performance even when the 4WD vehicle is based on a sub-compact car or light truck. Also, if the 4WD is really used in the conditions it is intended for, you are probably dealing with a lot of wheel slippage, steep terrain, or high rolling resistance, all of which can drastically reduce range. Like the car with AC, this is a type of conversion that can be (and has been) done. But you need to know what you're getting into before you start.

Getting The Right Start

This article and the previous one both addressed one big, three-part question: how easy will your donor vehicle be to convert, maintain, and live with? Last time, we talked about honestly and realistically defining your mission for the vehicle, which will make it easy to live with on a daily basis. This time, we established criteria for selecting a donor chassis that will lead to fewer design compromises. The fewer compromises made, particularly in the areas of battery and component placement, the easier conversion and maintenance will be.

In the next installment of the Conversion Workshop we will get into the start of the hands-on part of the conversion process with the first step, which is removing the gas or diesel engine and its supporting components.

Mike Brown, electro@cruzio.com



A Tribute to EAA Volunteers

By Stan Skokan

By the time you read this issue of CE a newly elected slate of board members may be setting this organization on a new course. This issue of CE may be the last one published by long-time EAA member Kurt Bohan as editor and publisher. Many long-time EAA members consider the hard copy of CE essential to the existence of EAA as an organization. As you may have read in the board candidates statements, the "old" board is being challenged by some "new" EAA members.

For several years our organization has been losing valuable talent due mostly to old age and job burnout. It was becoming increasingly more difficult to continue the traditions established by EAA founders. Repeatedly we asked for volunteers to help with editing and publishing the newsletter, membership administration, chapter relations and new membership drive. Very few came forward to help.

Now a group of individuals wants to accomplish renewal by assuming "control" of the board. The outgoing board welcomes the influx of new ideas and new volunteer energy, but showing results may be harder than rhetoric. Running the organization with volunteers who meet only bimonthly is hard work, requiring dedication and bringing few rewards.

It is my duty as one of the senior members of the board to give credit to those who recently worked relentlessly on behalf of you EAA members and made a lasting impact on the EAA organization. Following is a list of recent volunteers at the EAA "headquarters". They are listed in alphabetical order with the year of joining EAA following their names:

Will Beckett, 94

Currently President of the Silicon Valley Chapter and our public relations guru. He is the organizer of the EAA Stanford rally. His connections with newsmen and politicians keep EAA on television screens and newspapers worldwide.

Clare Bell, 92

Formerly the CE Editor, Board Chairperson, female EV racing team member and activist. Her talent as a professional writer has been a great enhancement to our publication. Her command of the English language and writing skills made the editorial part of the CE publication a major success. We lost her services unexpectedly when she left us to pursue other EV related goals.

Harold Bell, early 70's

Past Board Chairman from Phoenix and Chapter Relations committee chair. He was the last active Chapter Relations person who frequently contacted all chapters and traveled around the country to visit them.

Kurt Bohan, late 60's

Long-time technical contributor, vehicle builder, SF and EB Chapter President and activist. When we lost Paul Brash, Sue Hollis and Clare Bell he undertook the most difficult and most important function of this organization. He brought his talent, enthusiasm, equipment, software and publishing experience to keep the newsletter going. He demonstrated journalistic impartiality and integrity during difficult times. With Tim Loree he founded the "Cars for Clean Air" program, which generates badly needed cash for EAA.

Anna Cornell, 85

A petite woman with a giant's heart. She was always willing to undertake more than one individual can handle. She worked as Activities Director, New Membership contact (800 number), Chapter Relations Chair, Rally Organizer, E-Bay Chapter President, Board Secretary and, lately, as Membership Secretary.

Scott Cornell, 81

Technical contributor, Chapter President, Board Secretary, Board Chair and Phoenix Solar and Electric 500 racer. He built several high quality EV's and was always ready to help others. His computer and telecommunications skills greatly contributed to EAA.

Tony Cygan, 93

Sacramento Chapter President, Board Chair, and quality EV conversion builder. He brought EAA to the Internet by designing and managing our first "eaaev.org" Website. The "eaaev.org" home page still carries Tony's original look and feel.

Don Gillis, 81

Long-time EV Builder, promoter, San Jose Chapter President and EV publications archivist. He was the first EAA "historian". For the last several years he generated income and EAA promotion with his EAA Store. Recently he established the EAA E-Commerce and on-line membership solicitation.

George Gless, 93

EV designer, builder, newsletter publisher. As one of the long distance Board members George drove to Board meetings

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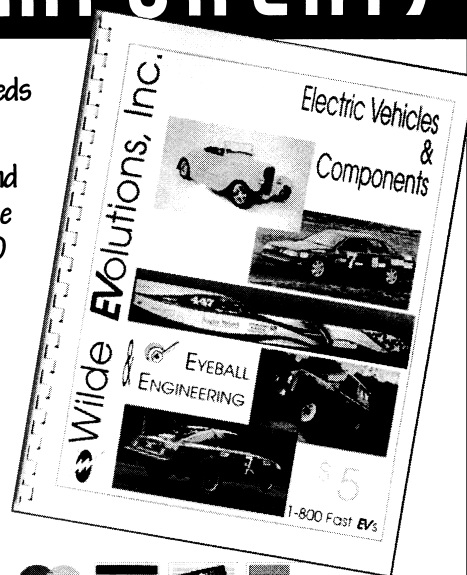
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from Colorado snow or sunshine. He supervised the EAA Awards programs and nominations.

Ed Holsinger,

Ed founded the EV Museum and brought it to many EAA public events. He encouraged Terry Wilson to become the EAA historian.

Roy Kaylor, late 60's

Longtime technical contributor, EV builder, EV record setter, S.V. Chapter President, Board member and businessman. He provided components and know-how to many of us. After Sue Hollis' departure he became our advertising accounts manager and is responsible for a portion of EAA income.

Tim Loree, 95

Sacramento Chapter President, educator, Board member and co-founder of the "Cars for clean Air" fundraiser program. He delivered the first check for a CfCA car.

June Munro, late 60's

For many years our extremely reliable Membership Secretary. A dedicated volunteer, responsible for years of EAA membership growth.

Bruce Parmenter, 94

Board member, EAA Webmaster, computer and communications guru. He took over the "eaaev.org" Website from Tony Cygan and maintains it today.

Terry Wilson, 96(98)

Self appointed EAA historian. He collects EAA historical and recent information and forms archives. Provides archive information to members and attends Board meetings. Works with other EV museums.

Stan Skokan



SHOP AT THE EAA STORE SEE PAGE 31

Help Support ZEV while you Eat

Looking for a good EV outing? If you live in Concord California you could go out to dinner and support ZEV at the same time. It's simple, just make your next EV trip out to dinner at T.R.'s Restaurant in Concord. T.R.'s is owned by Contra Costa County supervisor and restaurant owner Mark Desaulnier. Mark was appointed to the CARB board by Gov. Pete Wilson in 1994. For Mark the zero emission vehicle program is an example of what "smart growth is supposed to be all about - changing the way we plan our communities so they are sustainable". So if you live close to Concord, help support people who think the same way we do by making your next EV trip out to eat at T.R.'s Restaurant!

A CALL FOR LETTERS TO THE EDITOR

Read something in CE you would like to comment on? Do you feel something is being left out? Send us a "Letters to the Editor". You can E-mail us, Fax us or use snail mail at the addresses below:

E-mail: eaanews@aol.com

Fax: 510-864-9293

-or- Snail mail at:

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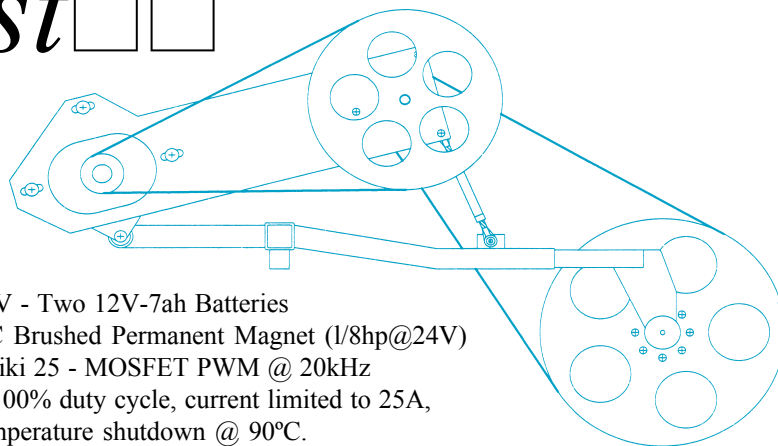
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For folks interested in **baking from scratch**, here is a list of circuits of my '95 homebuilt Electro-Metro with associated experiments, published previously in the **DEVC**. The **schematics** are \$2 per page, and the software (3.5" floppy) for projects using a microprocessor is \$10. For those who want a **pre-programmed microprocessor chip**, they are \$25.

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- **Surround Sound** Demystified, shows simple hook-up for surround sound.....(1 pg)
- 200 W Class-D amp 95% efficient **audio amp** for batt applications.....(2pgs)

CONVERSION OF A MGA TO A ZERO POLLUTION ELECTRIC CAR

By Bob Wing

I now look back on the great gas shortage of 1973, with its long lines at service stations and rising fuel costs, as a positive influence. It motivated me to act on a long-standing desire to have a battery powered electric car for local travel. My job in Menlo Park, California was 1/2 mile from home and offered an ideal situation for electric vehicle application. But I did not want just any electric vehicle, I wanted a rag top, something that did not look like other small sport cars on the road. Then I stumbled across a promising listing in a trade paper: \$100 for a '59 MGA roadster, or what was left of it after two inoperative MGAs were rebuilt into one operational gas car. Since an internal combustion engine was not required and the body was straight, it was just the right car for my conversion plan.

Now that I had made my electric vehicle commitment it was time to obtain some expert opinion. I'd been thinking about joining the Electric Auto Association for some months and now it was time to take action. At monthly chapter meetings and rallies I was able to get enough information and helpful suggestions to proceed. Many ideas were of course contradictory but one could see operating EVs with different controls, battery count and motors.

Armed with my newly acquired knowledge I started my conversion project. I cleared the engine compartment, rebuilt the brake system, replaced the worn differential, removed the spare tire (since battery

space was limited), gas tank, heater and other parts not needed. As this is a British car the Lucas wiring had deteriorated and needed replacement. I saved the gas tank in case a hybrid engine or heater was needed later.

I knew that on occasion I was bound to find myself on the road with dead batteries. MGAs are notoriously hard to find any part of the frame for towing support. However it was possible to make a false front axle of 1 1/2 inch galvanized pipe with caps at each end and attached it with "U" bolts to the front bumper supports. This false axle made a secure connection for a VW tow bar. I've towed the MGA over 3000 miles N and S Interstate 5.

Next, I collected all the mechanical and electrical parts required for the conversion except for the batteries. I purchased them last so they would be fresh. (Always insist that all the batteries are from the same batch on the same manufacturing date.) Now was the time to plan for the location of the wiring, motor mounts, controller, on-board battery charger and batteries. Batteries should be mounted outside the passenger compartment for the safety of the occupants.

My first traction motor was a surplus aircraft starter-generator and 200 amp contactors (relays) from wing-flap controllers, with a 24/48 volt series/parallel battery pack. Speed control and range were not satisfactory on my electric MGA. But four

motors and three controllers later I found the optimum system I wanted: 14 Trojan 6-volt golf cart batteries with a range of 24 miles between charges. The traction motor was mounted on an adaptor plate on the clutch bell housing with the flywheel mounted on the electric motor shaft. The 5-speed gear box was kept for a safety mechanical disconnect and to reverse without the use of another relay as contactors are troublesome. Most of my forward driving is done in 2d and 3rd gear, 1st being used for steep hills. My MGA can reach 25 mph in 2nd, 45 in 3rd and 63 in 4th on the level ground. I don't use the clutch when starting or stopping, only when shifting. If the entire battery pack is connected directly across the motor without a current limiting device something is going to break and it is usually one or both drive axles due to the high starting torque of an electric motor.

Before I found my optimum system I went through three motor-generators. The first two were very cheap and had been used in a mechanical experiment as I found out later. The drive shafts had been twisted off and the seller had welded on a new ones. When power was applied under load the motor sounded like a police siren as the armature rubbed the stator. I had to coast any time a police car came into view. The third used starter-generator had very noisy brushes and the most efficient speed was 7000 rpm, which was beyond the red-line on the MGA. Finally, I installed a solid state

controller and a new 20 hp Prestolite motor designed for EV application. If I had installed it initially many hours and dollars would have been saved. The result of my research and effort is now a valuable second car, useful for errands. Occasionally I have to borrow a cup of electricity to get home but I have never had to grind the valves, install a timing belt, change the oil, install a new starter or alternator.

Moving to Oregon in 1979 with California plates made it difficult to meet any one outside of business contacts. But I was invited to show the MGA at the Seattle 1979 Environmental Faire for six days and appeared on a 1/2 hour TV interview which included a video of the car being driven to the Faire. The Bonneville Power Administration had an ElectraVan there also. About 260 people left their names and addresses indicating interest in joining an electric vehicle club. But it was impractical for me to be active in a new group as I lived 170 miles south. The Seattle Electric Vehicle Association was being formed so I gave the organizers my list and this group is still functioning today and is affiliated with the EAA. I still try to get to the annual Seattle EV rally as there are always new EV ideas and old friends to see.

My MGA has been shown at various shopping centers and on the Oregon PBS TV stations. Nearer my home I organized a Salem Chapter of the EAA with monthly meetings and a quarterly workshop on Saturday mornings in my garage. I found a '73 Subaru coupe with a blown engine and with volunteer help from the EAA members we completed the conversion. In time I founded additional EAA chapters in Portland, Albany-Corvallis and Medford.

In 1982 we moved to Inverness north of San Francisco and towed three EVs, one at a time, 600+ miles south. My electric cars had 14 6-Volt batteries with maximum range at 75 degrees F of 25 miles on a charge. An ambient temperature of 40 degrees F cuts the range about in half if there is any hill climbing unless the recharging is done just prior to use to warm the batteries. The MGA gets two miles per kilowatt-hour and at our present rate that is 7.9 cents per

mile. With only one moving part in the motor, maintenance is minimal but water must be added to the batteries or at least checked monthly. It is really a pleasure to go to the gas station only to get air for the tires.

I usually used the MGA each day to pick up the mail at the Post Office or for other errands. There are lots of day visitors in the area since we are surrounded by Point Reyes National Seashore and the Tomales Bay State Park. Some people stop to shop in Inverness and immediately notice the quiet operation of the MGA. At least one person a week says "Is that a '59, I had one just like that." I have to respond "no, not just like mine." They insist and then I open the hood.

The electric vehicle cost \$4500 to complete over a five year period, in today's market it could be \$8,000, less you find a used EV for parts. There were no finance charges as the monthly payments consisted of buying parts.

The traction batteries have lasted 7 to 9 years but the replacement can be a major expense. But one always hopes for a new light-weight battery which will permit twice the mileage at half the weight. The MGA with gasoline engine weighed 1,995 pounds while the electric version weighed in at 2,950.

For those of you who have solar, hydraulic or wind power the EV can be used as the supplementary battery pack for your home. The EV is also useful for emergency power. In west Marin county we lost commercial power for four days during the 1982 storm and 6-8 hour blackouts occur each year. During the blackout I run 100-watt reading lights in the house from the traction battery pack.

Car conversions to battery operation can be accomplished by most anyone who can use common tools with some technical skill. Perhaps the quickest way to obtain the technical help is to join the Electric Auto Association, Membership is \$39 per year.

The future of EVs is now much more promising in California with the Air Quality Management Control Districts setting standards to reduce air pollution. Of the 23 million registered motor vehicles in California, about 4,000 are registered as electrics

according to the California Department of Motor Vehicles. High power density batteries at a reasonable price are still at least five years away we are told — but the battery industry has been telling us that for at least five decades. Now, at least the four year \$260 million public-private venture has been funded to develop better batteries. The United States Advanced Battery Consortium is one of several joint research projects recently initiated by Chrysler, General Motors, Ford and the Electric Power Research Institute, with the U.S. Department of Energy providing one half of the funding. Before 1915 more than one-half of all the motor cars on the road were electrics. I can't help but wonder when we will see that ratio in the urban areas again, but improved batteries at reasonable cost could speed the change from internal combustion to electric vehicles.

The final configuration of the MGA is as follows:

Driving EV '59 MGA Roadster since 1972, now with Prestolite 4001 motor, Zapi H2 400 A controller in E-pump mode, no contactor required, 20-12 VDC Optima deep-cycle batteries in buddy pairs at 120 VDC, E-Meter, beta-testing Zivan 'Smoother' battery equalizer (First one in USA on the road), both Russco 120 Vac and Zivan NG3 240 Vac chargers on same 30 A 240 V circuit.

My electric '59 MGA Roadster was sold on Jan 30, 1999 to Dean Grannes, 1081 Booner Ave, Fremont CA 94536. <<dean.grannes@intel.com>. The MGA could not have a better home and I have vitising rights.

Bob Wing, Media Correspondent, EV Consultant
POB 277, Inverness CA 94937-0277
Phone:.....(415)669-7402
Fax:.....(415)669-7407
E-Mail:....bwing@svn.net

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The end of OPEC ?

By Jack Swartz

Is it the beginning of the end of OPEC? Renewable Energy is becoming more and more in evidence in our daily lives. We see windmills, solar energy in more abundance and even solar powered vehicles occasionally. Over the past several years perhaps hundreds of solar powered trips have been made across Australia participating in the solar car races. This last summer a car made a trip coast to coast across Canada, a trip of 4000 miles more or less. To be sure, these cars are highly sophisticated and are not what one would consider to be a daily transportation vehicle. They are capable of high-sustained speeds, averaging 49 miles per hour for the complete 1800-mile trip. Recently a series of solar powered light utility vehicles were announced for sale in Holland.

I presently gather more solar energy than I have used over the past year to drive my electric cars. The GM EV-1 has about 9,000 miles over the past year and is by far the largest user. My solar panel setup is somewhat small, but the data shows more than 13,000 amp hours at 52 volts have been accumulated in the last 5 months. This system does not have MPPT and as such is losing as much as 20% of its power generating capability. MPPT is discussed later to a limited extent and will be analyzed in more detail in a later article. The system also has fixed arrays of different types. I have been evaluating various types of panels. Movable arrays help gather more energy versus the time of day. I have worked on this problem in a sporadic manner, it has a lower priority at the present time.

There are several other electric car owners I know that also charge their cars with solar panels. The "Real Goods" store

in Hopland, Ca. offers renewable energy conductive charging using a combination of solar and windmill generation. I have charged my EV-1 there using a portable inductive charger. At the same site there is a separate 132,000 kw. solar gathering array, a monster in size.

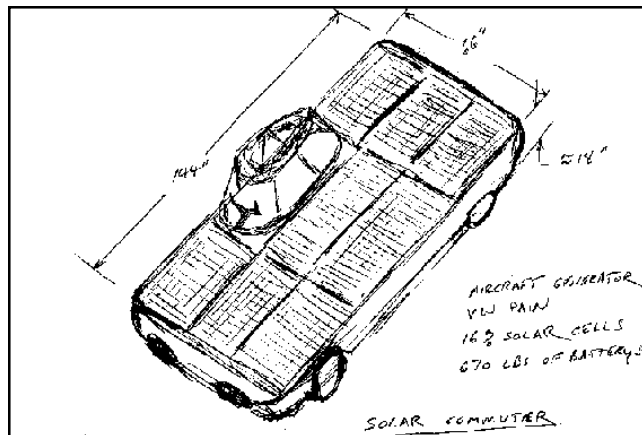
I have read of various people mounting solar panels on their vehicles to improve range by charging the batteries of their

with periods of standby for working, eating, site seeing, shopping, meetings, etc. This standby time is considered as an input for the computer simulation. It is assumed that the vehicle can be made to automatically charge any time the sun is shining without operator intervention. So that a typical daily commute might have an hour or more of driving time with eight hours standby with time before and after work in the sun. The car was to be parked in the sun during solar standby and to be in the sun during commute time. There may be many variations of these time sequences and the program can be used to simulate any combination. Obviously the car may pass through shadows or it may be cloudy where solar gathering is not at maximum. Because we live in an area where the sun shines much of the time I assume and have measured a large solar insolation on the solar panels most of the time.

I bought a used electric car to test these assumptions. It isn't the best car to test these ideas, but it was low cost, (\$500). It is a 1981 Electra Van modified to be electric by Jet Industries (now defunct). The car is what I call a micro van, having a 20 square foot frontal area with a Cd which I assumed to be 0.4. The rolling resistance is still being analyzed and was recently measured at about 30 lbs tow bar pull. I think this can be improved and am working on this parameter. The car has a 4 speed manual transmission and a 20 HP GE series motor. The car has 17 ea. 6 volt lead acid batteries of unknown vintage. The car is a driver, but I haven't done a battery load test yet. I may purchase a new set of batteries to have a known quantity.

The car has undergone some weight reduction and more is in store. The very large battery charger has been removed (85 lbs.). Some heavy steel panels have been replaced by aluminum.

I mounted 6 ea. 75 watt panels on the roof in a plane parallel with the road. I measure very close to the advertised power output in bright sun at morning to afternoon. At maximum power, this amounts to



A Flat-Top Carrier design solar car

electric cars. I decided to analyze the practicability of this idea. I wrote a program to determine the various critical parameters. Rolling resistance, weight and the most critical parameter of all, wind resistance, were factored. Energy consumption was determined for acceleration rates, speed, and energy required to ascend a 1000 foot elevation. Battery capacity and solar gathering capacity were inputs as was power to operate blowers, contactors, electronics, etc. The final output of the simulation program is a prediction of range under these various assumptions.

Any journey whether a local commute or a longer distanced journey is interspersed

about 450 watts. The panels were some that I had on hand, not the most efficient nor the biggest panels. These panels were probably of the 14% conversion variety. The actual array size is about 0.613 square meters although the area is not 100% utilized because of the rounded comers of the semiconductor so that at 1000W/square meter of insolation, the output is approximately 75 watts.

Solar panel technology is changing, panels of 14% efficiency are being replaced with higher efficiencies. Efficiencies of 17% and higher are available with up to 27% having been reported. The higher efficiency panels are more expensive. A competitively priced panel of 85 watts will next be investigated as will be a larger sized 120 watt panel.

Some time has been spent understanding and designing a primitive MPPT (Maximum Power Point Tracking) unit. These electronics are required to optimally mach the temperature varying solar panel output to the battery voltage. As the temperature rises the voltage output lowers. As the solar panel voltage lowers the current drops radically. An offset voltage has to be introduced to maximally extract power from the already low power output. The electronics I have now are set manually. In the future the electronics will have automatic control. The MPPT unit also contains a DC-DC converter for the auxiliary battery.

The car is not yet in final form, but at this point should be considered a test vehicle. The final vehicle will be a purpose built highly aerodynamic car of small frontal area and much lower weight. The present car is to be used to test the computer simulation and the concept of using solar power to provide the charging source for the batteries. The van hasn't had a charge from the utility company since August, before solar panel installation. At his writing it is mid-November. I haven't driven it much, other than to give numerous test and demonstrations rides around Hangar 20, spending most of the time modifying, testing and converting the car.

So far so good, the computer simulation accurately simulates my EV-1. The test

van has too high a rolling resistance but I have a fix in mind, the batteries are unknown and need to be either replaced or load tested to confirm their status. The MPPT needs more work. I won't put much energy into modeling the new car body until these items are better under stood. In following articles I expect to report more test results. The computer simulation suggests that I can expect to have a robust roadworthy car that can be driven indefinitely with typical rest or standby times without ever needing a charge from an external source. That doesn't mean it can be driven 100MPH

for hours on end nor can I drive it 4,000 miles at one sitting, but if the car is driven as I typically drive a car, it will never need external charging.

And there is more, there is an airplane which flies indefinitely, 24 hours per day, on solar power! I'll say more next article.

No need for OPEC to worry quite yet, but their days are numbered! These technologies can be applied to many different transportation types.

Jack Swartz <ECOL2000@aol.com>

Letters To The Editor *Continued from page 3*

1976 Fiat X-19 Electric Conversion

Owner/Builder Gary Dove

Motor:	Advanced DC Motors Model FBN-4001 Series Wound 30HP/85HP peak, 700 Amps, 96-144 Volts
Batteries:	11 Lead Acid 12Volt Marine Deep Cycle, 132 Volt Total Sears Die Hard Group 29HP, 1 Sears GC for 12 Volt system
Controller:	Auburn Scientific PC800-144 MosFet 15KHz 144 Volt, 800 Amp
Charger:	Custom built off-the-line SCR full wave rectifier. Three Phase: 120/208V 60 Amp total Single Phase: 120/240V 40 Amp total Single Phase 115/120 V 20 Amp total, half wave
Weight:	2690 pounds (safety sticker originally 2590 lbs.)
Distance:	50 Mi estimate
Speed:	85 MPH, maybe more
Meters:	E-Meter: Cruising Equipment Tachometer and Speedometer: Westberg Ammeters: Westberg 500A, automotive 60A for 12V system Voltmeters, Westberg 150V, digital 200V, automotive 15V Thermometers, analog 250F motor temp, digital, dual battery/outside temp Hourmeter, elapsed time on motor (under power)
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American Solar Challenge Cruises Route 66 in Summer 2001 EAA members encouraged to support Solar electric vehicle run

By Charlie Garlow

The American Solar Challenge will race across a new stretch of the USA from July 15 - 25, 2001. Akin to the Sunrayce event sponsored by GM, EDS and others, the American Solar Challenge racers will blast their college and other solar cars across the western US, in a Chicago to Los Angeles, via Las Vegas route. Following old Route 66 on a nostalgic summer trip, this run will be more challenging than previous Sunrayces, which have used flatter routes, because of the Rocky Mountains. GM dropped out of sponsoring this event, thus the new name. DOE, EDS and others are current sponsors. EAA should co-sponsor with in-kind contributions from our chapters and members.

This solar race will be a terrific opportunity for EAA chapters and individual members to come out and see the "eye popping" solar cars, to do advance press work to get others to come out and see them, and to show off their own electric and solar cars. What a way to educate the public and build EAA membership !

EAA members are encouraged to talk with, help to cosponsor and otherwise help get their local college and other solar car teams to get ready for the American Solar Challenge. Race teams from 38 colleges are already signed up. The deadline for signing up is June 1, 2001. Raise money, raise consciousness and raise spirits [of whatever octane you prefer] for your local solar teams. Get on radio talk shows with team members, work the press.

For those who live along Route 66, get ready to throw out the welcome rug. Our local EAA chapters in NM, AZ and CA might want to sponsor Feasts, Parties, swimming pools, and Events to accompany the arrival of the ASC racers. How about if our IL, OK and MO members formed a new chapter and sponsored an event? That will boost interest in clean electric transportation and will be a great way to thank the participants for putting forth the effort to race. The route is through IL, MO, OK, NM, AZ & CA.

Visit www.formulasun.org/asc/teams to see if a solar team near you is participating. Teams from New England to California, from Canada to Alabama are in the race already. Get in touch and offer to help.

Here are some more ideas to build this event. Bring or build a solar bicycle or solar electric go-cart to some of the stops along the way. Bring your Junior Solar Sprint racers for a JSS race! Sponsor your boy or girl scout troupe to follow the race for a portion or all of the route. What else more exciting than this are you doing with your summer vacation? Email me with the ways you plan to help, and I will prepare an update to this article on what EAA members are doing, in hopes of inspiring more of us to do even more.

charlie.garlow@juno.com
Tel: (301)593-9823

Charlie is the proud owner of a 1997 electric Chevy S-10 pickup truck.

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Contact information:

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Alameda, CA 94501
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Fax (510) 864-9293
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Tel. (916) 967-3044
Fax (916) 863-0303
E-mail: loreet@2xtreme.net

Competition Versus Co-operation

By Stan Skokan

The Free Enterprise system is driven by competition and co-operation. Public office elections are also driven by competition. This year we are witnessing contested presidential elections in Florida.

It seems, to some people in this Country, that winning is everything. It seems our election system has to have a winner and a loser. On the other hand, the polls show many people are tired of protracted bickering. What do we do when the election is a statistical tie, meaning the number of votes separating the winner from loser is less than the errors of counting. The most desirable solution would be to admit that the opponents are equal and share the power of political office 50/50. Somehow our Constitutional forefathers did not think of that. Do we want balance of power or one way biased government? Do we want harmony or endless struggle?

What is really the difference between competition and co-operation? In competition, there is one winner and one loser. In co-operation, there are two winners. In the Florida election, it appears, there will be two losers.

That brings me back to EAA. Some members of this organization believe "stir-

ring the pot will make for faster progress". That is, if you ignore the pain and damage done to the organization. Other members believe in fierce competition as we have seen in the last two years at some Board meetings. I hope, by the time the results of Board elections are counted and the new Board meets to do business, we will find ways how to convert the competition into co-operation. This organization cannot afford otherwise.

To the members of the Silicon Valley and San Jose Chapters I would like to mention the San Jose Mercury News. At a time when many printed newspapers are struggling and getting out of business under the pressure of the electronic information age, the SJ Mercury is flourishing. It is one of the few newspapers in the country, that has found the perfect balance between print and electronic publishing. The two sides of publishing live in a perfect co-operative harmony. They enhance each other, they complement each other. There is no competitive contest of any kind visible. They are part of one organization.

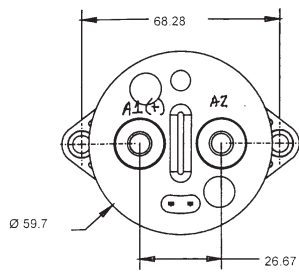
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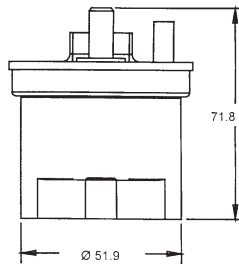
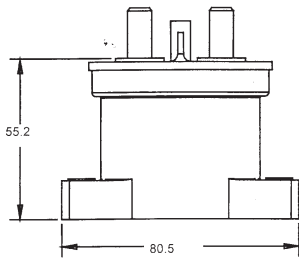
For those unfortunates who aren't members and did not receive this excellent survey of EVs and HEVs available by the year 2000, JOIN EAA NOW! and order a copy via the EAA store order form, conveniently located on p. 23.



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Events Calendar

March 4-6

California World Truck Conference, Monterey, CA. A technical forum bringing together participants from academia, industry, government and regulatory agencies to discuss the environmental impacts of trucking.

Contact: California Trucking Assn.
Phone: 916/373-3500
Fax: 916/373-3636

March 5-8

SAE World Congress, Detroit, Michigan. Focus of the 2001 conference is industry partnering in today's competitive/cooperative environment.

Contact: SAE
Phone: (877)SAE-CONG
Fax: (724)776-1830
Web Site: www.sae.org

March 5-8

18th International Seminar & Expo on Primary and Secondary Batterys, Fort Lauderdale, Florida. An international conference on the current status and future outlook of primary and secondary battery technology and application.

Contact: Thomas DeVita, Florida Educational Seminars
Phone: (561)367-0193
Fax: (561)367-8429
Web Site: www.POWERSOURCES.net
propulsion technologies and fuels for heavy-duty vehicles as we head into the 21st century
Contact: Susan Romeo, WestStart
Phone: (626)744-5600
Fax: (626)744-5610
E-mail: sromeo@calstart.org
Web Site: www.calstart.org

April 16-19

Beijing International PSE on Electric Vehicles, Clean Cars Technology. Beijing, China. Conference on electric and alternative fuel vehicle technologies with emphasis on automotive technology in China.

Contact: Ms. Yun Liu
Tel: 86 10 68321889 Fax: 86 10 68344994
E-mail: gcchb@bj.col.com.cn

April 27-28

6th Annual EV Challenge. Contact: Ralph Goodwin at: (519) 546-6551
Web: www.evchallenge.org

May 2-5

Canadian Electric Vehicle Conference 2001, Kelowna, BC CANADA. Annual conference of the Canadian EVAC, EXHIBIT OPPORTUNITIES

Contact: Tom Lewison, EVAC
Phone: (613)723-3127
Fax: (613)723-8275
E-mail: evac@evac.ca
Web Site: www.evac.ca

May 13-16

National Clean Cities Conference, Philadelphia, Pennsylvania. Annual meeting of the Clean Cities. EXHIBIT OPPORTUNITIES AVAILABLE

Contact: Clean Cities Program
Phone: 1-800-CCITIES (1-800/224-8437)
Web Site: www.ccities.doe.gov/conference.shtml

May 19-26

NESEA Tour de Sol, Boston, Massachusetts. Thirteenth annual road rally for electric vehicles will run from Waterbury Conn. and end in Boston, Mass.

Contact: Nancy Hazard, NESEA
Phone: (413)774-6051
Fax: (413)774-6053
E-mail: nhazard@nesea.org
Web Site: <http://www.nesea.org/>

June 4-7

ITS 2001, Miami Beach, Florida. Eleventh annual ITS America meeting and expo. EXHIBIT OPPORTUNITIES AVAILABLE.

Contact: ITS America
Phone: (202)484-4847
Fax: (202)484-3483
Web Site: <http://www.itsa.org/>

June 4-5

Electric: The Smart Solution, San Diego, California. EPRI national conference focusing on new technologies in non-road electric vehicles. EXHIBIT OPPORTUNITIES AVAILABLE

Contact: Marsha Grossman, EPRI
Phone: (650)855-2000
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News in Brief

Compiled by Ruth M. Shipley from information provided by EIN Publishing, Inc. If reprinted, please credit Current Events.

Japan Launches EV Time-Sharing Program

The Japan Electric Vehicle Company recently began tests of an EV time-share program in Kyoto. More than 300 people are participating in the program, which allows drivers to reserve EVs over the Internet. The program uses 35 EVs manufactured by Toyota and Nissan, and is the first such vehicle management effort to involve both companies. Drivers use "smart" cards to confirm vehicle reservations, as well as to start their car. Program officials will collect information that will allow them to make the most efficient use of the EVs, as well as to keep use of the program's six service centers spread evenly. "The way we use cars may change in the 21st century due to environmental considerations," said Toyota official Kohei Koide. "We want to study a new approach beforehand." A goal of the program will be to ensure the vehicles will be used throughout the day. Officials say an EV time-sharing scheme could actually turn a profit if each vehicle is used at least five times throughout the day, and if advertising concessions can generate revenue.

(NIKKEI ENGLISH NEWS: 12/20)

CARB Proposal Could Loosen ZEV Mandate

The California Air Resources Board (CARB) recently introduced a proposal that would allow hybrid electric vehicles (HEVs) and other alternative fuel vehicles (AFVs) to qualify as zero-emission vehicles (ZEVs) under the state's upcoming ZEV mandate. The agency will vote on the proposal next year. Currently, CARB's ZEV mandate requires ZEVs to make up four percent of annual sales in California by 2003. Under CARB's new proposal, the four percent

requirement would be split between ZEVs and AFVs that are powered by alternative energy technologies, including natural gas, fuel cells and hybrid electric drivetrains. Environmental groups in the state have criticized the proposal, saying that it slows the commercial and technical development of EVs. Many feel that in order for battery-powered EVs to become a viable and cost-effective transportation solution for Californians, EV production must increase. Officials said CARB's proposal would reduce the number of battery-powered EVs required by 2003 from 22,000 to 4,650. Many automakers feel CARB's existing ZEV mandate will force them to produce an "expensive technology with low environmental benefits [for] consumers who don't want it."

(AP: 12/8)

EVI Joins NRC, UOG on Fuel Cell Project

Energy Ventures, Inc. (EVI) recently announced that the Natural Research Council Canada (NRC) has approved a three-year, \$1.5-million Canadian (about \$989,669 U.S.) fuel cell project. EVI will conduct the project with NRC and the University of Guelph (UOG). EVI said the technical program for the project involves EVI, NRC's Institute for Chemical Process and Environmental Technology and its Steacie Institute for Molecular Science, and UOG. EVI will contribute \$120,000 Canadian (about \$79,100 U.S.) in cash and \$204,000 Canadian (about \$134,000 U.S.) in staff and equipment over the next three years. The project will be "ready to begin" when a collaborative agreement among the three parties has been finalized and executed. The goal of the project is to maximize the utilization of noble metal catalysts and further improve the performance of EVI's Direct Methanol Fuel Cell (DMFC). The company said the project, titled "Improved Anodes for DMFC," will complement EVI's fuel cell product development program and will offer the potential for product improvements. EVI is a portable power technology

developer and integrator with activities in DMFC and rechargeable battery technology.

(EVI RELEASE: 12/7)

Toyota Announces Successful Prius Sales

Toyota Motor Corporation recently announced that sales of its Prius hybrid electric vehicles have gone beyond the 50,000 mark worldwide. The company said more than 45,000 Prius four-door sedans had been sold in Japan as of November, 2000. The vehicles first went on sale in Japan in 1997. Since its debut in the United States in July, cumulative sales have grown to 4,631 units, not including outstanding orders for some 3,000 units, the company said. The Prius entered the European market in September and has since sold 549 units. Toyota said the Prius has become very popular in Sweden and Switzerland as well.

(KYODO: 12/13)

Ford Rejects Gasoline as Hydrogen Source

Ford Motor Company recently announced that it has rejected the idea of extracting hydrogen from gasoline to run fuel cell vehicles (FCVs). Ford Director of Environmental Vehicles John Wallace said the company is planning on developing a fuel cell-powered vehicle that utilizes a hydrogen storage system rather than an on-board conversion system to fuel the vehicle. There are currently three developing methods for supplying hydrogen to fuel cells. These include converting gasoline to hydrogen fuel, extracting hydrogen from methanol and the use of an on-board storage tank supplied by an external hydrogen source. Wallace said the company had rejected the development of gasoline-derived hydrogen because the technology only offers a fuel economy similar to that of existing hybrid vehicles. Additionally, Ford is working with DaimlerChrysler, who has also rejected the gasoline conversion system, to develop other fuel cell technologies.

(NIHON KEZAI SHIMBUN: 12/8)

Alameda Post Office to Use EVs

The city of Alameda, CA was recently chosen as a postal test site for 20 all-electric cargo vehicles. Alameda Power and Telecom has offered financial assistance with the project. Based on how effective the vehicles are in saving time and money, additional EVs will replace existing gasoline-powered vehicles in fleets in San Francisco, Alameda and Santa Clara counties. The United States Postal Service (USPS) made the largest ever purchase of EVs last December — buying 500 of the Ford-designed cargo vans. Zero-emission vehicles (ZEVs) are being tested in Washington D.C., California and Virginia and may eventually replace the postal service's 207,681 delivery vehicles nationwide, sources said. Postal carriers reportedly enjoy the ZEVs. They're cooler in the summer with less engine heat, and there are no fumes. The vehicles look just like the gasoline-powered ones and can carry the same amount of mail. Each of the vehicles cost \$42,000, but about half of the cost is subsidized by the states of California and New York, the federal Department of Energy and 13 environmental groups. San Jose and Sacramento are scheduled to receive 20 of the vehicles early next year. (OAKLAND TRIBUNE: 12/5)

Proton Officials Laud aXcessaustralia HEV

Officials from Perusahaan Otomobil Nasional Bhd. (Proton) recently lauded Australia's aXcessaustralia hybrid electric vehicle (HEV) and expressed hope that HEV technology could be "learned and implemented" in Malaysia. At a press conference following a preview of the HEV, Proton CEO Tengku Mahaleel Tengku Ariff said the concept and technology of the aXcessaustralia would fit well with Malaysia's automotive industry and market. Australian minister of trade Mark Vaile, who was also present at the press conference, said that the aXcessaustralia will be "well accepted by the global marketplace sooner than expected." He noted that the technology and design of the HEV needs

slight refinements before the vehicle is ready for the market. These improvements include reducing the vehicle's weight, tuning systems for commercial production and addressing the practicality of using the HEV. The aXcessaustralia HEV will visit 14 countries over the next three months, including Korea, Japan, Germany, France, Austria, Italy, Thailand, India, China, the United Kingdom and the U.S. (ASIAPULSE: 12/8)

CARB Approves Guidelines For ZEV Incentives

The California Air Resources Board (CARB) recently announced that it has approved guidelines for the distribution of \$18 million for zero-emission vehicle (ZEV) incentives. The program is intended to lower the cost of a full-service EV to a price that is comparable with a conventionally fueled vehicle. "Incentives to purchase [ZEVs] are an important part of the path to clean air in California," said CARB Chairman Alan Lloyd. "This commitment of dollars is a reflection of California's belief in the future of advanced transportation technologies." The program will provide a total of \$18 million in grants to reduce the incremental costs of purchasing or leasing new ZEVs over the next three years. CARB said individual grants totaling up to \$9,000 may be provided over a 36-month period. Grants are available to qualified private and public consumers who purchase or lease a new ZEV between October 1, 2000, and December 31, 2002. CARB said it will start accepting applications on December 15, and the first grants will be distributed February 1, 2001. Under the program, CARB may only provide grants to individuals, local government, state agencies, non-profit organizations and private businesses purchasing or leasing an eligible ZEV. (CARB RELEASE: 12/7)

Hazelnuts Could Power Fuel Cells

New Scientist magazine recently reported that hazelnuts could power fuel cell-driven cars of the future. A professor at a university in England said that hazelnuts could pro-

duce the hydrogen needed to generate an electric current for hybrid or electric cars. Turkey is the world's largest producer of hazelnuts and the country burns 250,000 tons of shells each year. The waste was tested and scientists found that 15 percent of the combustion gas is hydrogen. The remaining gases include carbon monoxide, methane, nitrogen and carbon dioxide, which can be converted and filtered. The magazine said a year's supply of Turkey's nutshells would produce 6,000 tons of hydrogen, which is enough to allow 1,000 hydrogen-fueled BMWs to travel 32,500 kilometers (20,190 miles) each. (REUTERS: 12/6)

Nuclear Energy System Will Produce Hydrogen

The Department of Energy's (DOE) Argonne National Laboratory is leading a research project that aims to develop methods to produce hydrogen using a nuclear reactor. Partners in the project include Texas A&M University, General Electric, the Japan Nuclear Cycle and Development Institute and the Italian National Agency for New Technology, Energy and Environment. A major benefit of the new technology will be that it releases no greenhouse gases. An integrated nuclear energy system will produce hydrogen and electricity, as well as water, oxygen and heat. The hydrogen is expected to be used to power fuel cell vehicles. The goal of the project is to develop a modular system using standard components that can be produced quickly and easily assembled by users. "Single modules will be sized to meet the additional energy needs of developing economies," said Dave Wade, director of Argonne's reactor analysis division. "Modules can be added as an area's economy grows, and several modules can be combined to meet energy needs in nations that are already industrialized." (GREEN CAR JOURNAL: OCTOBER 2000)

Motor Trend Compares Prius and Insight Hybrids

The automobile magazine Motor Trend recently conducted a side-by-side comparison of Toyota's hybrid electric Prius and Honda's hybrid electric Insight. The magazine said although the two vehicles are similar in price and performance, it prefers the Prius because the vehicle is available in a sedan package and has an automatic transmission. The Prius is a four-door sedan, while the Insight is a two-door hatchback built for two occupants. The Prius features a continuously variable ratio automatic transmission. The Insight has a conventional five-speed manual transmission. Motor Trend said the Insight is "a bit sportier" and is "the quicker of the two." However, the magazine noted that both vehicles performed "adequately for all manner of normal driving." One problem that the magazine had with both vehicles was the "use of narrow, high-pressure tires...designed to provide low rolling resistance." The magazine said the tires limit the cars in terms of cornering ability. "We like the Prius, as its sedan packaging and the availability of an automatic transmission both seem to suit its mission as a high mileage — and carpoolable — commuter."

(MOTOR TREND: JANUARY 2001)

AAM Urges CARB to Adopt "Fair Market Test"

The Alliance of Automobile Manufacturers recently called on the California Air Resources Board (CARB) to adopt a "fair market test" (FMT) to determine whether a sustainable consumer market exists for battery-powered EVs according to California's zero emission vehicle (ZEV) mandate. "The [FMT] is a common-sense approach to determine whether a viable and sustainable market for EVs exists," said AAM President and CEO Josephine Cooper. "We developed the fair market test to evaluate consumer responses to a range of EVs that are marketed in one specific geographic area." AAM said the test would be conducted through existing dealerships in one

California market over a certain time period beginning in 2003. Test funding would be provided by the auto industry, with contributions from CARB and other governmental units, utilities, battery suppliers, environmental groups and EV owners. The test would be conducted by a foundation with a governing board representing a broad range of interests, including CARB and the motoring public. The foundation would involve an "independent blue-ribbon panel of experts to assist with implementing the fair market test," said AAM. CARB's current ZEV mandate would be amended to defer its effective date while the test is conducted.

(AAM RELEASE: 12/7)

aXcessaustralia Wins CSIRO Gold Medal Award

Australia's Commonwealth Science and Industry Research Organization (CSIRO) recently announced that it has named the aXcessaustralia hybrid electric vehicle (HEV) as its Gold Medal winner for the year 2000. The group said the aXcessaustralia project is one of two low-emission vehicle projects that involve a CSIRO team. "This visionary project demonstrates the capabilities of CSIRO and the Australian manufacturing industry working together," said CSIRO Chairman Charles Allen. "I congratulate the Low Emission Vehicle Team, which has successfully placed CSIRO research on the world automotive stage." CSIRO provided complete componentry for the electrical drive trains on the HEV, as well as an advanced power management system. The group noted that the aXcessaustralia is "designed to demonstrate a wide range of innovations produced by more than one hundred companies in the Australian automotive industry." The Gold Medal award, which includes a check for \$25,000, is awarded annually to a research project that is judged to be the "very best in CSIRO research, and of national or international importance."

(M2 COMMUNICATIONS: 12/5)

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NESEA Announces Route for Tour de Sol

The Northeast Sustainable Energy Association (NESEA) recently announced that its 13th annual U.S. championship road rally for EVs, known as the NESEA American Tour de Sol, will be held May 19 through 26, 2001. NESEA said the tour will begin in Waterbury, CT, and will end in Boston, MA, with stops in Albany, NY, and Pittsfield, Greenfield and Worcester, MA. "This year's competition and exhibits usher in a new era for these greener, cleaner vehicles," said Tour de Sol organizer Nancy Hazard. "For decades, consumers have wanted cleaner, more efficient cars, but the choices just weren't there. Finally, that has changed; there are real vehicle choices available and we'll be showcasing many of them." NESEA said it will provide workshops on interactive education resources that teach students about sustainable transportation options and technology. The workshops and materials will be available at no cost. The group said the Tour de Sol offers a "chance for the public to see and sometimes even test-drive cleaner, gas-sipping vehicles

that are available right now.”
(NESEA RELEASE: NOVEMBER 2000)

DOE, GM to Support FutureTruck Competition

Students from 15 North American universities will join with advanced technology engineers from the automotive industry and government researchers to create environmentally sound sport-utility vehicles (SUV) as part of the 2001 FutureTruck competition. Each university team will receive a Chevrolet Suburban SUV and \$10,000 donated by General Motors (GM). The teams must re-engineer the SUVs' powertrains to lower emissions and increase fuel efficiency without compromising safety, performance and utility. All of the vehicles will be converted to hybrid electric vehicles. Although all the teams will convert the SUVs to hybrid power, not all of the teams will use the same fuel and design modifications. The teams plan to use such fuels as diesel, reformulated gasoline, biodiesel, ethanol and hydrogen. Other engineering modifications will include weight reduction, improved powertrain efficiency, better aerodynamics, computer-based energy management and advanced energy storage devices. The teams met earlier this year in Michigan for a series of technical workshops at the GM Truck Product Center. The teams will return to Michigan in June, 2001, for extensive testing and evaluation at the GM Proving Ground in Milford, MI. Teams will compete in such categories as overall accomplishment, greenhouse gas emissions reductions, safety, trailer towing, fuel economy and acceleration.
(FUTURE TRUCK RELEASE: 11/27)

Hyundai and Enova Introduce EV to Hawaii

Enova Systems recently announced it has entered into an agreement with the state of Hawaii and Hyundai Motor Company to introduce EVs into fleet use in Hawaii. Hawaii Governor Benjamin Cayetano recently hosted representatives from Enova, the High Technology Development Corpo-

ration (HTDC) and Hyundai at his executive offices at the state Capitol to announce the precedent-setting partnership. Hawaii will be the introductory site in the U.S. for Hyundai's zero-emission Santa Fe electric sport utility vehicle. HTDC began a program two years ago to make Hawaii the first EV-ready state in the country through the installation of rapid-charging stations. The goal of this initiative was to show Hawaii's commitment to battery-powered vehicles. Beginning in June 2001, the test period will run for two years and will feature a fleet of 15 Hyundai Santa Fe vehicles. HTDC will oversee the entire project. Enova's propulsion systems are used in OEM vehicles from Hyundai and are supplied to Ecstar for use in the Ford TH!NK city vehicle. Enova is also working to develop a new electric tram system for the Department of Transportation to be used at Honolulu International Airport.
(BUSINESS WIRE: 11/20)

FCV Processor Reaches 80% Efficiency

General Motors recently announced it has developed a current generation fuel processor that is able to operate at more than 80 percent efficiency. The automaker said the new fuel processor features a breakthrough catalyst system. The catalyst will be used in a fuel processor that will be installed in a Chevrolet S-10 pickup that will be part of a demonstration program in 2002. In addition, the company plans to demonstrate an integrated system with this new fuel processor technology and a fuel cell stack that produces 25 kilowatts. GM said the processor will be 50 percent lighter, half the size of the previous generation and able to start in less than three minutes. The catalyst in the processor is supported in a honeycomb-like device that prevents it from breaking down due to vibration during driving.
(GM RELEASE: 11/16)

CII Expands Offering for Battery Disconnect Relay

CII Technologies, Inc. (CIIT) recently announced that its Kilovac Division has added

an optional auxiliary contact and 48- and 72-volt direct current (VDC) coil voltages to the company's EV200 battery-disconnect relay. CIIT said the EV200 is rated to make, break and carry 200 amperes (A), carry 500 A for 10 seconds, and interrupt 2,000 A at 320 VDC. The EV200 measures 56 millimeters (mm) high and 66 mm in diameter. The auxiliary contact for the relay is rated for two A at 28 VDC and three A at 125 volts of alternating current. The relay also features a built-in coil economizer that allows it to operate over a wide coil voltage range of nine to 36 VDC, 32 to 95 VDC, or 48 to 95 VDC. The relay limits average coil holding power to less than 1.7 watts with no back electromotive force when coil power is turned off. The EV200 with the auxiliary contact is available for less than \$45 in 5,000-piece quantities. CIIT said the relay with new coils is now available, and the auxiliary contacts will be released in production quantities early next year.
(ELECTRONIC BUYERS NEWS: 11/15)

Chorus Motors to Test Motor Against Competitors

United Kingdom-based Chorus Motors recently announced plans to perform head-to-head tests of its new Chorus motor technology against comparable motors. The company said the new motor features novel windings and control electronics that provide greater start-up and continuous torque than a conventional, alternating current (AC) induction motor of the same frame size and heating limits. Recent tests showed that the Chorus motor with a 215T frame can provide 41.5 foot-pounds (ft. lbs.) of peak torque over 12 minutes of operation, compared to 31.3 ft. lbs. of peak torque from a three-phase AC induction motor of the same size and temperature limits. The company noted that over short periods of 30 seconds, the new motor can produce between three and five times the peak torque of comparable conventional motors. Continuous torque tests found that a Chorus motor running at 1,200 revolutions per minute can provide 22 ft. lbs. of torque, compared to only 14.6 ft. lbs. for a comparable AC induction motor using square

waves and the same power control electronics and thermal limits.
(BUSINESS WIRE: 11/14)

California Energy Commission Demonstrates NEVs

Thanks to a newly announced partnership between the California Energy Commission (CEC), the city of Sebastopol, CA, Holiday Inn Express Hotel and Suites, and Zapworld.com (ZAP), seven 25-mph neighborhood electric vehicles have been introduced to the city as part of a project to demonstrate the use of such cars in a downtown environment. ZAP is a local electric vehicle distributor and manufacturer which provided the vehicles for the \$120,000 project. The cars are part of a federal Neighborhood Electric Vehicle category created to encourage the use of zero-emission vehicles in cities. The vehicles are smaller than traditional vehicles, but are still required to have automotive grade headlights, seatbelts, windshields, brakes and other safety equipment. The vehicles are only certified for use on streets posted with a 35 mph speed limit.
(ZAP RELEASE: 11/10)

DOE Awards FCV Contract to IMPCO

IMPCO Technologies, Inc. recently announced that the Department of Energy (DOE) has awarded the company's Irvine, CA-based Advanced Technology Center an additional contract involving its advanced hydrogen fuel system technologies for fuel cell vehicles (FCVs). "IMPCO's objective is to develop a hydrogen storage system for FCVs that will provide a driving range that exceeds the driving range of existing gasoline-powered vehicles," said IMPCO Technology and Automotive OEM Division Vice President and General Manager Syed Hussain. Under the terms of the new contract, IMPCO will perform safety and performance validation testing on its patented 5,000 psi hydrogen Crash Resistant In-Tank Regulator and develop concepts to extend the ultra-lightweight TriShield hydrogen storage tank technology to 10,000 psi. IMPCO said it recently completed de-

velopment of a commercially viable high performance hydrogen storage cylinder with 7.5% hydrogen storage by weight. In addition, the company plans to develop and commercialize an 8.5% hydrogen by weight storage technology next year. IMPCO said the technology resulting from this project "will produce one of the world's lightest and safest hydrogen fuel storage tank technologies while meeting or exceeding applicable government regulations."
(IMPCO RELEASE: 11/9)

Precept Receives Popular Science Award

General Motors' (GM) hybrid electric passenger car, the Precept, was recently honored with the Popular Science "Best of What's New" grand award for automotive technology. The award was presented at a luncheon at the Tavern on the Green restaurant in Central Park in New York, NY. The award luncheon honored new products and technology developments in one of 10 categories, one grand award for each category. The editors of Popular Science selected 100 applicants for the "Best of What's New" award. The Precept is a hybrid electric five-passenger family sedan capable of achieving 80 mpg. The vehicle is three times more fuel efficient than a conventional family sedan and has nearly 130 innovations and more than 44 records of invention. The Precept has a dual-axle regenerative, parallel hybrid propulsion system that contributes to its 80 mpg fuel target and its maximum energy recovery. The vehicle was developed as a result of GM's involvement in the Partnership for a New Generation of Vehicles (PNGV) which began as a joint venture between the U.S. government and the domestic auto industry in 1993. PNGV aims to lower emissions and create increased fuel efficiency without compromising performance and affordability.
(GM RELEASE: 11/9)

Dodge Develops Hybrid Electric Ram

DaimlerChrysler recently announced that it has developed a hybrid electric version of its

Dodge Ram pickup truck that is cleaner and more fuel efficient than its predecessors, while being able to generate enough clean auxiliary power to meet the energy needs of a household. Dodge said that the vehicle achieves 15% better fuel efficiency, lower emissions and better performance than a comparably sized conventional Dodge Ram truck. Off the road, the vehicle can be converted into a stationary electrical generator with a production capacity of up to 20 kilowatts of power. Additionally, the vehicle's engine, which is fueled by traditional gasoline, is much cleaner than most portable generators. "We dubbed this vehicle the 'Contractor Special,' because it is perfect for construction site work, but we believe the vehicle will appeal to campers and outdoor enthusiasts, to farmers who have to work on remote sites, and to homeowners who need to keep their households running in case of a power failure," said DaimlerChrysler engineering technologies Senior Vice President Bernard Robertson. The vehicle is anticipated to cost about \$5,000 more than a conventional Ram pickup, and will add about 250 to 300 pounds to the vehicle's weight.
(DAIMLERCHRYSLER RELEASE: 11/8)

DaimlerChrysler Demonstrates Ballard DMFC

Ballard Power Systems, Inc. recently announced that DaimlerChrysler demonstrated a Ballard direct methanol fuel cell (DMFC) at DaimlerChrysler's Innovation Symposium in Stuttgart, Germany. The DMFC was used to power a one-person demonstration vehicle. "Ballard is leading in the development of all aspects of proton exchange membrane fuel cell technology, including direct methanol fuel cells," said Ballard Vice President and Chief Technology Officer Alfred Steck. "We are now beginning to redefine direct methanol technology for use outside the laboratory in applications ranging from portable and stationary power to transportation." Ballard said DMFC is proton exchange membrane fuel cell technology that permits the use of methanol as fuel without requiring a fuel

processor to extract hydrogen from the methanol. The three-kilowatt DMFC unveiled in Stuttgart was developed as part of an ongoing collaboration between research groups at DaimlerChrysler and Ballard. Ballard is a leading developer, manufacturer and marketer of zero-emission proton exchange membrane fuel cells for use in transportation, electricity generation and portable power products.
(BUSINESS WIRE: 11/9)

DaimlerChrysler Unveils New Nekar 5

DaimlerChrysler recently unveiled its new methanol-powered fuel cell vehicle, the Nekar 5, and declared it to be "fit for practical use." The company said the Nekar 5 is more powerful and reliable than previous versions, provides a dramatic reduction in greenhouse gas emissions and virtually eliminates tailpipe emissions. "Nekar 5 represents a significant milestone towards the commercialization of methanol-based fuel cell technology," said Methanex President and CEO Pierre Choquette. Methanex is a leading producer and marketer of methanol. Methanol is considered to be a leading fuel candidate for many fuel cell applications. The fuel is "an ideal storage medium for hydrogen: it is a liquid at normal temperatures and can be transported, stored and handled much like gasoline or diesel fuel," said DaimlerChrysler.
(CANADA NEWSWIRE: 11/7)

Mitsubishi to Negotiate with DaimlerChrysler

Mitsubishi Motor Corporation recently announced it will negotiate with DaimlerChrysler to develop fuel cells as a power source for vehicles. DaimlerChrysler now has a 34% stake in Mitsubishi and would like to promote joint projects such as fuel cell development, said Mitsubishi. Mitsubishi and Mitsubishi Heavy Industries, Ltd. plan to work with DaimlerChrysler to develop fuel cells and mass-produce vehicles equipped with them. A formal agreement is expected to be in place early next

year, the company said. The alliance will develop small, lightweight fuel cells and fuel cell-powered vehicles for four or five years. The three groups will share the development costs, which are expected to reach more than 100 billion yen (about \$930 million).
(KYODO: 11/7)

XCELLSIS Joins Fuel Cell Partnership

Fuel cell-powered engine developer and manufacturer XCELLSIS recently announced that it has been selected as the newest member of the California Fuel Cell Partnership (CFCP). XCELLSIS President and CEO Ferdinand Panik said the company's selection for membership in the CFCP "recognizes the company's ongoing success in designing fuel cell engines and demonstrating their effectiveness in automotive and transit bus applications." XCELLSIS said its fuel cell engines powered seven of the 12 fuel cell vehicles featured at the recent opening of CFCP headquarters in Sacramento, CA. The company said its latest hydrogen-fueled XCELLSIS passenger car engine was demonstrated in the new DaimlerChrysler Nekar and Ford Focus. XCELLSIS was formed as the result of a partnership between DaimlerChrysler, Ford and Ballard Power Systems, Inc. The company develops and manufactures hydrogen- and methanol-fueled fuel cell engines for the transportation industry.
(XCELLSIS RELEASE: 11/6)

GM Displays HydroGen1 in Beijing

General Motors (GM) recently displayed its HydroGen1 zero-emission concept vehicle in Beijing, China. The vehicle is based on GM's Zafira compact van and is powered by a fuel cell that runs on pure hydrogen. "For us, hydrogen clearly represents the fuel of the future," said GM Global Alternative Propulsion Center Co-director Erhard Schubert. "A propulsion system using hydrogen and fuel cells offers optimum efficiency, produces no pollutants or climate-relevant exhaust emissions, is vir-

tually silent and is a lot of fun to drive." The HydroGen1 features a 55-kilowatt, 75-horsepower three-phase electric motor, as well as a fuel cell stack comprised of 200 individual cells arranged in a series. The fuel cell is powered by pure hydrogen stored in liquid form at a temperature of minus 253 degrees Celsius. The vehicle also includes a battery under the floor of the load area that provides short-term peak output. The HydroGen1's direct current is converted to alternative current by an electronic control device. The HydroGen 1 seats five and is able to accelerate from zero kilometers per hour (kph) to 100 kph in 16 seconds. The vehicle has a top speed of 140 kph and an operating range of about 400 kilometers.
(ASIA INTELLIGENCE WIRE: 11/2)

EVAA Says EVS-17 Was Success

The Electric Vehicle Association of the Americas (EVAA) recently announced that its 17th International Electric Vehicle Symposium (EVS-17) was a "milestone event." EVAA said the conference, which was held October 15 through 18 in Montreal, Quebec, was confirmation "that the people, technologies and products comprising today's electric vehicle industry are truly 'Driving New Visions' of tomorrow's transportation." More than 3,000 people attended one or more of the conference venues, the group said. In addition, more than 1,600 delegates, speakers and exhibitors from 32 different countries attended the event. During the conference, environmental activist Jean-Michel Cousteau lauded delegates for developing clean and innovative transportation technologies. Cousteau also challenged delegates to continue to "lead and not follow" in their efforts to protect the Earth's environment. Quebec Vice Premier Bernard Landry delivered a keynote address at the opening session of EVS-17, informing delegates that the province is "open and ready" for the electric vehicle industry. Other officials who gave presentations at the conference included California Air Resources Board Chairman Alan Lloyd and Department of Energy Secretary Bill Richardson. The next International Electric Vehicle Symposium (EVS-18) will

be held October 21 through 24, 2001 in Berlin, Germany.

(EVAA RELEASE: 10/31)

Nissan Unveils Concept Fuel Cell SUV

Nissan Motor Company recently unveiled an initial concept model for its fuel cell-powered Xterra sport-utility vehicle (SUV) at the opening of the California Fuel Cell Partnership (CFCP) headquarters in Sacramento, CA. The unveiling is the first public announcement of Nissan's effort to produce a direct hydrogen fuel cell vehicle based on the Xterra. Nissan said that using a larger vehicle such as the Xterra will increase fuel consumption, but emissions will be significantly reduced compared to smaller vehicles using internal combustion engines. The company has been investigating fuel cell development since the 1970's and most recently began testing a vehicle equipped with a reformer designed to generate hydrogen fuel from methanol. The Xterra project uses Nissan's original management systems including processes to control energy, thermal and water management systems. Nissan joined the CFCP in March and plans to begin testing under the partnership in 2001. CFCP is a voluntary partnership of auto manufacturers and government agencies committed to the advancement of fuel cell technology. The partnership hopes to develop technologies that will lead to practical, affordable and environmentally responsible transportation options.

(NISSAN RELEASE: 11/01)

Volkswagen Unveils Fuel Cell Car

Volkswagen recently introduced its first fuel cell-powered car at the opening of the California Fuel Cell Partnership headquarters in Sacramento, CA. The car is called Bora HyMotion and is a zero emission vehicle (ZEV). The Bora model is known as the Jetta in the United States. The car's fuel tank has a capacity of 50 liters of liquid hydrogen at minus 253 degrees Celsius. The electric motor has a power output of 75 kW and accelerates from zero to 100 kilometers per hour in 12.6 seconds with a top

speed of 140 kilometers per hour. The prototype was unveiled in conjunction with the celebration of the grand opening of the headquarters for the California Fuel Cell Partnership. The partnership includes auto manufacturers DaimlerChrysler, Ford, Honda, Hyundai, Nissan, General Motors and Toyota. The partnership also includes energy providers BP, Shell and Texaco and fuel cell companies Ballard Power Systems and International Fuel Cells. Volkswagen of America is headquartered in Auburn Hills, MI and is a wholly owned subsidiary of Volkswagen AG headquartered in Germany. The company operates 35 manufacturing facilities in 15 countries across five continents.

(VOLKSWAGEN RELEASE: 11/1)

Insight Receives Climate Protection Award

The Honda Insight recently received the Environmental Protection Agency's (EPA) 2000 Climate Protection Award at a special ceremony in Washington, D.C. The company was the only automaker to receive the award. Climate Protection Award recipients are nominated by their peers for outstanding accomplishments in climate protection. An international panel of independent judges representing government, industry and non-governmental organizations reviews recommendations. EPA makes the final award selections based on originality and public purpose, persuasive moral and organizational leadership, global perspective and implication, and actual or equivalent reductions in greenhouse gas emissions. The Insight features Honda's Integrated Motor Assist technology, which includes a 1.0-liter, three-cylinder gasoline-powered engine paired with a lightweight 144-volt electric motor. The vehicle meets California's ultra-low emission vehicle (ULEV) standard and produces 70% less hydrocarbon emissions and 50% less nitrogen oxide emissions than a traditionally powered car.

(HONDA RELEASE: 10/30)

Ford Introduces Hydrogen Fuel Cell Vehicle

Ford Motor Company recently debuted its first production prototype, direct-hydrogen-powered fuel cell vehicle (FCV) at the 2000 Specialty Equipment Market Association (SEMA) show in Las Vegas, NV. The model is based on Ford's Focus platform, and is known as the Focus FCV. Ford said it is committed to offering fuel cell vehicles to customers by 2004. The company said the Focus FCV is fuel efficient, has zero emissions and a smooth "seamless" ride that is characteristic of EVs. "Ford plans to lead in the development of fuel cells, but there are still enormous hurdles that must be overcome in reducing cost, improving reliability and fuel availability," said Ford TH!NK Group Executive Director John Wallace. The Focus FCV was developed by TH!NK technologies and will be co-branded with the "powered by TH!NK" logo. The vehicle will be delivered to the California Fuel Cell Partnership to demonstrate the capabilities of fuel cell vehicles. Several additional FCVs will be delivered to the project over the next three years. Between 2000 and 2003, Ford plans to put up to 50 FCVs on the road. The Ford Focus FCV is the second direct-hydrogen powered fuel cell vehicle from Ford. The first — the P2000 — was introduced at the Detroit Auto Show in January 1998.

(FORD RELEASE: 10/30)

Technologies M4 to Start Prototype Production

Technologies M4 recently announced it has started prototype production at its new pilot production plant in Longueuil, Quebec. The company said the facility will produce a new electric drive system that can be housed in vehicle wheel assemblies. TM4 president David Johnston said the 6,500-square-foot plant will "meet growing demand from major auto companies for working prototypes of the company's E-Wheel Control System."

(TM4 RELEASE: 10/16)

EAA

CHAPTER LISTING

ARIZONA

PHOENIX EAA

Roy Thompson, President (480) 991-5075
7710 Gainey Ranch Road, #155
Meetings: 4th Saturday/month, 9:00 am
location varies in Phoenix Arizona, Contact Roy Thompson
Homepage: http://geocities.com/phoenix_eaa

CALIFORNIA

NATIONAL EAA HEADQUARTERS

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60 Alan Dr., Pleasant Hill, CA 94523-1902
HomePage at <http://www.eaaev.org/>
Tel. (925) 685-7580

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Scottt Cornell, President (925) 685-7580
E-mail: spcorn@pacbell.net -or- ebeaa@juno.com
60 Alan Dr., Pleasant Hill, CA 94523-1902
Meetings: 4th Saturday/month, 10:00am (call for Nov-Dec date)
2701 Monarch St., Hangar 20, Room 215
Alameda Point, Alameda, CA (old Alameda Naval Air Station)
From Hwy 880, take Broadway turnoff to Webster St.; from
Webster, go through the tube to Atlantic, right on Atlantic to the
old Alameda Naval Air Station
Web: www.geocities.com/MotorCity/1756/

Los Angeles EAA

Saxe Dobrin, President (310) 453-1531
1630A Franklin, Santa Monica, CA 90404
Meetings: 1 st Saturday 10:00 am
Cal Tech, Winnet Lounge, Pasadena, CA

NORTH BAY EAA

Chuck Hursch, President (415) 927-1046
13 Skylark Dr. #13, Larkspur, CA 94939-1270
Email: gandhi!chuck@uunet.uu.net
Homepage: www.ecoalliance.com/nbeaa/
Meetings in Santa Rosa, CA: Call (415) 927-1046 for time and
exact location.
Web: www.geocities.com/MotorCity/1757/

SAN FRANCISCO/PENINSULA EAA

Jean Bardon, Acting President (650) 355-3060
540 Moana Way, Pacifica, CA 94044
Homepage: www.geocities.com/MotorCity/1759
Meetings: 1st Saturday/month, 10 a.m.
San Bruno Public Library.
701 West Angus St. (at El Camino), San Bruno, CA

SAN JOSE EAA

Michael Thompson, Pres., Contact Person (408) 997-2404
E-mail: m.t.thompson@ieee.org
Mail: Roy Paulson, 1592 Jacob Ave. San Jose, CA 95118 USA
HomePage: <http://members.aol.com/sjeaa> Tel. 408-269-7937
Meetings: 2nd Saturday/month, 10:00 am (call to confirm), Reid
Hillview Airport, 2350 Cunningham Ave. San Jose. (Hwy 680,
Capital Expressway (South), right onto Cunningham)

SACRAMENTO ELECTRIC VEHICLE ASSOCIATION

Tim Loree, President (916) 962-3044, (916) 568-3100 ex 2833
2428 Wisconsin Dr. Citrus Heights, CA 95610-7432
E-mail: Loreet@2extreme.net
Meetings: Call Tim for new meeting time, place and date
HomePage: www.calweb.com/~tonyc/sevahome.html

SAN DIEGO ELECTRIC VEHICLE ASSOCIATION

Scott C. Kennedy, President, (619) 658-4152
1621 San Elijo Ave., Cardiff, CA 92007
Meetings: 4th Tuesday/month, 7pm (except December)
San Diego Automotive Museum
2080 Pan American Plaza, San Diego, CA.
Enter North-East door and go to the second floor conference room
E-mail: EVASD@WorldNet.ATT.net
Web: <http://home.ATT.net/~EVASD/>

SILICON VALLEY EAA (Founding Chapter)

Will Beckett, Pres., Contact (650) 494-6922, fax (650) 852-8384
4189 Baker Ave, Palo Alto, CA 94306
HomePage at <http://eaasv.org>
Meetings: 3rd Saturday/month, 10:00-12:00 am
Hewlett-Packard Co., Corporate World Headquarters
lobby A, Auditorium, 3000 Hanover St. Palo Alto, CA 94304
(Page Mill Road and Hanover St.)

COLORADO

DENVER ELECTRIC VEHICLE COUNCIL (DEVCC)

George Gless, President (303) 442-6566
2940 13th St., Boulder, Co, 80304
Meetings: 3rd Saturday/month. Contact George for time and location

MASSACHUSETTS

NEW ENGLAND EAA

Tony Ascrizzi, President (508) 799-5977
34 Paine Street, Worcester, MA 01605
E-mail: tonyascrizzi@juno.com
Meetings: Every 2nd Saturday 2:00 p.m. (call for directions)
HomePage: <http://eaaev.org/neeaa>

PIONEER VALLEY EAA

Karen Jones, President (413) 253-1633
P.O.Box 153 Amherst, MA 01004
Meetings: 3rd Saturday/month (Jan.-Nov.), 2pm
Jones Library (Amherst Rm), Amherst, MA

MISSOURI/KANSAS

MID-AMERICA

Bruce Edgeworth, President (816) 524-4734
Mike Chancey, Treas., 1700 East 80th St. Kansas City, MO 64131
E-mail: Mike Chancey evtinker@hotmail.com (816) 822-8079
HomePage at <http://www.geocities.com/MotorCity/Downs/4214/>
Meetings: Contact Mike for meeting time and location.

NEVADA

LAS VEGAS EAA

William Kuehl, President (702) 645-2132
4504 W. Alexander Rd. North Las Vegas, NV 89030
E-mail: billk@anv.net
Meetings: call (702) 642-4000 for time and place.

NEW MEXICO

ALBUQUERQUE EAA

Neil Wicai, President (505) 899-7660
19 Santa Maria, Corrales, NM 87048
E-mail: neilwicai@upaznm.com Web: www.abqev.org
Meetings: 1st Tues/month, 7:00 PM
Shoney's Restaurant, 6810 Menaul NE,
Albuquerque, NM

NORTH CAROLINA

TRIANGLE EAA

Jon Mauney, President (919) 834-4077
409 Brooks Ave., Raleigh, NC 27607
Meetings: 3rd Tuesday of the month, 5:30 PM, location varies
(Call Jon Mauney for details at 919-834-4077)
Email teaa@rtpnet.org
HomePage: www.rtpnet.org/teaa/

SOUTHEASTERN EVA

Lawson Huntly, President (704) 283-1025
PO Box 1025 Monroe, NC 28111-1025
Meetings: Call Lawson for date, time and location

TEXAS

HOUSTON EAA

Ken Bancroft, Contact Person, (713) 729-8668
4301 Kingfisher St., Houston, TX
Meetings: 3rd Thursday each month 6:30 PM - 8:30 PM
Citizen Environmental Center, 2nd floor, room 280
3015 Richmond, Houston, Texas (Take the Southwest Freeway to Kirby, go north to Richmond, turn left, the Center is on the left, three blocks down Richmond)

NORTH TEXAS EAA

Paul Schaffer, President (972)-437-1584
430 Ridge Crest, Richardson, TX 75080-2532
Email: pshf@cyberramp.com
Meetings: 3rd Thursday/mo, see www.engr.tcu.edu/nteea for time and location

UTAH

WEST VALLEY CITY EAA

Harry Van Soolen, President (801) 989-1130
3622 S. 4840 W., West Valley City, UT 84120
Meetings: Contact Harry for date, time and location

VIRGINIA

CENTRAL VIRGINIA EAA

Brian Murphy, President, (804) 530-7734
1902 Riggers Station Dr., Colonial Heights, VA 23834
Meetings: 3rd Wednesday/month, Richmond Technical Center,
Westwood Ave., Richmond, VA 23834

WASHINGTON

PORT TOWNSEND / NORTHERN OLYMPIC PENINSULA ELECTRIC CAR CLUB (NOPEC)

Karl Schreiber (360) 385-3532
11 Kanu Dr. Port Townsend, WA 98368
Meetings: 3rd Saturday/month, 10 AM
Port Townsend High School Shop

SEATTLE EVA

Steven S. Lough, President, (206) 524-1351, Fax (206) 526-5348
6021 32nd Ave., N.E., Seattle, WA 98115-7230
Meetings: Contact Steve for time and location
E-Mail: slough@halcyon.com
WWW Site: <http://www.halcyon.com/slough/seva.html>

WASHINGTON DC

ELECTRIC VEHICLE ASSOCIATION OF WASHINGTON DC (EVA/DC)

Dave Goldstein (President) (301) 869-4954
9140 Centerway Road, Gaithersburg, MD 20879-1882
E-mail: goldie.ev1@juno.com
Web at: www.evadc.org
Meetings: 2nd or 3rd Tuesday/month at 7 p.m.
National Institute of Health (NIH) Building 31-C, 6th floor
conference rooms, in Bethesda, MD. (Large white building near
Rockville Pike and Cedar Lane) Call for more information or
directions.

CANADA

VANCOUVER ELECTRIC VEHICLE ASSOCIATION

P.O. Box 3456, 349 W. Georgia St., Vancouver British Columbia,
Canada, V6B 3Y4
Bill Glazier, Contact (604) 980-5819
3344 Baird Rd. North Vancouver, B.C. Canada V7K 2G7
HomePage at <http://www.veva.bc.ca/> E-mail: info@Veva.bc.ca
Meetings: 3rd Saturday/month 7:30 p.m., BC Transit Center
Cafeteria. (Located off of Kitchener between Boundary and
Gilmore in Gilmore in Burnaby)

EAA Chapter List

*Chapter contacts and meeting locations. Most verified as of
9/1/99. For information about the Electric Auto Association,
call 1-925-685-7580*

Board of Directors Electric Auto Association

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E-mail: brucedp@yahoo.com
-or-
brucedp@iname.com

- FOR SALE - MEMBER WANT ADS - FOR SALE -

For Sale: TRACE INVERTOR TC-500E
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A Call for Letters to the Editor

Read something in CE you would like to comment on? Do you feel something is being left out? Send us a "Letters to the Editor". You can E-mail us, Fax us or use snail mail at the addresses below:

E-mail: eanews@aol.com
Fax: 510-864-9293
Snail mail:
EAA/Current Events
2701 Monarch St.
Hanger 20, Suite 142
Alameda, CA 94501

WANTED: Jet Industries Electra Van, dead or alive. Parts car or parts OK. Call Jack Swartz at (408) 872-0725.

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WANT ADS: Print clearly or submit typed copy of your ad with your name, address, and phone number. The EAA is not responsible for the accuracy of ads. Want ads must be received before the 1st of every even numbered month and must include payment to run in the next issue of CE.

\$10 for the first 35 words. Each additional word, 25 cents. Want ads are available to EAA members for the sale of electric vehicles, equipment and parts only. If you want to run your ad in more than one issue, please specify and include payment for each issue requested.

For corrections or updates, please send a written note or fax to EAA Want Ads at (510) 864-9293. Photographs of your vehicles may be submitted with your ad. If room is available, we run one photo each issue. These photos will not be returned. Send your Member Want Ad request and check payable to:

EAA Want Ads, Hanger 20
2701 Monarch Street, Suite 142
Alameda, California 94501

Electric Auto Association (EAA) Membership Application

New Member: _____
Renewal: _____

USA: _____
Canada: _____
Other Country: _____

Note: EAA membership dues are
tax deductible in the USA
as allowed by the IRS.

Date: ____/____/____

Name: _____ Company: _____
Street: _____ Phone: Hm-_____ Wk-_____
City: _____ Fax: _____
State: _____ Zip: _____ Country: _____

If a new member, where did you hear about the EAA ? _____
EAA Chapter you attend or support: _____
I need chapter information: _____

Membership / Vehicle Information — Please complete if new or changed

Please identify your primary areas of interest relating to EAA
(Please rank your choice with a "1" being most important, "2" second, etc.)

- 1: _____ Hobby / Builder
- 2: _____ Professional (EVs are a source of income for you)
- 3: _____ Competition (Rallies, Races, and Records)
- 4: _____ Environmental and Government Regulations for EVs
- 5: _____ Social (Rallies, Shows, Dinners, Other)
- 6: _____ New Technology and Research
- 7: _____ Promotion and Public Awareness of EVs
- 8: _____ Student or General Interest
- 9: _____ Electrathon / Bicycle / Off-road Vehicles
- 10: _____ Owner / Driver of Electric Commute Vehicle
- 11: _____ Other: Please Specify: _____

Number of total EVs you have ever owned?: _____

Number of EVs you now own?: _____

Please describe any Electric Vehicles you now own or are building: (if more than one, attach information on each)

Vehicle Lic#: _____	State: _____	Country: _____
Vehicle Type: _____	Make/Model: _____	Model Year: _____
Converted Yr: _____	Number of Wheels: _____	Motor Type: _____
Controller type: _____	Batteries: No./Type: ____/____	%Completed _____
Pack Voltage: _____	Avg. EV Mi./Week: _____	Avg. EV Trips/Week: _____
Other Features: _____		
Comments: _____		

Please make your check or money order for appropriate amount (see below), payable to the Electric Auto Association, fasten it to this form and mail it to :

Electric Auto Association
P.O. Box 6661
Concord, CA 94524

USA \$39 /yr (U.S. Dollars only)
Canada \$42 /yr International \$45 /yr

Note: All information and statistics in this application are for the exclusive use of the EAA. We never sell or loan our mailing lists.

ver 8/29/97

EAA Store Order Form

Printed materials

CE	Selected Current EVents (specify specific issue)	\$3.00 each issue
CEFY	Current EVents - Full year {specify specific year}	\$20.00 each year
CONV01	Convert-It EV Conversion Book	\$24.95
CATAL1	KTA Electric Vehicles Kits & Component Parts Catalog	\$5.00
BG 1998	1998 Preview 2000 by Electrifying Times (Nov./Dec. 98 CE)	\$5.95
BG 1997	1997 Buyer's Guide to Electric Vehicles (April 97 CE)	\$5.95
BG 1996	1996 Buyer's Guide to Electric Vehicles (Feb. 96 CE)	\$5.95
BG 1995	1996 Buyer's Guide to Electric Vehicles	\$5.95

Other EV items

BS800	EAA Bumper Sticker #1, 3.75x10.5 inch	\$2.00
BS002	EAA Bumper Sticker #2 with "the Switch is On", 3.75x15 inch	\$2.00
CAP002	Embroidered Hat, ajustable fit	\$9.50
DECAL	EAA Decal - (The Switch is on)	\$1.00
KEY01	EAA Key Chain with LED light and "30 Years 1967-1997"	\$2.50
MUG02	Insulated Car Coffee Mug	\$6.50
MUG003	Ceramic Coffee Mug	\$5.50
SHIRT01	Polo Shirt w/ embroidered logo (10 weeks for all colors except Forest) select shirt color & size: Teal Green, Forest Green or Navy (s,m,l,xl)	\$30.00
SS001	Auto Window Sun Shade with Logo	\$8.00
PATCH1	Embroidered Sew-On Patch, white	\$6.50
PATCH2	Embroidered Sew-On Patch, green, (special order allow three weeks)	
PEN01	EAA ball-point pen with EAA 800 number	\$1.00
LICPH1	Electric Auto Association Licence Plate Holder, plastic frame	\$10.00
PARK01	"EV Parking Only" Sign (18"x12") green icon	\$25.00

Electric Auto Association Store Order Form EAA Store
 Send order to: 5820 Herma St.
 San Jose, CA 95123-3410

Name _____ Phone _____
 Address _____

Item #	Size/Color	Quantity	Item Description	Unit Cost	Amount

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* for Canada add 15% or for other foreign destination add 25 % for postage

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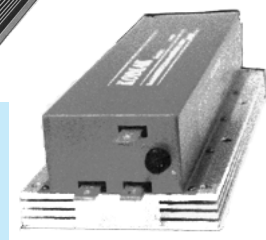
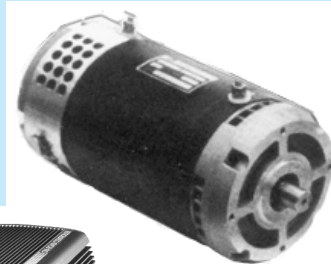
ELECTRIC VEHICLE

Components, Kits, Publications, & Design

Since our beginning in 1984, KTA SERVICES has been dedicated toward supplying the largest variety of safe and reliable components to our EV clients. We provide individual components or complete kits to electrify 2, 3, or 4wheeled vehicles weighing from 200 through 10,000 lbs. total weight.

Our components and tech support have enabled hobbyists and others in 17 countries to create nearly 500 on-road electric cars, pickup trucks, motorcycles, and various racing vehicles. Our technology has found its way into electric powered boats, submarines, aerial trams, golf course mowers, amusement park rides, special effects apparatus for the movie industry, robots, and even a window washing rig. Nobody knows the components or their application better than KTA. All components are new, competitively-priced, and come with full manufacturer's warranties. We stock and sell the largest variety of the very best.

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