# AMECTRAN ARTICLES

# Access

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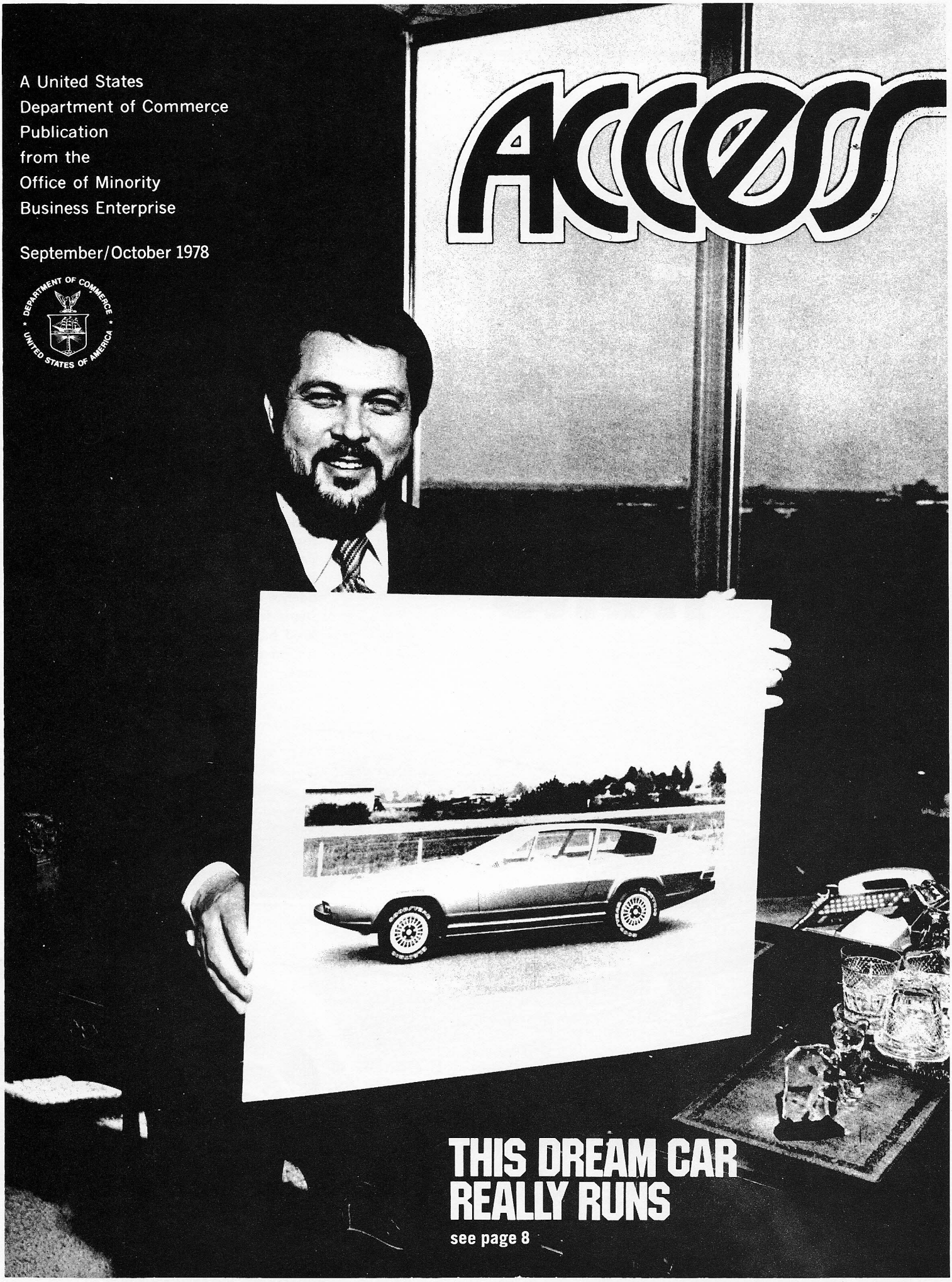


## THIS DREAM CAR REALLY RUNS

see page 8

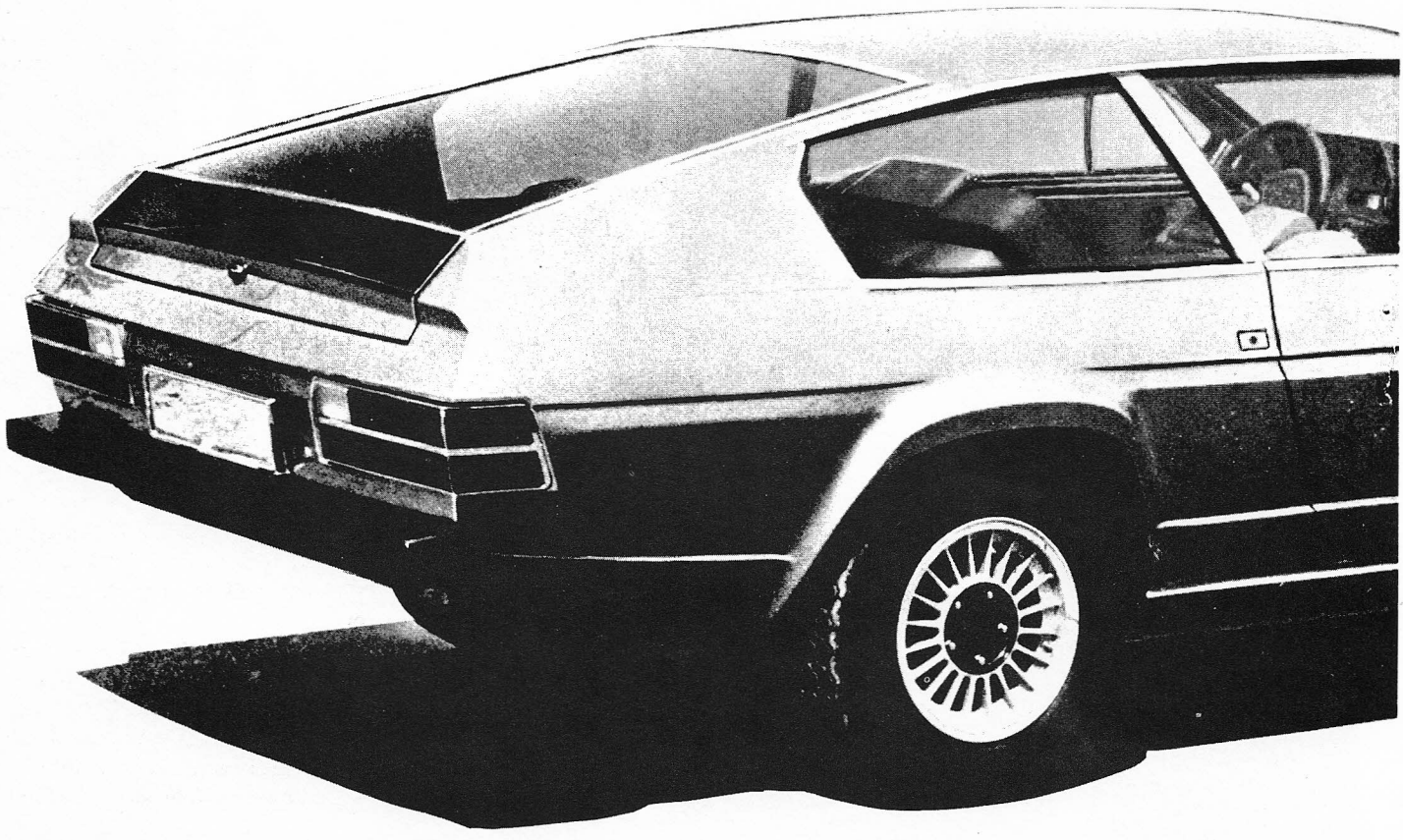
# THIS DREAM CAR REALLY RUNS

ED Ramirez could be on the verge of fulfilling an American dream.

For the last 5 years, the 42-year-old Dallas entrepreneur and several associates have been developing an electric automobile. Ramirez believes (and some industry experts agree) that his design is far superior to anything else available today. What's more, his prototype is ready to be built and sold now, not in a year or two years like other designs still on the drawing boards.

With this in mind, Ramirez has allowed himself to dream of producing and selling his cars across the U.S., not in head-to-head competition with Detroit, but as a leader in a brand new industry. But for the last year or so Ramirez' promising dream has been stopped dead in its tracks for lack of financing.

Seated behind the desk in the comfortable offices of his firm AMECTRAN (American Ecological Transportation), Ramirez exhibits a combination of confidence and frustration. His confidence stems from the belief that he has indeed built a better product. The frustration is because few people seem to care.



"What makes our car different is that we set out to build an electric car from the ground up," Ramirez explains, comparing the AMECTRAN prototype to others being developed by major auto makers.

To prove his point, Ramirez ticks off a list of engineering features which contribute to the efficiency of his design. Development of these involved a number of contractors including several major companies that supply parts for conventional cars.

"We had Goodyear design a special tire to reduce rolling resistance and this allows the car to have a greater range," Ramirez notes.

The 19-hp motor was built by General Electric according to AMECTRAN specifications. AMECTRAN engineers developed their own light-weight brake system for the car.

The list of special design features goes on including some that Ramirez won't divulge for competitive reasons. He says that it is this attention to every detail which allowed his company to come up with an electric auto that goes farther and faster than others.

But starting from scratch takes time and costs money (so far, nearly $2 million from private investors). And it will require at least another $2 million befor the first AMECTRAN vehicle rolls off the assembly line.

**Others Had Failed**

In an article on AMECTRAN in the February 1978 issue of *Dallas* magazine, Ramirez says a report that Japanese auto makers could only produce a 40 mph/50-mile range electric car whetted his appetite to tackle the problem.

"I could not accept the fact that five of the finest auto companies in Japan along with all of their engineering talent and all the funding available couldn't do better than that."

So, the one-time owner of a computer firm set out to build a practical electric car. What he and his associates came up with is a passenger car prototype that has reached speeds up to 100.4 mph with a range of 100 miles at 55 mph. It can be recharged in about 8 hours using regular 110-volt house current.

The AMECTRAN vehicles have not been tested by the Government. However, a recent article on the company appearing in *EV Focus,* an international electric vehicle (EV) newsletter published by McGraw-Hill, compares Ramirez' performance claims with a recent Government report on EVs.

"Indeed, based on the Department of Energy's 1978 state-of-the-art report on EVs . . . Amectran's car clearly leads the field."

Noting that while two other models match AMECTRAN's combination of relatively high speed with good range, the article states, "No other car's acceleration approaches the 12 seconds to reach 55 mph claimed by AMECTRAN."

A ride in the company's S/T prototype on a busy Dallas freeway seems to confirm the performance claims. With AMECTRAN Vice President Gus Pellizzi at the wheel, the car moves easily out into high-speed traffic.

Of course, this isn't news to Ed Ramirez who has believed in his car all along.

"The first time we took it out on the expressway for a road test, it performed so well that it has never been back on the test track since," he recalls with pride. Now the car is simply taken out on the road when a demonstration is needed.

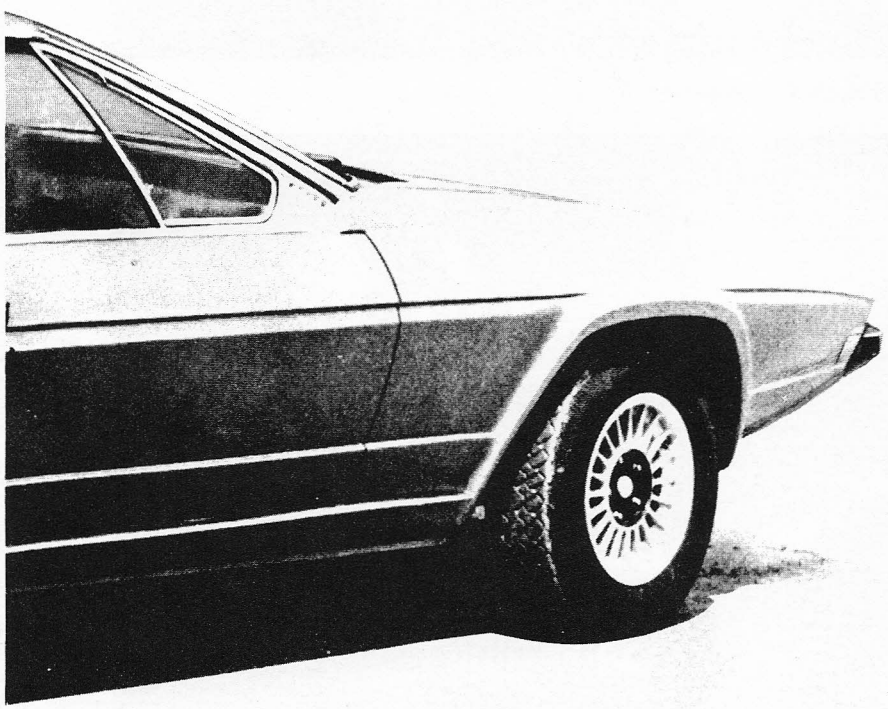
Ramirez believes that an electric car is ideal for commuters and other drivers who make a lot of short, in-city trips.

"Most people most of the time drive fewer than 50 miles a day," Ramirez insists. "And they travel at speeds of about 25 to 50 miles an hour. That's perfect for an electric car."

Ramirez thinks that up to three million electrics could be sold in the U.S. each year. When he gets into production, he expects to eventually capture at least 10 percent of the market, selling around 300,000 cars a year at capacity.

The sales estimates are based on an elaborate manufacturing/marketing strategy that is ready to go into place when AMECTRAN is capitalized. It features a unique combination of manufacturing and service operations at regional facilities in 15 cities starting with Dallas. Each one will cost $2 million and will employ about 160 workers.

What the AMECTRAN plants will turn out is a futuristic-looking automobile complete with all the extras conventional car buyers want. Called the EXAR-1, it is the fourth AMECTRAN prototype. It follows an earlier two-



*AMECTRAN President Ed Ramirez wants to put this car on the market in 15 U.S. cities.*

passenger version, and two others called the "yellow car" and the S/T.

### Italian Design

If Ed Ramirez gets excited about the engineering features of his product, Ramirez is positively ecstatic about the EXAR-1 body design. Crafted in Italy, the acryllic fiberglass body has about the same size passenger compartment as a Cadillac Seville, weighs 3,200 lbs. and will carry 4 or 5 passengers. The 19 horsepower motor is powered by 24 six-volt lead acid batteries. All electric functions are controlled by a small, on-board computer.

Standard features include an AM/FM/tape deck/CB radio console, air-bags, aluminum mag wheels and air conditioning.

What will all this cost? Ramirez says he can build and sell the EXAR-1 for less than $6,000. AMECTRAN believes operating costs will average about one-fifth what it costs to operate an internal combusion auto.

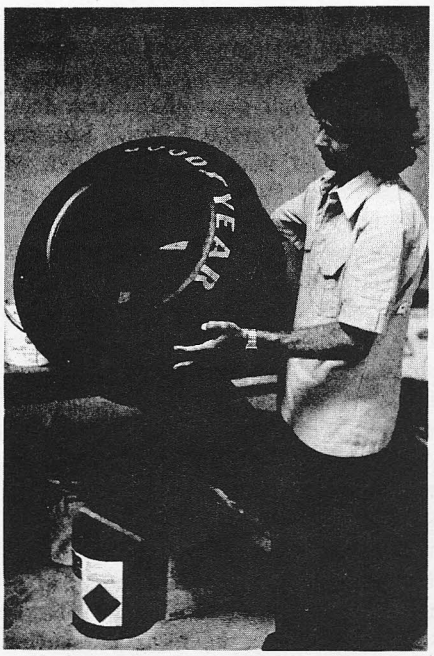
If he could locate the necessary seed money, Ramirez says he could start production in 8 to 10 months and have the first EXAR-1 autos on the road in a year or so. But that's where his dream founders.

So far, Ramirez's auto has attracted little attention outside of the relatively small EV industry. The exception is OMBE, where program resource specialists are working with Ramirez.

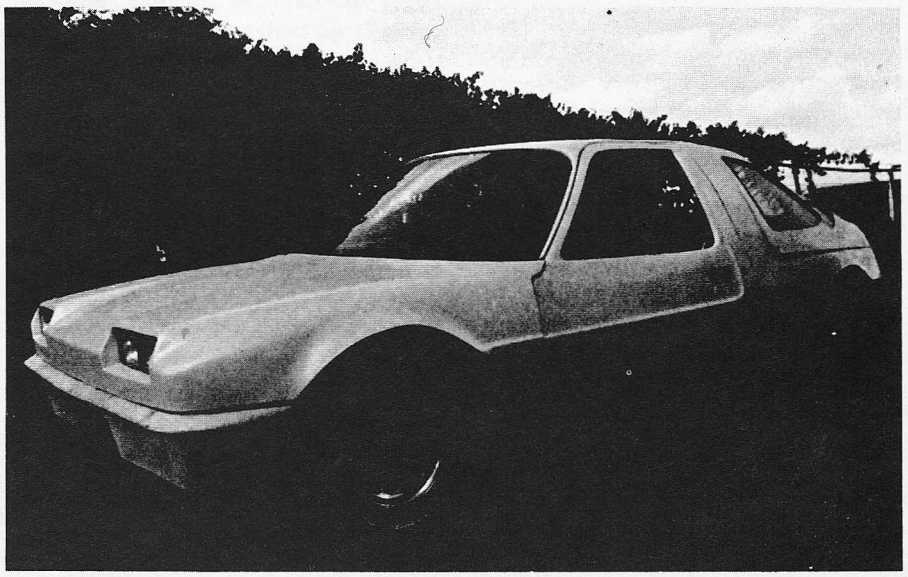
OMBE operates technology commercialization centers at several locations around the country. Three of these worked with AMECTRAN on its market surveys and strategy. Center officials believe that Ramirez will be successful in getting his project financed and plan to assist in start-up.

A few large private companies have expressed interest in AMECTRAN, but were unable to come to terms with Ramirez who hopes to retain control of his company. There are possibilities of Federal loans or grants from agencies like the Energy or Commerce Departments or the Small Business Administration. But earlier, Energy rejected an AMECTRAN proposal in favor of a big auto maker.

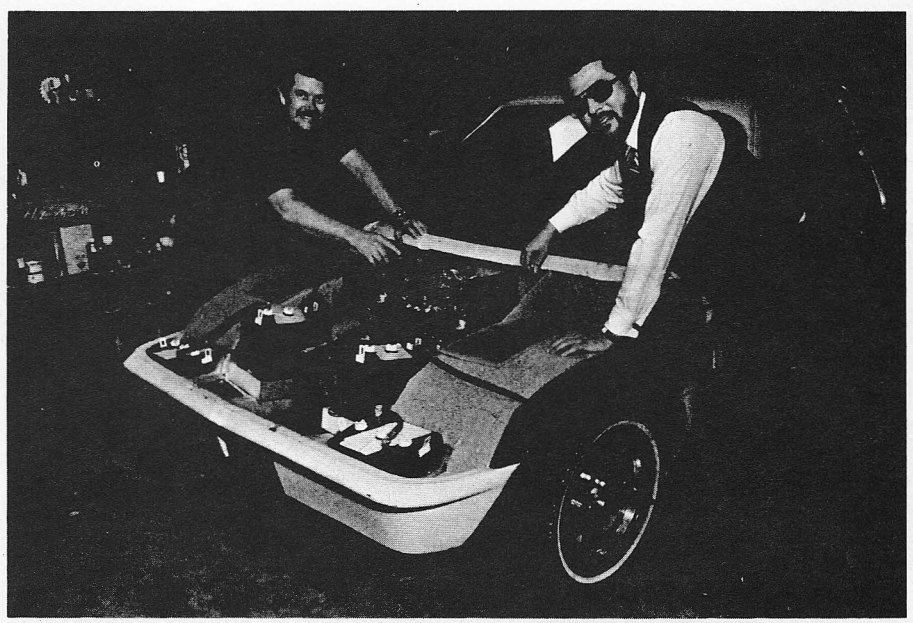
So, for the present, Ed Ramirez' dream of becoming a modern-day Henry Ford must wait. And for the Dallas auto maker, this is the toughest part. □




*AMECTRAN cars feature specially developed tires that reduce rolling resistance.*

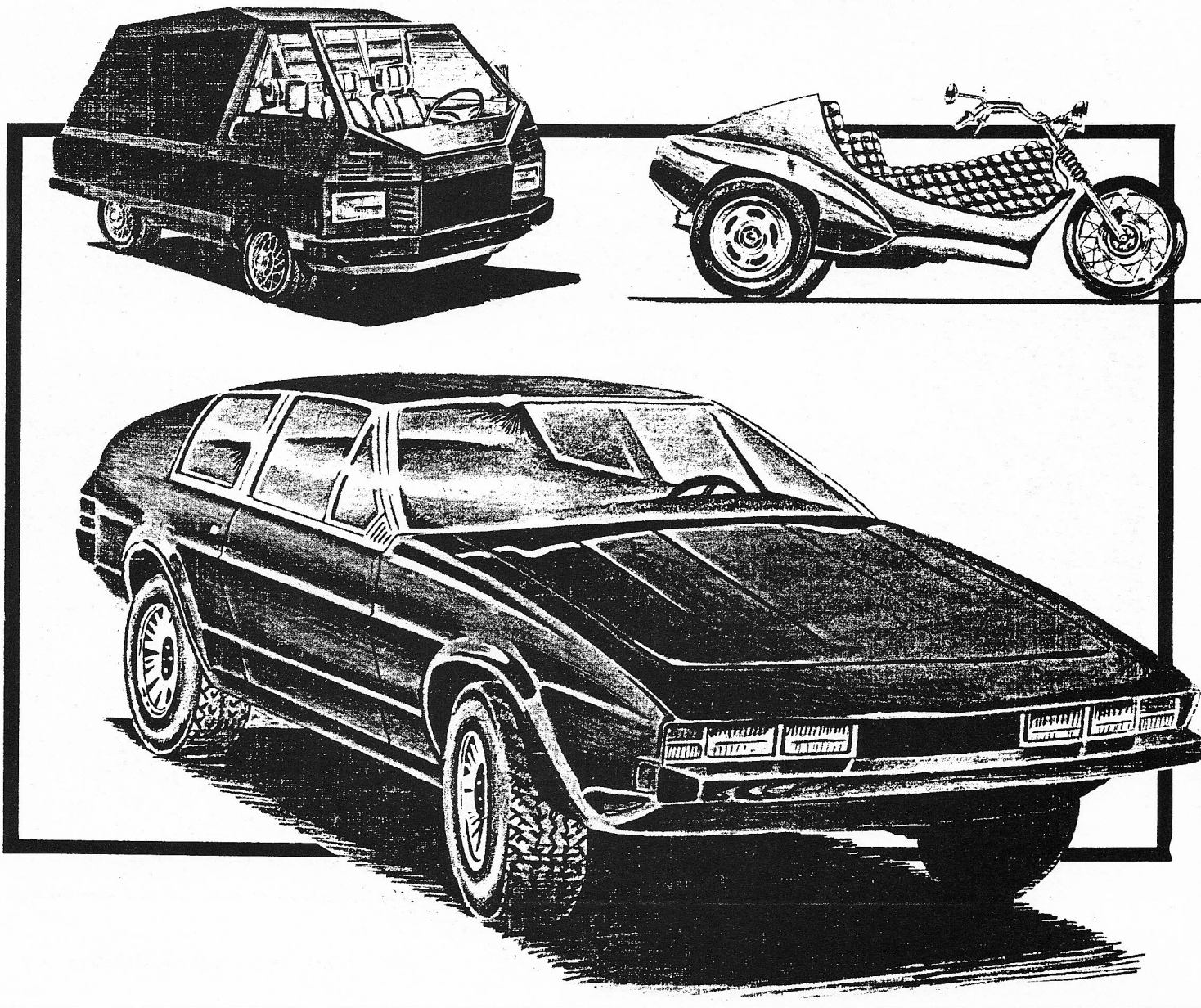


*The AMECTRAN S/T model.*



*AMECTRAN President Ed Ramirez, right, and one of the firm's engineers, check out the S/T prototype.*

# WORLD GUIDE TO BATTERY-POWERED ROAD TRANSPORTATION



# WORLD GUIDE TO BATTERY-POWERED ROAD TRANSPORTATION

## COMPARATIVE TECHNICAL AND PERFORMANCE SPECIFICATIONS

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There is still another distinction to be made between vehicle types. This is between vehicles that are conversions of existing gasoline-powered vehicles and those that have been created "from the ground up." Conversions benefit in that many of their components are mass produced and assembled, thus lowering their costs of production and servicing. Manufacturers of "ground up" vehicles are not locked into using any particular component or type of component, thus freeing them to choose more efficient parts and designs. Proponents of ground-up vehicle designs point out that their vehicles have been designed expressly for electric propulsion and thus are overall stronger and more efficient than conversions. Furthermore, among ground-up designers there is further division as manufacturers such as Amectran point out that every component of their vehicles has been redesigned for use in that particular electric car, while other manufacturers use components as large as chassis and suspension systems from conventional vehicles for their ground-up designs. Of the vehicles in this book, 59 are conversions and 67 employ some form of a ground-up design.

Profile of the industry:

The range of companies involved in the electric vehicle industry represents a remarkable collection of corporate entities. The list includes General Motors, the world's largest corporation in terms of sales; three-person operations in Southern California and Florida; and a government agency in India. This book, which details only those companies with vehicles now or soon-to-be available for purchase, excludes some firms ready to appear on the scene. Even so, it contains reports on 126 vehicles made by 68 companies spread around the world in 14 countries. With such a diversity of companies, it is only natural that the approaches they take toward developing and marketing their products varies greatly.

Italy's Fiat and the Japanese firms, such as Suzuki and Daihatsu, for example, have developed detailed plans for introducing their electric vehicles. Interestingly enough, most of the large, professional organizations involved with EVs plan to enter the field first with vans and trucks, which can be used in fleet operations where they can be controlled and serviced carefully. Also, fleet operations are likely to buy more than one vehicle, thus increasing the possibility of multiple-vehicle orders for the manufacturers. Other large corporations working directly with vehicles are Ford, General Motors, and Chrysler in this country. In Japan Daihatsu, Toyo Kogyo, and Suzuki are aggressively developing EVs. In Italy Fiat is preparing to market a passenger EV around 1983. In Germany Volkswagen, Daimler-Benz, and Messerschmitt-Bolkow-Blohm all have either production vehicles or prototypes they are developing. France's Peugeot, Renault, and Thomson, the electronics firm, all have prototype vehicles.

At the other end of the spectrum are the small entrepreneurs, many of which have no formal plans. These companies characteristically suffer from a lack of capital and marketing finesse, which leads them to ignore fundamentals of creating an accepting public for their product, concentrating instead on securing enough funds to finance the completion of a handful of vehicles which they hope to sell through word-of-mouth methods. These firms often specialize in electric or hybrid passenger cars. Some small makers, notably P.G.E. and Amectran, do have extremely well organized plans, however.

Government involvement:

As mentioned earlier, in the U.S. the Congress in 1976 mandated the Dept. of Energy (then named the Energy Research and Development Administration) with the responsibility to help create a viable electric vehicle industry. Under public law

## VEHICLE HISTORY

**Production history:** Information pertaining to the research, development, and production for sale of vehicles is recorded in this section. Some vehicles such as British dairy delivery trucks, known as milk floats, have been manufactured for nearly 40 years, while most EVs have relatively little production history. Information concerning earlier prototypes designed by the company often is included. This information appears when the production model being reported on is a direct out-growth of that earlier work.

**Use history:** Some manufacturers provided information concerning the number of their vehicles purchased by particular users, and on the performance and operating results these users have experienced with their vehicles. Such data is recorded in this section whenever it is available.

**Licensing:** Laws regulating the licensability of vehicles vary from country to country and from state to state. In general, whether a vehicle is licensable for road use in the U.S. on major thoroughfares is mentioned here, since American laws concerning road worthiness are among the most stringent. Member countries of the European Economic Community have standardized their licensing laws, so that a vehicle certified for use in one EEC country also is licensable in all other EEC states.

In the U.S. Some electric vehicles are prohibited from using interstate highways and other limited-access roads, while others are granted licenses as motorcycles rather than as cars. H-M-Vehicles' Free-way Electric, for example, is licensed as a car in some states and as a motorcycle in other jurisdictions.

## PERFORMANCE SPECIFICATIONS

**Collection of data:** Unless otherwise specified in the Comments section at the end of each vehicle report, performance data provided in these reports were either generated by tests conducted by the manufacturers or, in the case of new models, represent theoretical estimates.

**Max. speed:** The maximum speed of most electric vehicles is between 30 mph and 50 mph. Many vehicles are designed for around-town use and thus are not capable of highway speeds. There are several exceptions to this range of maximum speeds, however. At the low extreme are many delivery trucks built in Great Britain and The Netherlands. The Spijkstaal 3000 has an 11-mph top speed and Crompton Electricars' E Range has a top speed of 15 mph. There are, the manufacturers of these trucks contend, no reasons to overload their vehicles with power capabilities that they never will need. It only adds to the cost of the vehicles.

At the other extreme is Amectran's Exar-1, the fastest automobile in this book with a maximum speed of 85 mph. Other EVs with notably high top speeds are Western Research's Lektrikar II, with a top speed of 75 mph, and Unique Mobility's Electrek car and van, Electric Auto Corp's Electric Limousine, and JMJ Electronics' Omni Electric and Electric Dodge D-50—all with 70-mph top speeds.

**Cruise speed:** Typical cruising speeds for EVs also are anywhere from 30 mph to 50 mph, although cruising speeds

be it manual, automatic, or continuously variable, the overall differential ratio is recorded. The continuously variable transmission is a relatively recent innovation through which power is more accurately transmitted from the motor to the wheels. It permits the motor to run at a constant, optimum speed, thus avoiding wasting energy.

Tires: Most manufacturers now use radial tires on their electric vehicles, since radials have the lowest rolling resistance of any tires currently available. Rolling resistance, described above, is the amount of friction created by the tires, wheels, and wheel bearings as the vehicle moves. Tires are the source of most of this resistance. Because electric vehicles must bear a heavy load of lead-acid batteries, manufacturers are interested in decreasing as much as possible the rolling resistance, which in turn reduces the energy consumption of the vehicle. The two major means of reducing this resistance is to increase the air pressure inside the tires and to reduce the load. While increasing the tire pressure can be dangerous, since electric vehicles generally do not travel at high speeds the danger of a blow-out due to over-inflated tires is diminished. Many manufacturers now inflate their tires to around 35 psi, a higher pressure than tires on conventionally fuelled vehicles are. Goodyear meanwhile has developed a variation of its elliptic tire with low resistance expressly for EVs.

Brakes: Electric vehicles use the same types of brakes as do conventional vehicles. Most common is the use of hydraulic disc brakes on the front two wheels and hydraulic drum brakes on the rear wheels.

Instruments: Typical instrumentation in EVs includes most of the standard devices found in conventional vehicles, including a speedometer and an odometer. In addition, EVs usually have an ammeter and a voltmeter attached to the traction batteries, to monitor the flow of power through the system. Some vehicles have ammeters on their auxiliary battery system as well. Most vehicles now have some type of state-of-charge meter to give the operator a sense of how much mileage is left in the batteries' charge. State-of-charge meters are still in an early stage of development, however, and are not as accurate as manufacturers would like them to be. More sophisticated vehicles have other instruments, such as motor temperature gauges.

Body: Nearly half—59 out of 126—of the vehicles in this book use the bodies. chassis, and much componentry of conventional gasoline-powered vehicles. The Volkswagen Rabbit and Dodge Omni are used by several manufacturers, while several large automakers currently are using bodies of their mass-produced vehicles for their electrics. Examples include General Motors, Volkswagen, Fiat, and Toyo Kogyo. Of the remaining vehicles—those that use original bodies—a wide variety of materials are used. Seeking reduced vehicle weight, and thus improved mileage, many EV makers have turned to aluminum and fiber glass for body materials, while others still use sheet steel.

→ Amectran uses high-impact Kevlar-reinforced acrylic for its Exar-1's body. Marathon Electric Car uses a special Alucabond aluminum and polyethylene bonded material for the body of its C-360 van. Electric Passenger Cars and Vans uses a special polyurethane kinetic safety vehicle body consisting of a flexible polyurethane envelope filled with polyurethane foams of various viscosities. These envelopes form a protective skin around the standard Ford Pinto body, used by EPC/V on its Hummingbird Hybrid Mk IV, which absorbs energy during a crash. The chassis of most EVs are made out of tubular steel and iron in the same way as are chassis of conventional vehicles.

## MANUFACTURER DATA

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or
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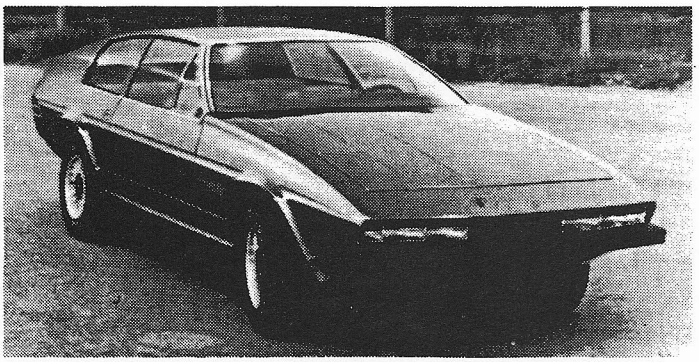
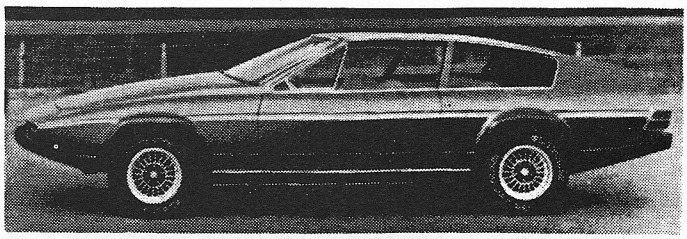
Lillian Huff, vice president, national civic relations, Washington
Robert Blansky, advertising representative, New York City

## VEHICLE DESCRIPTION

Name/model: Exar-1
Type: Electric passenger car
Seating: Five
Doors: Two
Status: Production prototype
Base price, single unit: Approximately $6,000
Base price, fleet sales: Approximately $6,000
Standard equipment: Electric sunroof, tachometer, AM/FM stereo radio with tape player, batteries with self-watering system, 40-channel CB radio, carpeting, air shocks, air conditioning, heater/defroster, Kevlar acrylic body designed by Frua, power-assisted steering, disc brakes on all four wheels, regenerative braking, tinted windshield and windows, special Goodyear tires with low rolling resistance, mag wheels, computer diagnostic system, onboard charger, clock, air bags, full instrumentation.

Options: The Exar-1 will not have options. All improvements are intended to become standard equipment.
Colors: Black, White, Blue, Yellow, Red, Green, Bronze, Silver.
Unique features: Kevlar body parts with low replacement costs, air shock and air jack system, special tires, diagnostic computer, 4130 chrom-alloy steel chassis, air bags.
Safety features: Devices prohibit starting the car during charging, isolate the chassis during charging, and prevent prolonged overcharges. A low-speed audible warning is emitted by the car below 27 mph in forward and reverse. The propulsion system is fuse protected. Air bags and seat belts are standard passenger restraints. Other safety features include padded dash and knee guards, energy-absorbing body panels and steering column, safety glass, and internal roll-bar.





## SALES AND SERVICE

Availability: The company hopes to beginning taking orders for the Exar-1 by the end of 1979, with first deliveries planned for late 1980.

Delivery: Sold on a delivered basis.

Dealer prep: None

Terms: Cash, six-year company financing plan.

Dealerships: None established or planned.

Sales to individuals: Yes

Warranty: Most items such as the body, chassis, bearings, and drive train will carry a form of limited 20-year guarantee. Standard warranties on other components will apply, although Amectran will handle replacement and/or repair of parts.

## VEHICLE HISTORY

Production history: Amectran has produced a number of prototype electric vehicles since 1973, one of which was clocked at more than 100 mph. Included in this series of prototypes was Amectran's S/T vehicle, which was completed in 1977. The S/T, which still is used to shuttle visitors at high speeds from the Dallas airport to Amectran's offices, has a top speed of more than 85 mph and a 100-mile range at a constant 55 mph. It accelerates 0-55 mph in 12 seconds. Verification of the S/T's performance has been made by several independent sources. Amectran claims that it is able to obtain these seemingly impressive performance data through the continual testing and experimenting with every aspect of its vehicles' design. In this way Amectran says it is able to tap the newest innovations of high technology. Examples that company president Ramirez gives of this care and precision include more efficient axle, brake, and suspension designs. Development of the Exar-1 began in 1977. The car will use a body designed by Pietro Frua, the Italian master designer who previously had created such automobiles as the Rolls Royce Camargue and the Maserati Kyalami. The production version of the Exar-1 will differ from the prototype in several ways, including the use of an acrylic body in place of the prototype's steel body. Some componentry also is scheduled to be changed.

Licensing: Fully licensable.

## PERFORMANCE SPECIFICATIONS

Max. speed: 85 mph

Cruise speed: 55 mph

Cruise range: 75-100 miles at 55 mph

Start-stop range: NA

Gradeability: Approximately 75 mph on a 15% grade

Acceleration:

| 15 | 30 | 60 mph |
|---|---|---|
| NA | NA | 12 seconds |

## TECHNICAL SPECIFICATIONS

Length: 181 in

Width: 69 in

Height: 51 in

Wheelbase: 106 in

Track: Front..58.3 in
Rear...57.9 in

Ground clearance: 6 in

Curb weight: 3,000 lb

Battery weight: 1,800 lb

Gross vehicle weight: 4,000 lb

Payload: 1,000 lb, including five people

Doors: Two

Battery location: Batteries are located in the front and rear of the vehicle, beneath the hood and under the trunk.

## COMPONENT SPECIFICATIONS

**Motor:** 18-hp series wound General Electric DC motor with internal fan ventilation. Weight is 225 lb.

**Batteries:** 24 six-volt lead-acid batteries with single-point watering and gas recombination system. Fan ventilated. One 12-volt auxiliary battery is connected to the propulsion system via a DC/DC converter.

**Controller:** The controller is a combination of General Electric and Cableform units, modified by Amectran. The company will not release details on the unit. Regenerative braking.

**Charger:** Onboard solid state charger with automatic charge controls, built by Amectran.

**Drive train:** Four-speed semi-automatic transmission.

**Tires:** Goodyear HR 78-15 high rolling resistance tires, inflated to 40 psi. The tires were designed for electric vehicles.

**Brakes:** Hurst disc brakes on all four wheels.

**Instruments:** Computer-controlled voltmeter, state-of-charge meter, tachometer, clock, ammeter. Digital display for battery condition, lights, battery water level, brakes, etc. Speedometer markings in mph and km/hr.

**Body:** An acrylic-reinforced Kevlar body on a 4130 chromalloy steel chassis, by Amectran will be used on the production model, although the production prototype will have a steel body.

**Bumpers:** Shock-mounted energy-absorbing bumpers.

**Heater:** Stewart-Warner gasoline heater.

## OPERATIONAL AND THEORETICAL DATA

**Energy consumption:** NA

**Cost of operation:** NA

**Battery as % of GVW:** 45%

## GOVERNMENTAL CONSIDERATIONS

**Safety standards:** Expected to meet all Federal Motor Vehicle Safety Standards.

**DOE self certification:** Certification submitted Sept. 12, 1978.

# MANUFACTURERS

## AMECTRAN

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Lillian Huff, vice president, national civic relations, Washington
Robert Blansky, advertising representative, New York City

Company background: Amectran—the name stands for American Ecological Transportation—was created in the early 1970s to develop and market electric vehicles. The number of people on Amectran's staff varies from six to 30, depending on the work in progress at the time. Amectran's president Edmond Ramirez is the first EV maker to have developed a comprehensive and aggressive approach toward electric cars, planning to market the expensive-looking, high-performance Exar-1 at an affordable price. He has taken all aspects of production and marketing into consideration. Plans existed more than a year before planned market entry covering even the most minute details of advertising, fabrication, servicing, and distribution of the Exar-1. This comprehensive plan calls for establishing a series of 15 medium-sized assembly plants throughout the U.S. and using seed money from investors to secure government guaranteed loans from such agencies as the Dept. of Agriculture, the Economic Development Administration, and the Small Business Administration. Amectran intends to be in production by late 1980, and expects to produce 75,000 cars within the first 30 months of operation. By the fifth year, the Ramirez scenario has it, Amectran will be producing 300,000 cars per year. This plan's boldness has attracted some critics, who predict the company will be unable to live up to its claims. However, numerous independent authorities have ridden in prototype Amectran cars and attest to the vehicles' capabili-

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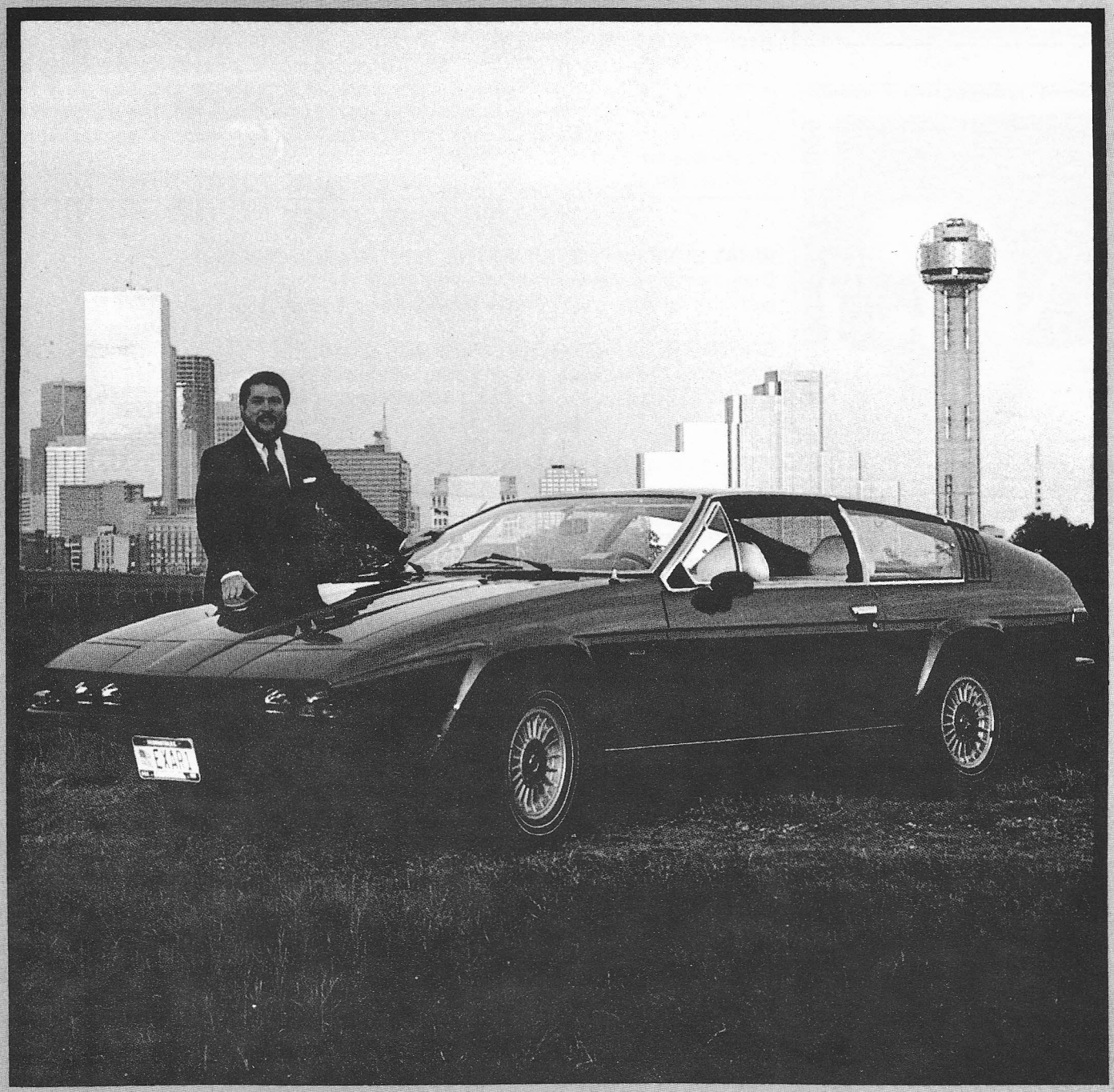
November 1981

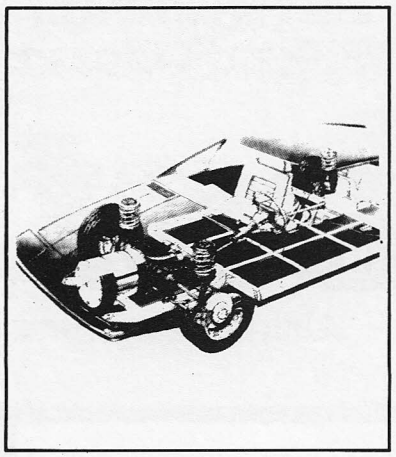
# Southwest™

Airlines Magazine




## Is This the Car of the Future?

### Amectran's Electric Exar-1



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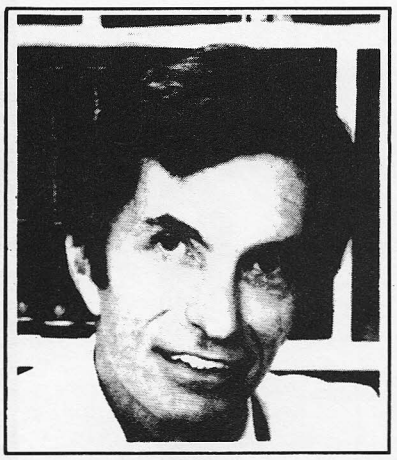

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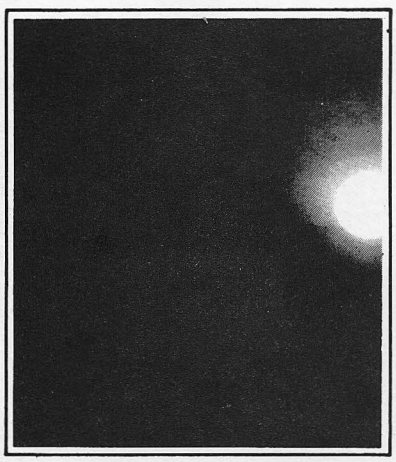

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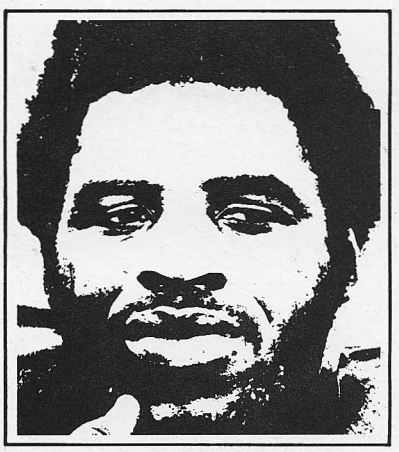

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# Southwest™

Airlines Magazine

November 1981 Volume 11 Number 4


## THE COVER

*"Big D's" futuristic skyline seemed an appropriate backdrop for a futuristic car, one that may become the car of the 1980s and beyond. We are speaking of the electric automobile. This month, in "What Ever Happened to the Electric Automobile?", associate editor Tom Walker analyzes reasons for the delay in perfecting and manufacturing this wonderfully economical invention as well as prospects for, and problems attending to, its mass acceptance. The man on the cover is Edmond X. Ramirez, founder of Dallas's Amectran Corp. and father of the Amectran Exar-1, the splendid electric car beside him. Photo by Boyce Graham, Dallas.*

## SPECIAL FEATURES



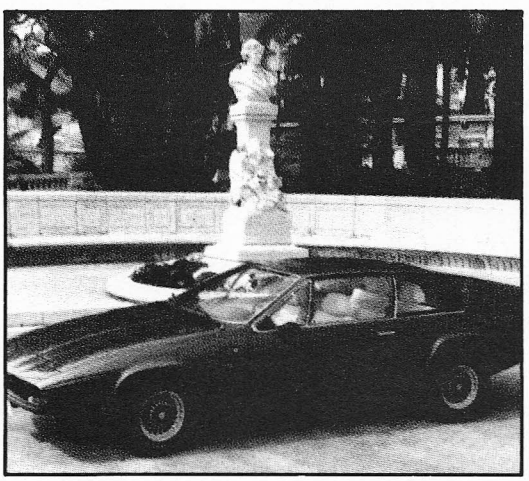
## REGULAR FEATURES

By Tom Walker

# WHATEVER HAPPENED TO THE ELECTRIC AUTOMOBILE?

*It's alive and well. In fact, it's never looked or driven better. But somebody up there doesn't like it. Who?*

On Tuesday, July 14, of this year, I had an experience I assume relatively few of you have had. It was unforgettable, and I have to share it with you. I joy-rode for half an hour in an electrically powered automobile and felt, like some astronaut, as though I'd taken a Giant Step for Mankind.



The car, a prototype, was blue, sleek, and sporty, along the lines of the Maserati Khlami. It was designed by Italy's Pietro Frua (who has also designed Lamborghinis and Ferraris) for BMW, but the German manufacturer rejected the design because they considered it too racy, and the electric-car company picked it up. The car seats five persons, with two comfortable bucket seats and lots of leg room in front. The only things turning the key accomplishes are to unlock the steering wheel and turn on the dashboard computer controls, which then give a readout: directions on what to do.

The controls first direct you to enter the starting code, known only to you and yours. It's a security and safety measure; you press some buttons on the keyboard to enter the code, and if you botch it, you start over. Botch it again, start over again. Botch it four times, though, and the computer decides you're in no shape to drive this car, and

everything shuts down. You can overrule the computer if you choose to and start the car anyway, but if you do the horn will blare and lights will flash and you'll wish you hadn't.

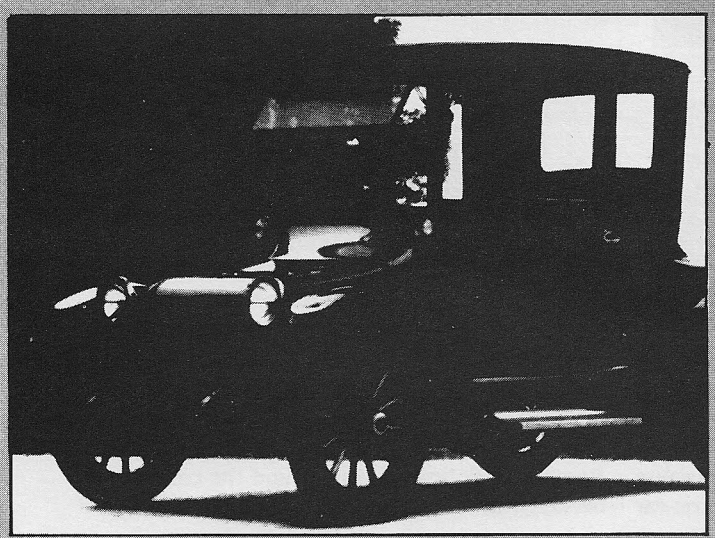
After you've entered the starting code, you simply shift into gear and drive off. The shifting is and isn't standard. You may shift if you want, but you may also put the car into third and leave it there. Also, there's no clutch to depress. You simply let up on the accelerator when you shift.

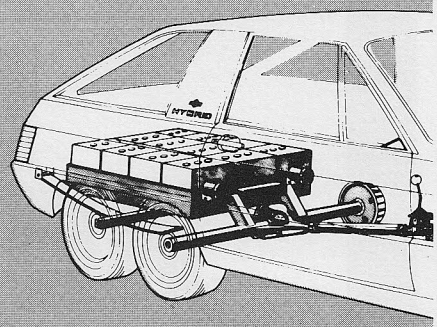
The first thing that will strike you as you're driving the car is its eerie quietness. I couldn't get used to it. It's as if the hood were hollow and the wheels not touching the ground. It's almost *too* quiet. The car makes just two noises unless you have the AM-FM radio or tape deck on or your elbow on the horn. One noise is an harmonic, quiet yet audible. It's a low-frequency pitch that's activated at speeds under 27 miles per hour for no other reason than to let people know you're coming. The other, which sounded to me like the clicking of a taxi meter, emerges from the regenerative braking system, whose function is to return power to the batteries as you decelerate, causing the motor to act as a generator.

The car ran smoothly and felt incredibly light. I was amazed. The prototype weighed 4,915 pounds, but the production vehicle will weigh 2,000 pounds less, because unlike the prototype it won't be made from steel but from Kevlar, a lightweight acrylic petro-

## Milestones of Electric-Automobile History

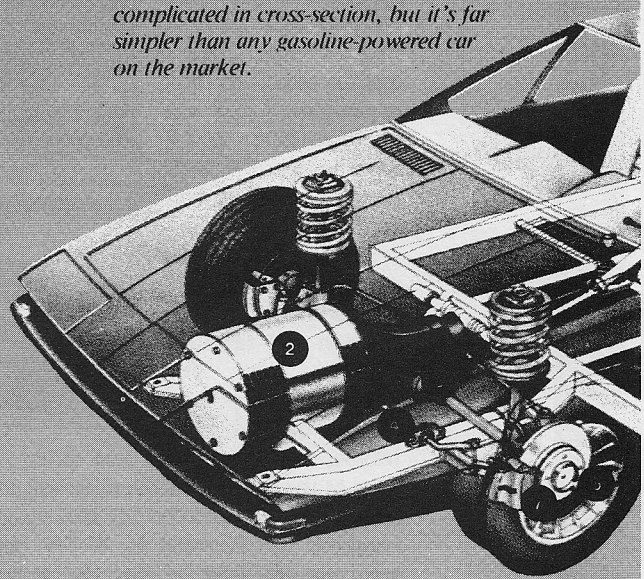
*Above: Henry Ford (l.) and Thomas Edison announce their intent to build an electric car in the 1920s. Below: this is what it looked like. Ford's wife drove one, but the car was never mass-produced.*






*The Briggs & Stratton Hybrid Electric, a six-wheeled prototype. B&S feels that six lightly loaded tires roll easier than four fully loaded ones. This electric car contains an 18 hp 2-cylinder gasoline engine.*

*Ed Ramirez's Exar-1 prototype looks complicated in cross-section, but it's far simpler than any gasoline-powered car on the market.*

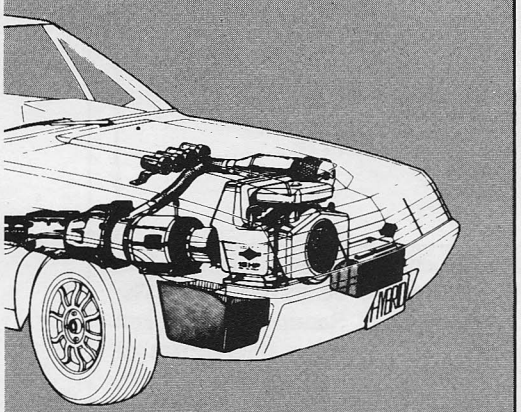


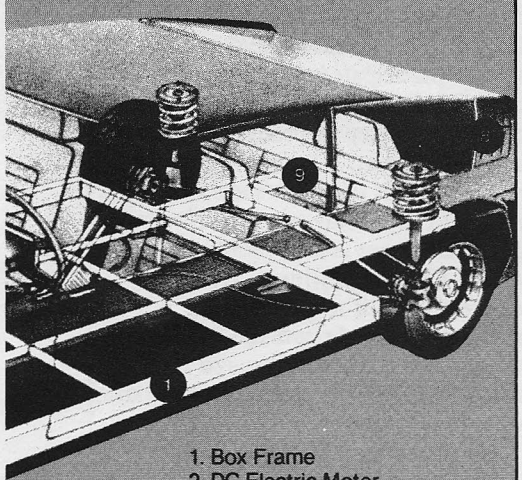
chemical. The car reached speeds as fast as 80 miles an hour and accelerated from 0 to 60 in 12 seconds.

If one of its tires (specially designed by Goodyear) went flat, the operator assured me, we could continue to drive for a while anyway. A battery gauge on the dashboard, coded in red, yellow, and green, told how much juice we had left before we had to recharge. (Position 5 of the computer controls will tell the same thing.) When we got close to 80 mph on Dallas's LBJ Freeway, I started to tense, but the operator assured me it was not to worry.

The options available on the controls are called the "menu." They tell what condition the vital features of the car—lights, brakes, cylinder, battery charge, battery water—are in at any time. One option is called "climate control": you can program the computer to have the car attain and hold a given temperature at a given time on a given future date. Another option is called "quarter-mile range": put the computer into this control and the car will run for a quarter-mile—long enough for a lot attendant to park it and drive it back to you—without the key or starting code in operation. That way, he can drive your car without learning the secret to starting it. Still another computerized control indicates how many rpm's your motor is making.

This electric car is equipped with a specially designed Japanese air-conditioning unit, and with a two-gallon gasoline tank for the heater.





1. Box Frame
2. DC Electric Motor
3. Transaxel
4. Stabilizer Bar
5. Constant Velocity Joint
6. Aluminum Alloy Wheel
7. Disc Brake Rotor
8. Rear Battery Vent
9. Front & Rear Battery Packs

# Who's Been Dragging Whose Feet on the Electric Car —and Why?

*Excerpt from Hearings of Senate Committee on Commerce, Science, and Transportation on Department of Transportation Secretary Brock Adams's Proposal to Investigate Automobiles like the Amectran Exar-1.*

*March 23, 1979*

**Senator Howard Cannon of Nevada:** "Often small entrepreneurs . . . leapfrog conventional technology. It has come to my attention here that one of these types of companies has developed an electric car that seats five, has a top speed of over 75 miles an hour, a 100-mile range, accelerates from zero to sixty in twelve seconds, and can sell at a nominal production volume for under $6,000. I may say its a pretty darn good-looking automobile, the way it's designed. The car is designed to provide long life, low rolling resistance with energy efficiency, and an innovative control system using a microprocessor. Now reports are that the prototypes actually achieve the performance specifications that I've mentioned using lead-acid batteries. Have you personally heard of this effort, or has your department evaluated its design, and does it plan to provide any support to help investigate this effort?"

**Secretary Adams:** "Yes sir. We're familiar with that. We have recommended that it be pursued. We have recommended, because the purchasing of those kinds of vehicles is within the Department of Energy, that they bring in these vehicles for testing. You will have to inquire directly of them. It is my understanding they say that you can bring in a vehicle so that we can test it. The testing of an electric vehicle, Mr. Chairman, is a key component within slight variations, as to what will be its actual range under test conditions over a period of time. I would certainly say it's important that a number of these be bought and tested and tried, because I do believe in innovation and a pool of small people having an opportunity; and we have set up under Mr. Rhodes Stevenson in our department where we get these. They are evaluated by our department and by DOE and we try to get them into a prototype stage where they can run and people can really see them. Yes, I think that is a good vehicle. We should pursue it."

There is a storage trunk in back. Batteries are located in back also, as well as in front. Driven at 55 miles per hour, this car will travel almost 100 miles before you must recharge it. You do so simply by plugging it into an electrical outlet. Charging time is eight hours on a 110-volt current (the standard one), five hours on a 220 (the kind you plug your washer and dryer into).

And here's the best thing of all. The charge costs approximately one dollar. What kind of gasoline-powered car will carry you 100 miles for one buck?

It sounds too good to be true, doesn't it? Maybe it is. The electrically powered automobile is certainly not a new idea, and yet the American government and American car manufacturers—indeed, the American motorist—seem to regard it as one whose time has not yet come. Take, for example, the electric car I rode in, the "Exar-1." The prototype was made by a Dallas-based company formed in 1973 called Amectran. It's the third electric-car prototype Amectran has come out with, and yet the concern and its founder-braintrust, Edmond X. (Ed) Ramirez, a Dallas-born-and-bred computer wizard, *have yet to put a single car into production.* That seems all the more incredible in light of the fact that for the past five years, at least, Ramirez's prototypes have received more national publicity than any other electric-car project in the works anywhere.

The first ancestor of Ramirez's Exar-1 was a prototype called "The Yellow Car." According to the Department of Energy's 1977 State of the Art Report on Electric Vehicles, it had a top speed of 70 mph and a range of 100 miles at 55 mph. Ramirez sought to amend these statistics, claiming that his car would actually go as fast as 100 mph—a remarkable figure for an electric prototype that weighed over 4,000 pounds. In any case, owing in part to an unsightly appearance (it looked like a Gremlin that had been assembled by a blindfolded Woody Allen), the Yellow Car never made it to the factory.

Ramirez and Co. followed it up with another late-seventies prototype, the "S/T." Constructed from AMC body parts, it was designed to convert readily from a mid-sized hatchback sedan to a small pickup truck. Though better looking, the S/T fell a bit behind the Yellow Car performance-wise, and it, too, never saw the light of day on a production line. American Motors, originally interested in manufacturing it, was finally uninterested.

Undiscouraged, Ramirez continued to solicit investors, the most notable of whom was the singer Pat Boone, for the invention, design, and manufacture of a third prototype. This time, Ramirez pulled out all the stops. He called the new car the Exar-1, after his initials. "Nobody would buy a 'Ramirez,' " he told the journal *Nuestro*. "They'd be waiting to see if tamales came out of the exhaust pipe." He bought the design Pietro Frua had submitted to BMW. He conscripted Harold Chenault, chief electronics engineer at Texas Instruments, to engineer his project. He commissioned Goodyear to develop a low rolling-resistance tire that a lightweight car could continue to drive on even *after* it flatted. He investigated the possibilities of Kevlar as a body material, and found it to be far lighter than steel and amazingly impact-resistant; moreover, the car's color could be pigmented into the Kevlar, rather than painted on, so that nicks and scratches could not take paint off the car. Kevlar was also desirable from the standpoint that as a petrochemical derivative, it would not be frowned on by the oil industry, and so maybe the car wouldn't either.

Ramirez's Exar-1 was in no way a conversion. It would be built from the ground up, with every concept of the electric automobile in mind. Ramirez put his extensive background in the computer industry to good use for the car's computerized-control dashboard. Body colors would be black, white, blue, yellow, red, green, bronze, and silver. The car would contain 24 six-volt lead-acid batteries, with a single-point watering and gas recombination system; a four-speed semiautomatic transmission; a 4130 chromalloy steel chassis; Hurst disc brakes on all four wheels; Goodyear HR 78-15 low rolling-resistance tires, inflated to 40 psi.; and shock-mounted energy-absorbing bumpers capable of withstanding a 7.5-mph impact.

For a time it appeared that Ramirez would realize his dream at last. Some Senate hearings in 1979 with the Department of Transportation (see box) boded well for him, and the DOT seemed friendly and cooperative. He applied for government loan guarantees—something entirely different from government assistance or subsidy—and they seemed to be forthcoming. The City of Berkeley, Ramirez claims, asked to test the car for the Department of Energy when it went on tour in 1980, and Berkeley's response was so favorable that it gave Ramirez the keys to the city and immediately began making plans for an Exar-1 plant there.

*"The electric automobile is certainly not a new idea. But the government, car manufacturers, and American motorist stubbornly regard it as one whose time has still not come."*

Ramirez's dream plant would implement the ultramodern principles of Japanese plants rather than what he considered the obsolete principles of Detroit ones: workers would be rotated so as to participate in the whole process of building the car rather than just one or two; each step of production would be reported into a computerized keyboard, so that the exact stage of every car could be quickly ascertained at any point. Day care centers would be provided for the children of female workers. And if a crew finished a job ahead of schedule and the work was sound, that crew was through for the day, week, or whatever, regardless of what time it was.

But 1980 was also the year things really began to go sour for Ramirez, and now, once more, the Amectran project resembles a silver lining encompassed by a dark cloud. The government-guaranteed loans that had seemed so certain during the Carter administration seem most uncertain under the current one; a new route will have to be pursued for the company to get the millions of

dollars in loans it needs to build factories and produce the automobile. Similarly, the people who wanted to build the Berkeley plant are no longer in power there, says a Ramirez spokesman, and the people who've replaced them will have to be sold on the car.

Worse still, Ramirez insists that incidents have befallen the Exar-1 in the past year that bespeak sabotage. Last fall, he claims, arsonists tried to firebomb his prototype in Los Angeles; some goons tried to pick a fight with his people at an automotive show in Chicago; and a West Coast newspaper journalist who was primed to praise and endorse his car in print was threatened with firing if he did. (The journalist, Ramirez adds, wrote a false, unfavorable report on the car instead.)

*" 'I ask you,' says Ramirez, 'how a little Mexican American nobody from a poor section of Dallas who didn't even go to college can invent a car that the big Detroit companies can't?' "*

Ramirez also feels that the cautious, skeptical Department of Energy has dragged its feet on testing and endorsing his car even though members thereof have ridden in it and found it to surpass even his most exalted claims. About the DOE Ramirez is unabashedly bitter: "They [the DOE] are made up of the biggest bunch of lunatics, nincompoops, and incompetents this country has ever seen. And now that I've given you my compliments about them, let me add that I feel they have no integrity, no concern that their job be done properly."

He is no more charitable toward Detroit: "The shame our automobile industry has put our country into is astronomical. They haven't changed their production techniques in the last sixty years. American Motors is selling out to the French, Chrysler's looking for anyone to buy them out, Ford is in trouble, and GM is hanging on by its teeth. And yet they won't *change*. That's a horrible condemnation of an industry that at one time was the glory of the world."

What is Ramirez getting at? Does he feel there is a conspiracy involving the DOE and Detroit against his little car? "No," he replies. "I am not a conspiracy theorist. There is no organized effort to stop us. I can't believe Detroit is behind this—they don't need to make me into a Ralph Nader. One should be enough for them. But certain people are dragging their feet on the electric-car concept. I ask you this: how can a little nobody Mexican-American guy from a poor section of Dallas who didn't even go to college come up with a car that the big Detroit companies, with all their millions, can't invent? If I can make a car that works, how come GM, the largest corporation in the world, can't? GM has been working on an electric car for ten years now. Where is it?"

Ramirez's vice-president of public relations, Paul Brian, a 30-year-old former disc jockey who quit his job on the air to announce he was joining the Ed Ramirez team, agrees with the boss foursquare: "Look, Detroit is scared. Figures show that most of the driving Americans do is within a thirty-mile radius of the home each day. With an electric car having a hundred-mile range, you could satisfy a lot of needs for a lot of people. Detroit is threatened by the electric car, and I can't say as I blame them."

Actually, the biggest problem Ramirez faces with his Exar-1 is not Detroit or the DOE or the DOT, nor is it the oil industry or goons or firebombers. It's the fact that so far he's been unable to raise enough money to get the car into production. Investors seem skeptical of Ramirez, his product, and, for now, the whole concept. Thus far, according to Brian, the company has been through $3.5 million, half of it just to raise the other half, and has twice been reorganized under provisions of Chapter 11 of the Bankruptcy Law—in both cases an exercise, says Brian, that amounted to no more than the court's laying out a long-term plan through which Amectran, of which Ramirez owns 78 percent, could pay Ramirez back what it owed him. Brian and Ramirez claim 300 investors to date, but the amount invested isn't enough to buy the land for and build a factory and hire hundreds of line workers to assemble the car. They need *big* money, *big* loans, before the Exar-1 becomes a reality.

My own impression, after visiting him briefly, is that Ramirez is a brilliant but strident, abrasive man, frustrated in the extreme by his failure to put into production a product on which he has lavished care, genius, love, and huge sums of money. His stridency and abrasiveness work against him: the angrier and louder he becomes, the more skeptical people are about him. It seems a pity, because Ramirez, who wants to go down in history as the Henry Ford of the electric-vehicle industry, may be offering us a considerable car. I, for one, will never forget the day I rode in it.

What ever happened to the electric automobile? That's a question motorists have been asking for the past 60 years, ever since they saw the first one. In the interim people have tried to make cars run on alternative forms of power like alcohol, amalgams of gasoline and alcohol, and, in one form where shortages would be unlikely, manure. Cars can also be propelled by power produced by hydrogen generators from water, but the process is involved and costly. The best alternative to gasoline continues to be electricity.

Back in the 1920s an inventive duo named Henry Ford and Thomas Edison joined their geniuses to build an electric car. Edison had developed a fairly long-lasting battery, and Ford wanted to mass-produce the car and sell it. The car was manufactured in limited number but never mass-produced—Ford Motor Company copped out at the eleventh hour. Nevertheless, Ford's wife, Clara, drove an electric car until 1930 because she rather ungratefully hated the nerve-racking racket and noxious fumes of the Model T's which had made her wealthy.

So the electric car has been with us for 60 years, yet never in any great number. Why not? Because gasoline has, until recently, been plentiful and relatively cheap and capable of supplying more power and range than could be gotten from any electric batteries developed in the same time span.

But the long-languished interest in the electric vehicle (EV) was rekindled

by the energy shortages of the decade just past. In 1976 Congress passed the Electric and Hybrid Vehicle Act, which called for the development of vehicles not dependent on oil. The country's electric utilities, smelling a few (or perhaps many) dollars more for themselves, also pressed for electric-auto development.

The U.S. government may not have done much to encourage Ed Ramirez's Exar-1, but it has offered a lot of help in the form of research-and-development contracts and loan guarantees to Detroit's Big Three to come up with an EV. The response of the Big Three has been underwhelming. According to a recent New York *Times* article, Chrysler does not seem interested in the EV concept at all; Ford has all but dropped the idea, preferring the concept of alcohol as an alternative to petroleum-based fuels; only General Motors is still actively researching and testing the EV, but they don't seem in any great hurry. For the past three years they've been working on a zinc-nickel-oxide-powered battery, which would give more power and range than the lead-acid batteries electric cars have conventionally contained. Three years ago GM predicted it would have a car with such a battery, a 50-mph top speed, and a 100-mile range (per charge) ready by the mid-eighties. At present their projected date is 1988. In 1988 who knows what it will be.

In the meantime, small independent companies across the country have developed, produced, and sold a few thousand electric cars, but it may take a model from Detroit to capture the interest and fancy of the American driver. "The electric car will gradually come into its own," a marketing executive for GM told the *Wall Street Journal* three years ago. "It just won't be a revolution."

A company that's been trying to develop a better battery for the EV is Gulf and Western, a conglomerate that manufactures a cornucopia of industrial and consumer products but is better known to the man on the street as the owner of Paramount Pictures. In 1980 G&W introduced a zinc-chloride battery system which its president, David N. Judelson, immodestly called "one of the most meaningful developments since the turn of the century." The New York *Times*'s "Business Day" section described the G&W system as a "complex assembly of pumps, storage tanks, heat exchangers, cell stacks, and a separate recharger the size of a refrigerator." Here's how it works. A zinc-chloride solution is pumped through graphite cells the zinc is deposited on. The chloride escapes as a gas that's sucked away, cooled, and stored in an independent tank. Then the chilled chlorine solution is pumped back to the cells, where its reaction with the zinc engenders the electricity that powers the car.

*"Detroit hasn't really pushed to develop the car; the government hasn't pushed anyone but Detroit to; and the public is still wary of it, indifferent to it."*

Why should Americans at least consider driving an electric car once the vehicle is available on the mass market? For several good reasons. One, since EV's don't require liquid fuel, our dependence on imported fuel and on our own diminished reserves would be greatly lessened. A patriotic motive. Two, based on current gasoline prices, the electric car would cost between one-fifth and one-sixth as much to power as the conventional car does. Three, the internal combustion engine is noisy, filthy, and infernally complex, whereas the EV is quiet, emission-free, and relatively simple.

Four, except for a few expensively produced models, the electric car will cost a lot less to *buy* than the gasoline-powered one. And why shouldn't it? It's got a whole lot less inside, and by its very nature it's going to be lighter and smaller and more compact. No EV should require spark plugs, a distributor, a crank case, pistons, a radiator, a water pump, a fuel pump, a carburetor, hoses, an ignition, a fan belt, valves, a muffler, a tailpipe, an air filter, an oil filter, a condensor, or points.

Some other countries have caught on to its advantages already. In Europe and Japan, where gasoline costs more than in the U.S., EV's are already in use as delivery vehicles. And in our own country some states have already caught on. In Colorado, an ecology-minded state, the purchasers of electric cars have been offered not only rebates but also lower electrical rates at night.

Nevertheless, Detroit has not really pushed to develop the car; the government has not pushed anyone but Detroit to develop it; and the public is still wary of it, indifferent to it, despite the miseries caused by inflation, OPEC, and energy shortages in the seventies. "The American people," says one auto-industry spokesman opposed to EV's, "are profoundly conservative where matters of lifestyle are concerned. Their philosophy is 'Unless it is necessary to change, it is necessary not to change.' They're afraid of the change implicit in having to juice up their car every night. They'll miss our gas pumps. They're terrified of the prospect of being stranded along some lonely road in an electric car with a bunch of dead batteries."

Actually, the public is wary for sounder reasons than those. Foremost among them is the EV's 100-mile-tops range, which is fine for a "city car" or "commuter car" making in-town trips in the home-work-supermarket-church route, but it's no good for long-range travel. The EV thus becomes a "second car," something lots of American families don't have and never will, because they can't afford one. Says Bill Graham, automotive editor for the San Antonio *Express*, "The key is that the inventors and manufacturers have not yet been able to offer an electric car that gives the desired range. I think EV's must get up to the approximate range of a full tank of gas before people will take them seriously. Even if they could just get up to, say, a two-hundred-mile range, I think the public would strongly consider them."

Buddy Diebel, automotive sales supervisor for the San Antonio *Light*, agrees: "I think there will be a niche for EV's, because they are clean and quiet. But a lot of work remains to be done on their battery system and their range—

especially in Texas and the Southwest, where we have wide-open spaces and people like to drive out of town a lot. They need to have on-board alternators and rechargers." And Jim Robinson, a Texas Ford salesman who sells electric cars (with converted Ford Escort bodies) that cost as much as $15,000 apiece, opines, "They [EV's] will never present a threat to the combustible-engine car until they can increase their range to two-hundred miles at forty miles an hour."

Says Eldon Larsen, a Texas EV manufacturer, "It's not the car manufacturers who are dragging their feet on EV's—it's the battery manufacturers. We need a dry-charge, larger-capacity battery, one that will give a better range, and so far they haven't come up with one. As for the Detroit car companies—right now they have enough to occupy them in just keeping their gas cars safe. When they do come out with an EV, I'm sure it will be very good, but it won't be in this decade. They don't want to bite the hand that feeds it."

Larsen's opinion about Detroit was seconded by Doug Janisch, project engineer for a Milwaukee component manufacturer that has come up with a six-wheeled EV prototype: "I would not say Detroit is anti-EV or even uninterested in it. Detroit simply wants to continue building what it has historically sold the most of. The electric car just doesn't seem to fit their traditional way of doing business. They don't see enough market statistics there for it—yet."

The six-wheeled prototype mentioned above is called "The Briggs & Stratton Hybrid Electric." It's actually a hybrid of an electric and gas-fueled automobile. A sporty family sedan, it can be driven by either its electric motor or an 18-horsepower two-cylinder Briggs & Stratton gasoline engine—or both together—to produce variable gas mileage of from 25 to 150 miles per gallon. Why *six* wheels? Mainly because B&S feels that six very-lightly loaded tires roll easier, with less resistance, than four loaded to near capacity. According to Briggs & Stratton president Frederick P. Stratton, Jr., the hybrid was designed to carry "two adults, two children, and the groceries."

Says Doug Janisch about the product, "We have spent in the low hundreds of thousands of dollars on it. The Department of Energy has an $8.5 million contract right now with GE for two very similar gas-electric hybrids. That might give you some idea of the difference in economics between private and government enterprise."

Does Briggs & Stratton expect to make money on the hybrid? "Hardly," Janisch replies. "We are not going to produce or sell the vehicle. We have a prototype, and we are throwing it into the public domain for anyone to use. We feel our product is superior to any EV designed thus far because with it *you need never be stranded.* Our motives in designing this car were twofold: one, to promote the nifty two-cylinder engine we had just come up with, and two, to provide good public relations for our company, the world's largest producer of small engines." The car has not yet been tested by the DOE or DOT, Janisch adds. "They have expressed some concern, but they are backlogged in testing commercial cars."

This hybrid electric-gasoline car has been driven by such racing heroes as NASCAR's Richard Petty (68 mph in a short burst on the 2.62-mile road course at Riverside International Raceway in California), Johnny Rutherford (70 mph on a 20-mile distance at Pocono International Raceway), and Mario Andretti, whose performance stats were unavailable. It also attracted considerable public attention on the national tour it took two years ago. Can *this* be the car of the future? A number of people seem to think so. Says automotive expert Buddy Diebel, previously quoted in this article: "I think it [the hybrid] is extremely practical, because it has a small economical gas engine that can run at highway cruising speeds. It can operate on gas, batteries, or both."

And then there's "The Electrica." It's not a hybrid, but it's a conversion of a conventional auto (it's got a Ford Escort body), and it may be the spiffiest, classiest, most expensive EV currently on the market. Billed as a "front-wheel-drive, four-passenger sports coupe," the Electrica is manufactured by Jet Industries, Inc., a 14-year-old concern out of Austin, Texas.

Jet claims to be the leading EV manufactuer in the nation in terms of experience (10 years) and electrical capabilities. The Electrica has a manual four-speed transmission and can go as fast at 70 mph. At 35 to 45 mph cruising speed, it has a range of 65 miles per charge. It operates on a 96-volt lead-acid battery; it has a fully automatic on-board charger; it takes a complete, 220-volt current charge in eight to ten hours.

According to Jet Industries public relations counsel Julian Wise, the Electrica has been tested by both the DOE and DOT, and it passed with flying colors. The car carries a one-year or 12,000-mile guarantee of freedom from defects in workmanship. Says Wise, "We purchased the Escorts from Ford, then took out the carburetor and exhaust system and so on and reengineered the car. What the Electrica costs you depends on the options you choose, but right now we're in the process of bringing the cost down considerably." In the meantime, however, the Electrica is base-priced at a cool $10,900 and costs a whopping $15,000 "loaded" (air conditioning, velour interior, power brakes, AM-FM sound system, defrosters, etc.). That's a lot of money for a "second" or "city" car.

"The conversion ups the cost," explains Wise. "It's just not economically feasible for us to build the Electrica from scratch right now. When the demand is greater, we probably will. As for Detroit, I really don't think they'll get into this game until the market has been proven and demand is quite high. Detroit is geared to huge markets and would not consider producing EV's in smaller volumes than 100,000 units per product."

Hasn't The Electrica priced itself out of the EV market? Wise answers, "The average price for a GM gasoline car this year will be $10,500. At a $10,900 base price and counting down, we'll be very close to them." Still, most of the people I intereviewed for this piece felt that any electric car that sells in five figures would be overpriced even if it could be made to fly on occasion. Says automotive editor Bill Graham (previously quoted), "For a car that's going to travel strictly from home to work or the supermarket and back, I think $6,000 is a good, reasonable price. But I do not think that $15,000 is a good, reasonable price. And I must question whether to most people even $6,000 is not too much."

On this question—pricing—Amectran spokesman Paul Brian says, "People ask us how we can bring the Exar-1 out for just $8,000. I tell them that if we were mired in the traditional obsolete, Detroit way of building automobiles, we couldn't. But our factories, once we get them set up, are going to use so many time-and-money-saving techniques, most of them sixty years ahead

of Detroit's, that keeping the price down won't be any problem at all."

Still another firm in the race is the Marquess Electric Car Co., of San Antonio, previously referred to, which has been in business since 1968 and claims to have built over 2,000 EV's in the last three years alone. Marquess builds four models: an unusual-looking convertible, priced at $7,600, and a van, station wagon, and pickup truck, all priced at $9,600. Owner-proprietor Eldon Larsen boasts that his cars have been sanctioned by the DOE after testing by San Antonio's Southwest Research Institute. Designed from the ground up as EV's, they are manufactured at a local plant. Their range is 80 to 100 miles per charge, and they can attain speeds as high as 60 mph. The Marquess cars operate on a 96-volt system and a 24-horsepower motor. It takes eight to 10 hours to charge them with a 110-volt current; with a 220 it takes just four to six. The company's new convertible, "The Alamo," currently available in a limited edition, boasts an operational cost of less than $0.02 per mile. It runs on just eight batteries, is equipped with a 110/220 built-in charger, and has an overall length of just 114 inches. It's one *small* car.

Says Larsen candidly, "The electric car is rapidly gaining its place in the industry, but I don't believe it will ever replace the combustible engine car—at least not in the next fifty years. As long as petrochemical energy is available for combustible engines, the electric car will never be a 'first' car, or one used for cross-country travel. But as an economical, short haul, commuter car, it'll do fine."

So that's the picture—or a good portion of it—for now. The EV is not unlike an overeager baseball player sitting on the bench, dying to get into the game, to be tested, to prove what he can do, and to make some money once he's proven it. If there's nothing so powerful as an idea whose time has come, the EV must hope that it's time is at last at hand. Whether it actually is, though, seems uncertain. There is a mysterious, powerful resistance to this product. But there was also a mysterious, powerful resistance to inventions like fire and the wheel, and the automobile itself was not received with open arms. Let's hope, in any case, that we are not so resistant to change and progress that in the year 2001 we'll still be hearing the question "What ever happened to the electric automobile?"

# EV FOCUS

NEWS AND ANALYSIS OF HYBRID AND ELECTRIC VEHICLES WORLDWIDE

A McGraw-Hill Publication Vol. I No. 13 August 15, 1978


**INSIDE THIS ISSUE**



The Industry

## Can Amectran Leapfrog The EV Industry?

### The Dallas Firm Has An Ambitious Master Plan For A Workable, Affordable, Marketable Auto

For the last five years a little-known Dallas company named Amectran has been methodically perfecting a high-performance electric car, and a comprehensive plan to make and market it.

The final body assembly of the latest version of Amectran's car is now being completed in Turin, Italy, under the direction of master auto designer Pietro Frua. After a number of delays, the elegant four-passenger electric sedan (*see pictures*) is now scheduled to be flown to the U.S. in late October.

Amectran had intended to unveil the car in Philadelphia the first week in October at the Second International Electric Vehicle Exposition and had contracted for 5,000 sq ft of exhibit space. However, production delays stemming from Italy's traditional August vacation period have forced the unveiling to be postponed.

The arrival of the production prototype will set into motion a grandiose financing, marketing and production master plan that could—if it works—greatly accelerate the re-emergence of the electric automobile.

#### Master plan assumes orders of 75,000

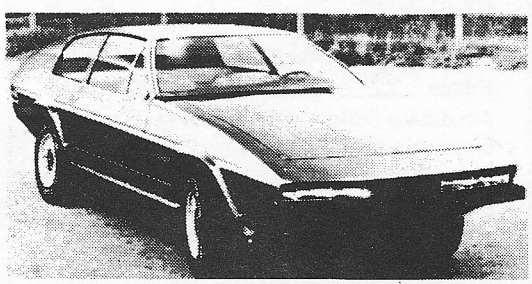
The master plan, elaborately developed by Amectran's founder and president Edmond X. Ramirez Sr, hinges on four things: 1) Raising an additional $1- to $2-million seed money now; 2) Leveraging that money through a variety of government loans and loan guarantees; 3) Taking orders in 15 U.S. cities where plants have been scheduled; and 4) Building 15 regional assembly/service facilities.

Amectran's scenario, greatly simplified here, assumes orders of 75,000 to 300,000 cars over a 12-month period and actual production of 75,000 vehicles in the first 30 months. The plan is intended to climax in a $50- to $100-million public offering that would cover debt and ensure future operating capital.

Ramirez is projecting annual production of 300,000 cars by the fifth year of operation. He points out that this would be less than 10 percent of all foreign cars imported into the U.S. annually.

He believes that the initial investment can be leveraged into tens of millions of dollars because Amectran "would be instrumental in starting a new industry and employing an unskilled labor force to include minorities."

Government officials who have studied Ramirez' plan confirm that sufficient loan and



Amectran's EXAR-1

loan guarantee programs would be open to him—partly because he is a Mexican-American, which qualifies him for minority as well as other programs. Other officials, pointing to the complexities of obtaining multi-agency loan guarantees, characterize his chances as "unlikely but not impossible."

The electric car that is the key to the entire plan would appear to have all of the prerequisites necessary to capture the imagination of the American public: It is expensive looking, low priced and boasts impressive performance

characteristics for an electric. Although it has the look of a $30,000 automobile, Amectran's car—called the EXAR-1—is designed to sell initially for less than $6,000.

### Outperforming a Corvette

Amectran's earlier prototypes were capable of top speeds of more than 85 mph and ranges on a single charge of more than 100 miles at 55 mph. The newest prototype and the production model are expected to perform even better. To prove it, Ramirez plans to dramatize the new vehicle's capabilities by "outperforming" a Chevrolet Corvette in both acceleration and top speed.

Although the U.S. government has not tested any Amectran prototypes—Ramirez refuses to have his cars tested on the SAE J227 cycle, which he considers "inadequate"—a number of knowledgeable people have ridden in the Amectran cars, and attest to their impressive performance. His own track tests in 1976 on a 2.2-mile oval track at speeds averaging 50 mph yielded ranges from 105 to 110 miles.

Ramirez claims that his car is designed for both high speed and stop-and-go driving, although many skeptics maintain that you can't have it both ways. He stresses that "our criterion is normal traffic pattern use . . . if it does not work under all driving conditions, it is worthless."

Indeed, based on the Dept. of Energy's 1978 state-of-the-art report on EVs (*EVF, Mar. 1, p9*), Amectran's car clearly leads the field. Only Electric Fuel Propulsion's cars and Copper Development Association's prototype also combine relatively high speed and good range. No other car's acceleration approaches the 12 seconds to reach 55 mph claimed by Amectran.

These performance characteristics eclipse DOE's present minimum standards for electric personal use vehicles of 50 mph, 31-mile range and acceleration from 0-31 mph in 15 seconds (*EVF, June 1, p8*). They also exceed the characteristics that are expected for the second generation of electric cars now being planned for the 1980s.

Ramirez attributes the apparently superior performance of the EXAR-I (the initials, incidently, belong to Ramirez; his middle name is Xavier) to no one development, but instead to many small improvements in operating efficiencies. Ramirez maintains that his is the only "real" electric car ever built from the ground up.

(Most electric cars are either conversions from conventional ICEs or ground-up prototypes not ever intended for production. However, Triad Services currently has several projects aimed at production (*see separate story*), and other firms may now have similar projects in various stages of completion.)

By paying attention to details and modifying inefficient components, Ramirez was able to squeeze out the extra range, he says. For instance, the bolt that holds the disc brake system together was redesigned with a resultant 7-percent reduction of drag on the brakes. Major changes were made to the suspension and brake systems, as well as in the control and drive systems.

One of the few articles written on Amectran, in the February 1978 issue of *Dallas* magazine, quotes Ramirez as saying, "It's seven percent here and four percent over there and nine percent here and 15 there . . . and all of these percents together finally means the difference between our car going the 50-mile range and the 100 miles.

"I could not accept the idea that five of the finest auto companies in Japan along with all of their engineering talent and all the funding available . . . could only eke out a 40 mph/50 mile range electric car," he said.

Most of the engineering work on the Amectran prototypes was subcontracted out to a variety of local firms. Other component modifications were done by vendors at Amectran's request. General Electric, for instance, modified its motors to Amectran's specifications and Goodyear has worked with Ramirez to develop a low-rolling resistance tire suitable for an electric vehicle.

### Plans for plants in 15 cities

Ramirez proposes to exert that control through a series of carefully calculated steps. He plans to promote the car by taking it, as part of a traveling exhibit, on a 15-city tour starting in Los Angeles and continuing through Phoenix, Denver, Dallas, Oklahoma City, Chicago, Cincinnati, St. Louis, New Orleans, Miami, Washington, Atlanta, New York, Philadelphia and Boston.

Each designated city has been earmarked for a regional manufacturing facility, which would also service the cars it produced. Each factory, expected to cost $2 million and employ 160 people, would have a one-shift capacity of 5,000 electric cars per year. An operating rate of only 25 percent (1,250 units per year) would be necessary to break even, including debt service on the capital costs. The auto plants are relatively inexpensive because they would be modeled after the small-volume Italian specialty car assembly lines, such as Lamborghini.

The multi-city tour would serve the dual purpose of firming plans for the regional factories and creating the enthusiasm that would generate orders for the car. Ramirez plans to ask prospec-

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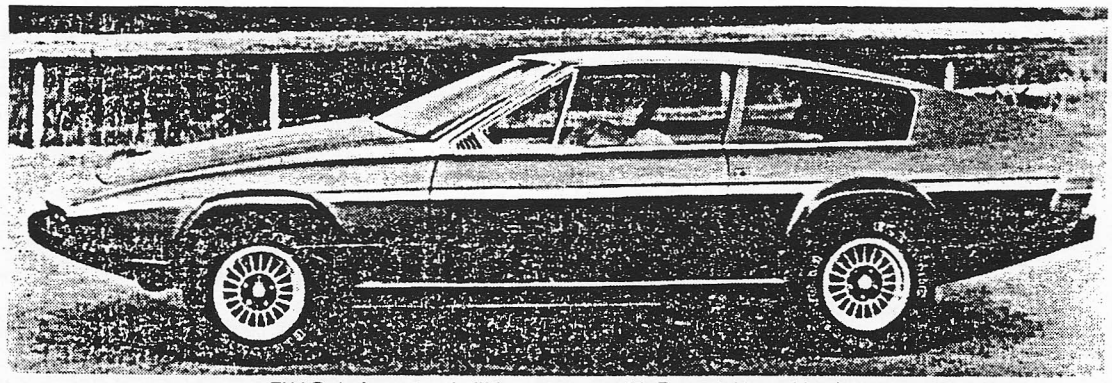


EXAR-1: Amectran's fifth prototype with Frua-designed body

tive buyers for a $400 deposit in escrow, which would place them on a priority waiting list and ensure them of the lowest possible price for the car.

If he does get orders of the magnitude he anticipates, an escrow account of up to $120 million would be established. While the company could not touch those funds, it would be entitled to the interest, which Ramirez calculates could total as much as $12 million over the first 16 months.

### Computer controls electronic functions

The car with which Ramirez plans to tour is the evolutionary result of four earlier prototypes built and tested over the last few years. The new prototype is a roomy, aerodynamically-styled sedan seating four or five passengers. The 16-foot car will weigh only 3,200 lb and is "about the same size as a Cadillac Seville," Ramirez says.

Twenty-four 6-volt Marelli Modular lead-acid batteries will acount for about half of the weight. They will drive a modified, 225-lb General Electric 19-horsepower DC motor. The motor is front mounted with the batteries distributed in both the front and rear of the car.

The motor modifications greatly increase the amount of torque available to the wheels, Ramirez says. The car will have a four-speed transmission.

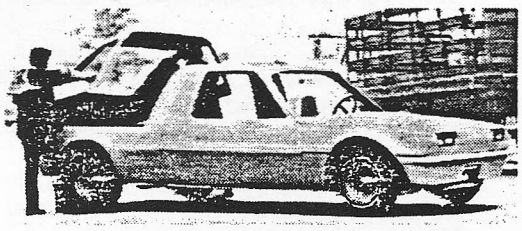
An onboard computer—based on Intel 8080 or one of Texas Instruments' 990 family microprocessor chips—will control all electronic functions and is "intended to optimize the resonance between the motor and the batteries." The motor controller will be either a modified Cableform or GE system.

The car has regenerative braking and four-wheel disc brakes. The chassis is formed of 4130 chromalloy steel and incorporates three roll bars. Tires are of a special design developed by Goodyear.

The car will have numerous frills as part of the standard equipment package. These include a digital combination code lock, AM-FM-tape deck-CB radio, plush carpet, leather-trimmed bucket seats, gasoline heater and air conditioning. Air bags also will be standard equipment.

In keeping with Ramirez' stated intention to build a safe as well as salable electric car, he has incorporated a built-in noise generator which emits a harmonic tone at speeds below 30 mph. Because EVs are inherently quiet, they pose a hazard to pedestrians used to listening for ICE cars. Ramirez feels that the Dept. of Energy's EV standards should require such a feature on all EVs.

There will be substantial differences between the prototype and the production model. These are expected to enhance performance characteristics even further, says Ramirez.



Amectran's S/T prototype

Other changes were born of necessity: the Frua body, which was originally aluminum, was recreated in steel for Amectran's prototype and will be vacuum-formed of Kevlar-reinforced acrylic in the production model.

Operating costs are estimated by Amectran to be less than five cents a mile, including battery replacement and car depreciation (vs. 30.1 cents for a conventional car, according to the latest Hertz survey). Energy use is cited as 18-20 kwh for 100 miles of driving, which translates to costs of about 90 cents in New York City and 70 cents in Dallas for 100 miles. Batteries can be automatically recharged in five to eight hours with either 110- or 220-volt household current by means of an onboard charger.

### $5,200 cost termed 'realistic'

Despite the stylish body and the luxury extras built into the car, Ramirez intends to retail the car for as little as $5,200 (in 1978 dollars). He can do this, he says, by marketing direct to the auto buyer. This eliminates the traditional 30-plus percent dealer markup. The selling price includes an $800 profit.

Ramirez also expects to hold costs down initially by buying key parts at OEM quantity prices while he is gearing up for production. A number of potential vendors have already agreed informally to those kind of price breaks in order to encourage production of the car.

Ramirez plans to assemble labor-oriented parts such as seats, steering wheels, brake systems and wheels overseas in order to hold those costs down. He envisions his own battery plant (for nickel-zinc batteries) and a motor manufacturing facility later on, in order to retain as much self-sufficiency as possible.

A major potential vendor confirms that

Amectran is being realistic about its component costs. John R. Tucker, head of GE's EV systems department, told *EV Focus*, "He's talking about the finest electrical system we know how to build in quantities no one has considered before. At these quantities, the price of the vehicle will be less than that for a comparable ICE. If his numbers pan out, his prices are realistic."

For instance, if Amectran—or any other company—ordered 75,000 19-hp motors with the prospect for more, the vendor would most likely want to build an integrated, dedicated motor plant. When it did, unit prices would plummet and the availability of a powerful but low-cost motor would undoubtedly stimulate other EV makers.

### Earlier prototypes paved the way

The current DOE state-of-the-art report, which relied on builders' published data when no test data was available, lists Amectran's 1976 prototype along with more than 60 other electric cars. The fiber-glass-bodied car had a curb weight of nearly 4,400 lb, including 24 Trojan batteries weighing 1,700 lb. It was a two-door, five-passenger model, but was slightly shorter than the new version.

Like the newest prototype, it used a 19-hp motor (although the government report listed it as 13 hp) with electronic controls. It had direct drive and was listed as having a maximum speed of 70 mph and a 100-mile range at a constant 55 mph. Ramirez verifies these numbers except to amend the top speed to 100.4 mph and added that acceleration from 0-55 mph took 12 seconds.

That prototype, referred to as the "yellow car," has since been retired, along with a tiny electric two-seater resembling a Porsche 914 which was built even earlier. However, track and road tests of these cars were video taped "because no one would believe us otherwise," Ramirez said. A third prototype—to have been a high-speed Volkswagen conversion designed to break the battery-powered vehicle speed record—was abandoned for reasons of money and priorities.

Last year Amectran completed its S/T prototype, which is designed to easily convert from a mid-sized sedan-hatchback into a pick-up truck (*see picture*). Even though all earlier Amectran vehicles had been built from the ground up, this one was constructed using AMC Pacer parts in an effort to interest American Motors in an investment in the company. The deal soured however, despite keen AMC interest in the car.

The white S/T prototype still is used to shuttle visitors at high speeds from the Dallas airport to Amectran's offices. It can go up to 85 mph and cover 100 miles on a charge at regular highway speeds, according to Ramirez.

The S/T prototype uses an experimental five-speed transmission. Although that transmission has since been rejected for use in the production model, the testing of it did lead to the conclusion that a four-speed transmission linked with a controller and computer was the best combination to use. Said Ramirez in a recent report to stockholders, "We consider this a major achievement."

Through this and other experimentation and testing—which also eliminated torque converters as unsuitable—Amectran has, in Ramirez' words, "implemented the newest innovations of high technology" in its new electric car. He emphasizes, "It is not just a toy."

### Car being completed in Turin

Ramirez had been intending to commercialize the original EXAR-1 (the yellow car), which he personally designed, until he toured Europe in early 1977 on a fund-raising and information-gathering tour. While in Italy he realized the inadequacy of his own design and immediately sought out a more marketable body.

He commissioned Frua, one of Italy's leading auto designers, to modify a body which he had previously designed for BMW. The conservative German automaker considered the car too futuristic and elected not to produce it, even though the design had reportedly cost $833,000. The car was featured in the 1976 edition of *World Cars*. Ramirez secured the redesign for less than $370,000.

Frua lengthened the body slightly to accomodate Amectran's chassis and propulsion system. High-impact plastic bumpers with shock absorbers are to be added, plus some other modifications.

Ramirez sums up the changes by saying: "The overall idea of this design is to combine the roominess of a mid-size automobile, the compactness of an efficient, practical commuter vehicle, and the futuristic design and aerodynamic soundness of an expensive sportscar."

Gus Pellizzi, an Amectran vice president, escorted the motor to be used in the car to Italy last week only to find the workers on vacation and the project behind schedule. The car is now expected to be flown to the U.S. sometime in late September to mid-October.

### Selling the sizzle

When the car arrives in the U.S., Ramirez is betting that the design—coupled with its peppy acceleration, high speed and low price—will cause the car to sell itself. While some have expressed doubts as to how significant Amectran's engineering modifications are, few doubt that the car will sell.

For instance, Fred C. Allvine, marketing professor at Georgia Institute of Technology, where Ramirez lectured last year, noted that "if the car is only one-half as good as your tests indicate, the marketing opportunities look outstanding."

GE's Tucker called the body design "super," adding that "kids are going to buy it and convert it to gasoline."

To get the message across to the auto buying public that the Amectran (that's American Ecological Transportation) car makes sense ecologically (saves energy, doesn't pollute, reduces noise), Ramirez plans a series of television ad spots around the theme ". . . anything else is obsolete." Creative work on the ads, which are both professional and effective, was completed several years ago by Dolphin Productions (the agency was responsible for the campaigns that launched Ford's Granada and Fairlane, among others). Print ads would stress that the car has only 300-400 parts as opposed to several thousand in a conventional car.

The TV spots would be aired in the 15 cities to coincide with the schedule of the traveling exhibit. The exhibit, which features a two-story observation deck and vendor displays (*see picture*), has already been designed for the Philadelphia EV Expo.

### Active support from OMBE

Margaret E. Matta, the project officer at the Commerce Dept.'s Office of Minority Business Enterprise (OMBE), is a long-time Amectran booster. She has arranged a loan for Ramirez in the past, has ridden in his prototype and generally has been instrumental in drawing attention to the car. Last month, for instance, she wrote to the *Wall Street Journal*, pointing out that Amectran has developed an EV at its own expense that exceeds the minimum government performance standards.

OMBE is trying to put together a package to help Amectran. "It is probably unusual," she told *EV Focus*, "however, OMBE is doing all sorts of unusual things."

Among the unusual things that OMBE is doing for Amectran is not just trying to put together a package of federal financing and guarantee programs, but also trying to find customers for Amectran vehicles. For example, OMBE has been in touch with AT&T, individual Bell companies, and Sears to try to interest them in including Amectran cars in their future EV fleets. It also has been talking to state governments, and at least two have indicated interest, officials say. There have been no promises yet, however.

EV experts from DOE and NASA-Lewis; Congressman James P. Johnson (D-Colo.); Dallas radio and TV reporters; officials from AT&T, GE, LTV Corp. and others have verified the speed, acceleration, range and gradeability claims made for Amectran's cars—though they have not been independently tested.

The representative of one major U.S. automaker stated in his favorable report: "I was amazed at the pick-up . . . and passing ability." J.D. Gilmore, who is exploring the EV industry for LTV through Vought Corp. Systems Div., told *EV Focus*, "I rode in Ramirez' car. The prototype does what he claims it will do."

### Leveraging seed money

Although Amectran has spent nearly $2-million to date on its electric car development, Ramirez needs another $1 million to $2 million now in order to keep his master plan in motion. He is in various stages of negotiations with nearly a dozen individuals, government agencies, major corporations and investor groups to raise the needed capital.

In general, he is offering a 7-11 percent equity interest in Amectran—or its equivalent—in return for the seed money he needs to qualify for federal loans and loan guarantees.

Six million dollars in 90-percent loan guarantee funds could be available to Amectran under DOE's EV program as soon as Congress amends the FY 1978 appropriations act to permit that program to start (*EVF, May 1, p10*).

In addition, Ramirez also expects to tap the Economic Development Administration (EDA), the Farm-Home Administration (FHA) and the Small Business Administration (SBA) for another $3 million to $10 million of 85-percent loan guarantees. That leveraged cash would make it possible to build the first production plant and proceed with the rest of the plan.

The additional 14 manufacturing facilities would also qualify for EDA, FHA and SBA loan guarantees. Also, an on-the-job training program would qualify for 100-percent federal support for all employees for the first six months on the job.

By taking full advantage of existing government programs, which for the most part means building in areas of high unemployment and hiring unskilled minority workers, Ramirez intends to retain control of his company. After giving up as much as 11 percent to his next private investors and setting aside 20 percent for a future public stock issue, Ramirez still would hold 54 percent of Amectran stock.

If he fails to raise the seed money he needs now, his contingency plan is to float a $3- to $5-million public stock issue in Texas and New York for 20 percent of outstanding stock. However, he admits that he doesn't now have the $150,000 to $200,000 that would be required to go public.

Some observers think Ramirez is being impractical in his singleminded effort to retain control of his company. The Dallas *Morning News* quoted David G. Holly, who was the intermediary between AMC and Ramirez, as saying:

"I think Ed in some ways has his head in the sand on trying to maintain control of it. I think if he were to go to one of the majors [auto manufacturers] and offer to make a deal with them whereby he would get a royalty—anywhere from a 5 to 10 percent royalty—I think he would be a multi-, multi-millionaire in a very short period of time."

### Another Henry Ford?

Ramirez sees himself as the father of the electric car industry in the U.S. He likens himself to Henry Ford, both in achievement and in difficulties encountered along the way: "Ford went broke a dozen times before he made it," Ramirez says.

Numerous industrialists and entrepreneurs have tried to crack the Detroit-controlled U.S. auto industry in the past—they range from Henry J. Kaiser to Malcolm Bricklin—but none succeeded. The latest to try—other than Ramirez—is former General Motors executive John Z. DeLorean, who last week announced funding and siting for a $140-million plant to build a luxury gasoline-powered sportscar that would compete mainly with the Corvette.

However, the primary reason for past failures—the vast capital requirements, the complex parts supply network and the obligatory national sales/service network—are all not requirements of Ramirez' equation. The very nature of the electric car eliminates the first two: its relative simplicity reduces both the number of parts and capital costs by at least a factor of 10. Ramirez avoids the sales and service aspect by electing to sell and service directly from regional plants—a concept that probably would be impractical with a more complex automobile.

Until now, there has been little possibility that anyone would be in a position to mass produce

electric consumer automobiles before 1981 or 1982 at the earliest (*EVF, May 15, p1*). That is the time frame during which the U.S. government-sponsored electric and hybrid auto prototypes now being built by GE/Chrysler and Garrett/Budd could reasonably be expected to be commercialized. It is also the period in which Italy's Fiat has said it could produce EVs in quantity. General Motors isn't expected to have an electric passenger car ready for market until 1984 or 1985.

Ramirez told *EV Focus* last week that he would start production just 10 months after closing a deal for as little as $1 million. Although his timetable has been delayed before—he was originally expecting to be in production this year—he is now targeting a late-1979 production start-up. If everything works as planned, that could put as many as 525,000 Amectran cars on the roads before GM enters the market.

## Triad Developing Its Own EV, Plans To Be In Production Within Two Years

Triad Services, which designs and builds ground-up EVs for others, has been engineering a first model of an electric car it plans to commercialize itself. A "mule" of the EV is complete now, and Triad has formed a new company to produce it.

The new company, Detroit Electric Car, is a partnership between Michael A. Pocobello, president of Triad, and Daniel Armstrong, an engineering consultant of Triad. Second-stage financing, said to involve the inclusion of several more business partners, is slated for August or early September.

The mule, which Pocobello said has the "controller, suspension and handling characteristics" of the eventual vehicle, cost between $60,000 and $100,000 to produce. The modified body of an Elcar, one of two Detroit Electric Car bought for testing and research, now rests atop the mule. The other Elcar was used to test components.

"None of the chassis components are Elcar," Pocobello said. "They are all built specifically for this purpose. This is the first one [EV] we have ever built with manual transmission."

Though the company does not want to speculate on how its vehicle will perform, Pocobello says he is pleased with the four-speed manual transmission and clutch being used in the mule. "It gets us away from the armature control end of the business. For example, CDA's Runabout (*see separate story*) has a very nice control system. It's very smooth, very quiet, very efficient and very expensive," Pocobello added that the manual transmission "has a little fun, which is important for this vehicle."

### Ground-up design aimed at production

"When you talk about ground-up you are talking about new structures, new suspension designs that may or may not use some production components, new brake systems in terms of distribution sizing, new drive systems, new controls and new motors" according to Pocobello, whose Dearborn, Mich. company has designed such vehicles for the Copper Development Association and General Electric (*EVF, June 15, p1; May 1, p7*).

"You end up having to engineer the complete vehicle. It is not like rolling out a Chevrolet Nova, chopping a hole in the floor and sliding in some batteries. I am talking about starting from a clean sheet of paper. I don't know of too many of these aimed at production. Most ground-up models have been demonstration vehicles," he said.

### Plans call for 1,000 units a year

Detroit Electric Car has "selected a market that is well outside of anything the large companies might do, for reasons of size, performance and image," Pocobello said. "We are talking about a relatively low volume—under 1,000 units a year."

Plans call for the new car to be marketed primarily in the South, "because you can't operate these things in the winter time" in the North, Pocobello said. "You don't have a heater worth a damn." He said production of the vehicle will take place wherever it makes the most economic sense.

Pocobello, formerly one-third owner of Antares, which designed CDA's first EV, said Detroit Electric Car could be starting production within 24 months, contingent upon how rapidly the financing scheme proceeds. "We have been involved in the program for 18 months with all the financing coming from within" the corporation, he said. "That can't go on forever."

The next step for Detroit Electric Car is to complete a production design and to build a prototype. Pocobello estimates this will cost $250,000. The third stage will be production engineering, tooling and "facilitization," he said, which will cost about $1.5 million.

Detroit Electric Car has generated "some" interest among investors, Pocobello said, "but we are not ready to approach those people seriously until we have our car. We are not going to try to get money until they can ride in our mule." The car is scheduled to be tested later this month, after a couple of minor changes are made.

### GM not to be feared

Pocobello does not believe that the entry of the large automakers into the EV field will hurt the small manufacturers. "I can't visualize anything but good things happening from major auto manufacturers' being involved in the electric vehicle business," he said.

"I don't see them as big giants that are going to wipe us out." He admitted that the small manufacturer will be unable to compete with the large corporations and will have to position himself as a maker of specialty vehicles which the major manufacturers are disinterested in producing.

"GM's going into the production of electric automobiles is not going to hurt our business. It probably will help it. There will be more development work on components for people who are trying to sell to major auto manufacturers. Large companies coming into the business will accelerate the development of components that are difficult for the little guy to invest enough in to develop."

## U.S. Electricar Offers Public Stock; Minimum Sale Level Already Reached

A $495,000 public offering of stock in U.S. Electricar, formerly C.H. Waterman Industries, was issued June 26, and the minimum prescribed 60,000 shares already have been sold, *EV Focus* has learned. The remaining 120,000 shares, at $2.75 apiece, are being offered on a "best efforts" basis. J.J. Kreiger, 44 Beaver Street, New York City, is serving as underwriter.

The company will receive $435,000 if all 180,000 shares are sold. However, legal, printing and accounting costs will reduce net receipts to less than $400,600.

If all the shares offered are sold, officers, directors and affiliates of the company would retain 63.8 percent of the outstanding common stock. They have contributed an aggregate equity of $170,978 since February 28. Public shareowners would hold 36.2 percent of the outstanding common stock.

### Safety standards prove troublesome

Chandler Waterman, president and founder of the company, told *EV Focus* that U.S. Electricar is in contact with all five Dept. of Energy site operators. "We feel we will very shortly meet the DOE performance and safety standards," he said.

"We can meet acceleration and range specs with no problem. The safety standards are more bothersome." One of the problems smaller manufacturers have in complying with the safety standards is that they must absorb the cost of crash testing one or more vehicles to prove they are safe.

The Waterman plant in Athol, Mass., recently received 25 newly designed motors from Eltra's Prestolite Div. The DC motors increase the available torque of Waterman's converted Renault 5 cars by about 50 percent, a company official said.

The company is accumulating vehicles now to show potential dealers and distributors. The firm does not intend to sell vehicles directly to individuals, Waterman said. Sales this year have been small, a fact that Waterman attributes to the lengthy, time consuming process of raising working capital. Obtaining SEC approval of the offering circular took approximately seven months.

If the offering is completely subscribed much of the proceeds, some $224,600, will be used to develop an inventory of about 60 passenger vehicles, the offering circular reported. This would mean the cars cost $3,800 each to manufacture.

Since its inception in 1975 the company has sold 10 passenger vehicles, the circular said. Before incorporating, Waterman had built and sold 30 electrics (*EVF, Apr. 15, p4*).

Waterman said he remains optimistic that his car will find acceptance as the electric vehicle market expands.

## Lucas Lands $4.37-Million UK Grant

The British Dept. of Industry has announced plans to grant Lucas Industries $4.37 million to produce 120 one-ton-payload electric vans over three years as part of the U.K. government's EV development program.

Lucas will make the vans with modified shells from Vauxhall Motor's existing models. The vans will be leased to fleet operators who are likely to be large customers when the van is fully developed, one Lucas spokesman said.

Lucas will have to repay the Dept. of Industry grant only if the development program is successful. The company already has spent about $7.8 million in developing its van over the past 12 years (*EVF, March 15, p3*). It will be another two or three years before the van is ready for mass production, a company spokesman said.

Last November the Greater London Council encouraged another trial of 25 Lucas electric vans by offering to pay potential Lucas customers the difference between the Lucas vans' cost and the cost of similar combustion-engined vans (*EVF, July 15, p7*).

## New CDA Car To Use All-New Motor, Many Renault Production Parts

The new electric car that Triad Services is building for the Copper Development Association incorporates an all-new motor designed especially for automotive use, *EV Focus* has learned. The new CDA car, which is currently being tested in Toledo, Ohio, will also use many off-the-shelf production parts in order to facilitate later mass production (*EVF, June 15, p1*).

The new motor was built in conjunction with Reliance Electric. The ratings were selected for auto rather than industrial service, which results in a smaller, lighter motor of a more compact design, according to Triad president Michael A. Pocobello.

"Until now we have been unable to find a machine of the size we need that is not an industrial engine. We get a weight reduction, which is the biggest thing, and a cost reduction because we don't have as big a part," he said.

Pocobello also confirmed that the CDA car—called the Runabout—will make extensive use of Renault production parts. He called it a "big deal" that Renault has agreed to sell Triad production parts in low volumes to be used on the Runabout. These include "a lot of Renault suspension parts."

The unique seating arrangement of the four-passenger car consists of a rear-facing back seat, which is the same configuration as the GE car also being built by Triad. However, the two cars are different in every way other than the seat positioning. Both cars will be officially unveiled at the EV Exposition in October.

## Pininfarina Approaches EV Production

Two or three vehicles this year, nine or 10 next year . . . . With numbers like these Sergio Pininfarina is talking about launching the four-passenger EV his Turin body-making company and Fiat have designed (*EVF, May 15, p1*).

"We might eventually produce a limited number," said Pininfarina's partner and brother-in-law Renzo Carli. "We might do it within two years."

Carli said the car, a prototype of which was shown at a recent Turin auto show, will meet the Dept. of Energy's minimum performance stan-