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THE TWO-PAYCHECK MARRIAGE
by Caroline Bird

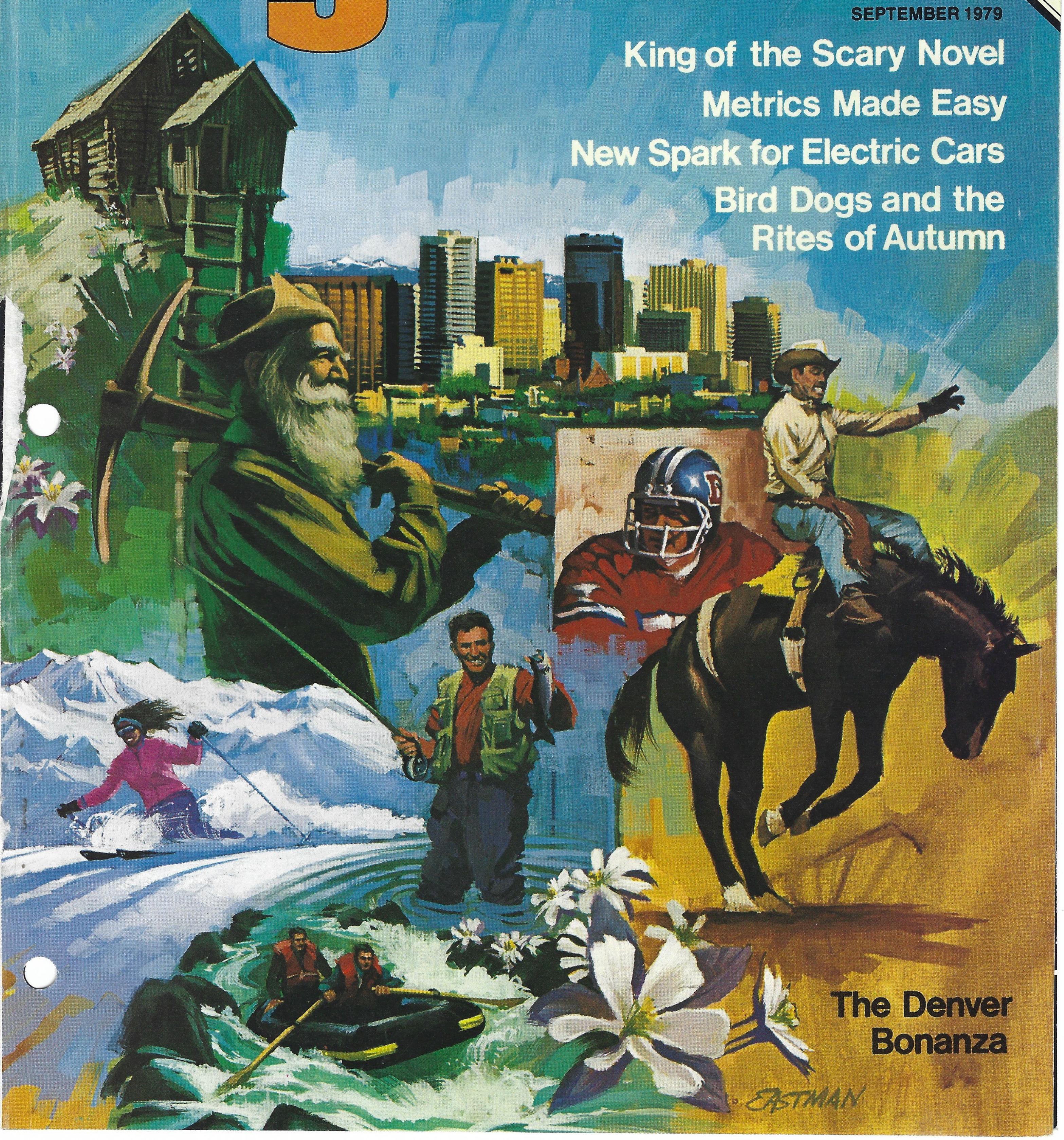
King of the Scary Novel

Metrics Made Easy

New Spark for Electric Cars

Bird Dogs and the Rites of Autumn

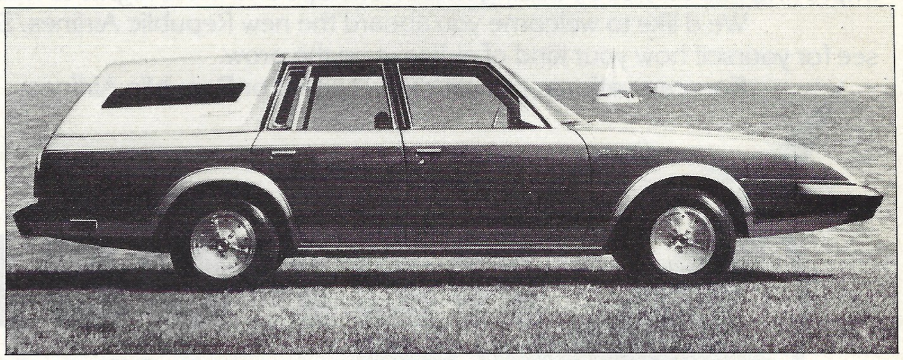
The Denver Bonanza



EAST/WEST NETWORK, INC

Electric Cars
Solution or Problem?

by Craig Donohue



For sale in 1981—5,000 Silver Volts, Electric Auto Corporation's proposed $15,000 converted station wagon with auxiliary gas engine.

Getting a break in the traffic, you step on the "gas." There's a momentary delay, then a relay clicks, the motor whirs and the car starts to move. Initial acceleration is fairly brisk, but your speed increases slowly and ponderously after that first brief spurt. You glance nervously in the mirror as traffic rushes up behind.

Once up to speed, you hold a steady 55 miles per hour, accompanied by a muffled electric whine from under the hood. You could go faster, 60 mph or more, but you know that doing so would quickly decrease your batteries' range and hasten the inevitable recharge. You check your gauges—volts (charge), amps (current), perhaps miles remaining (range) and battery temperature—and move with the traffic, accelerating and decelerating in a normal manner.

The battery system is heavy, and you can feel this excess weight while cornering and braking. The car always seems just a little behind your steering, the tires complaining audibly as they work under the load. Releasing the accelerator produces regenerative braking (which feels much like the normal "compression" braking of a piston engine), as the motor turns into a generator to pump some electricity back into your batteries. Stepping on the brake pedal results in maximum regenerative braking (and more recharging), as the motor/generator helps the conventional brakes bring the car's mass to a stop.

After forty to a hundred miles or so, depending on your speeds and driving conditions, you'll need a recharge. This could take six to eight hours with an on-board recharging system, so you'd better be home, at work or at an overnight stop. If your car will take a fast charge, however, and you've reached a charging station equipped with an external fast charger, you could be on your way in forty-five to ninety minutes.

This is a typical driving experience in one of many electric passenger vehicles now in the prototype stage. No one is currently mass-producing practical electric cars in America for sale to the public, but thanks to government encouragement and financial assistance, there is a considerable amount of ongoing electric vehicle (EV) research and development in the field.

Chrysler and General Electric have jointly developed a new, state-of-the-art, subcompact electric car (unveiled in June); battery maker Globe-Union has demonstrated a sleek, four-passenger Endura electric; the Copper Development Association (CDA) has shown its sixth operational electric prototype, the Copper-Electric Runabout; General Mo-

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Photographs: Courtesy of Copper Development Association Inc.

Illustration: Robert Krogle

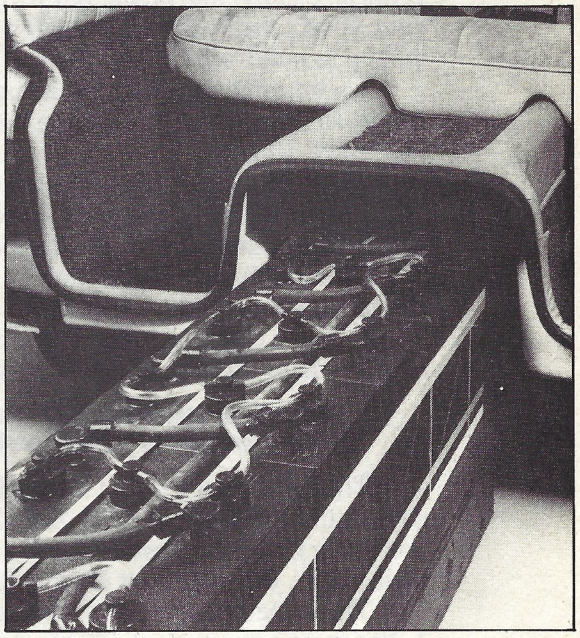
tors is heavily engaged in advanced battery work and has a Chevette-based Electrovette prototype, and Electric Auto Corporation of Troy, Michigan, plans to begin producing $15,000 electric luxury cars (based on GM intermediate wagons) early in 1981.

"The big thing is that you're free of the gas pump," says Electric Auto Corporation Chairman Sir John M.G. Samuel, a transplanted British electric vehicle expert. EAC has three working prototypes of its Silver Volt, a 5,200-pound converted station wagon boasting an auxiliary power unit (a small gas engine) that runs the car's many accessories and provides some in-use battery recharging for increased range. Ten more prototypes are scheduled to be built this fall for extended testing, and a limited production run of 100 to 150 more test models is slated for early next year. If all goes well, Samuel hopes to have 5,000 Silver Volts for sale in 1981 and ultimately to accelerate production to a maximum of 20,000 per year.

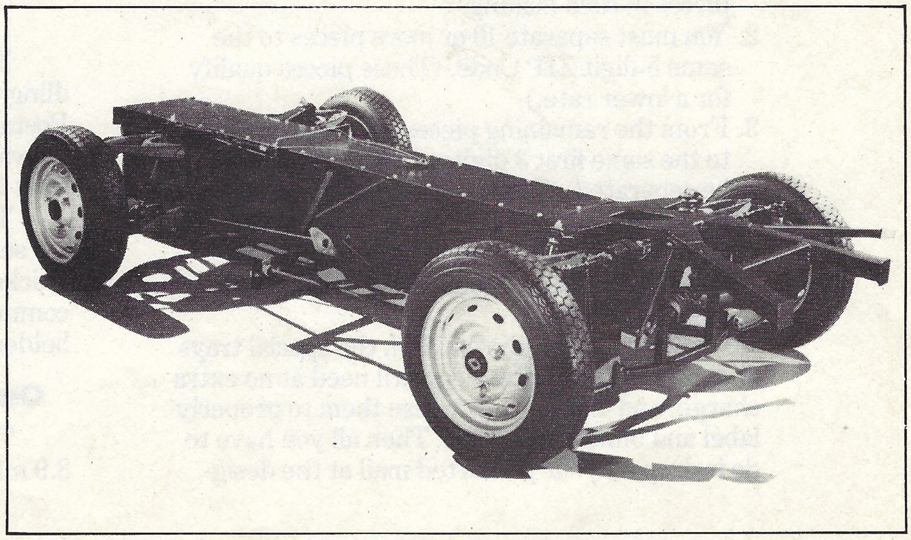
What separates EAC from other potential electric car builders is the nature of its car and the prospective buyer Samuel is after. "It will be a status symbol rather than a curiousity like previous EVs," he says. The Silver Volt has a top speed of 70 mph, a practical range of seventy to one hundred miles, fast-recharging capability and a 0–30 mph acceleration time of only seven seconds, scoring better in every performance category than any other current EV prototype in spite of its excessive weight. (*For performance comparisons, see sidebar.*) The auxiliary power unit puts about 30 percent of its output back into the battery, providing enough on-board recharging to make it impossible to be totally "out of volts."

"We're absolutely sure there's a market out there," says Samuel. "We get sacks of mail from people who want to buy these vehicles. And my phone's been ringing off the hook with people looking down the road and wanting to get into the business as dealers."

There's no doubt that this year's energy shortage has stimulated interest in EVs (as well as other alternate engines and fuels), just as the 1973–74 Arab oil embargo did six years ago. But now, as then, people seeking to escape fuel-pump slavery are disappointed to find no practical alternatives, electric or otherwise, yet on the market. Most existing EV prototypes are little more



Lightweight, aerodynamic and space efficient is this all-electric prototype from Copper Development Association (top). The battery tray slides in and out of the car's central frame on Teflon rails (middle). The electric's frame and four-wheel independent suspension use Renault Le Car components.



Electric Vehicle Statistics

	Passengers (no.)	Batteries (no.) weight (lbs.)	Curb weight (lbs.)	Max. speed (mph)	Range (miles)	Acceleration 0–30 (secs.)	Cost
Federal near-term objectives	4	n.a.*	n.a.	60	75	9.0	**$5,000**
General Electric Centennial	4	18/1225	3250	60	45–75	9.0	**6,000**
Globe-Union Endura	4	20/1600	3200	60+	100+ (at 30–35 mph)	n.a.	**n.a.**
Electric Auto Corp. Silver Volt	5	2**/1800	5200	70+	70–100	7.0	**15,000**
Copper-Development Association runabout	4	12/822	2152	59	42–72	8.6	**5,000**
General Motors Electrovette	2	20/920	2950	53	50	8.2	**n.a.**
General Electric/ Chrysler	4	18/1140	3400	65	145 (at 55 mph)	9.0	**n.a.**

* not available **2 large batteries with 36 individual cells each

than demonstration vehicles and test beds for battery and component technology. GM and other domestic makers are looking at the mid-1980s for earliest large-scale production. EAC seems alone in having serious, realistic production plans at this time, but even its high-priced, luxury EV is more than a year away.

The problem is the battery, which is not a very efficient energy storer compared to the conventional car's fuel tank. "The traditional trouble with electric vehicles," says GM Chairman Thomas A. Murphy, "has been short-range and low speed. No one has ever been able to develop a battery-powered vehicle that could meet even the minimum performance requirements of the typical American driver."

Electric vehicles have a longer history than the gas-engined variety—the first one was built in Scotland in 1837, and by 1900 one out of three automobiles was battery-powered. Few have been built since 1918, however, because of the vastly superior versatility, performance and energy storage capability of the internal combustion engine. Modern EV technology began in 1961 when vacuum cleaner maker Eureka Williams began converting French-built Renaults—and has come a long way since then. But an efficient electrical energy storage technology has yet to be devised.

GM's Electrovette, for example, has in its rear seat area twenty conventional (lead/acid) twelve-volt batteries weighing more than 900 pounds, but even under optimal conditions this heavy and bulky battery pack "can propel the car on a single charge about the same distance as one gallon of gasoline," according to Murphy. The two-passenger car weighs 2,950 pounds, accelerates from 0–30 mph in 8.2 seconds and has a top speed of about fifty-three miles per hour and a range of fifty miles at 30 mph. Clearly some breakthroughs in battery size, weight and storage capacity are needed before such a vehicle would be acceptable to more than a handful of potential buyers.

GM researchers say that more efficient zinc/nickel oxide batteries, which would double this range, "are just around the corner," while smaller, lighter and more powerful high-temperature lithium/iron sulfide batteries may be ten to fifteen years away, barring unexpected breakthroughs in technology.

Still, there are other problems. Electrics don't like cold weather, for example, because the batteries must be warm during charging, and batteries that are constantly charged and discharged don't last very long. EAC's Samuel estimates that the Silver Volt's battery pack will last for about four years or 35,000 miles before needing replacement at a cost of $1,800. This must be added to fuel costs, which (at a dollar per gallon of gasoline for the auxiliary power unit and forty cents per electrical charge) comes to 2.4 cents per mile, figuring the maximum practical range of one hundred miles—and assuming the consumption of two gallons of gasoline out of the five-gallon auxiliary tank. By comparison, a twenty-miles-per-gallon conventional automobile burns five cents' worth of dollar-per-gallon gasoline every mile.

Most EVs to date, such as GM's Electrovette on one end of the scale and EAC's Silver Volt on the other, have been merely converted versions of cars originally designed for gas-engine power. But the most practical designs are bound to be those planned as electrics from the ground up. The Chrysler/GE, Copper Development Association and Globe-Union Cars, for instance, are relatively lightweight and highly aerodynamic and feature space-efficient battery storage in aluminum trays that slide in and out of the car's central frame structure. Such advanced design gives these experimental cars better range and performance than the Electrovette at a potentially affordable price, but no production plans have yet been announced for any of them.

One partial solution to the range and speed problems might be the so-called "hybrid" vehicle that can operate on either electric or conventional piston power depending on conditions and needs. One such hybrid, a tiny Honda 600, with its original two-cylinder gas engine driving the front wheels and a pair of electric motors attached to the rears, is under development by Hybricon Inc. of North Hollywood, California. Called the Centaur, this little "roller skate's" batteries are recharged while driving on the gas engine, and its range is 160 miles on only four gallons of gas. Top speed using the gas engine is 70 mph—but only half that using the electric motors alone. General Electric and others are currently working under government contracts on more advanced applications of this hybrid principle, which may offer the best compromise between the advantages and disadvantages of both liquid fuel and electric propulsion for future transportation needs.

Under the Electric and Hybrid Vehicle

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Electric Cars

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Research Development and Demonstration Act of September 1976 and subsequent legislation, the U.S. Department of Transportation (DOE) is helping to coordinate and fund a number of cooperative efforts aimed at putting increasing numbers of both commercial and private EVs on the road in the next few years. The object, of course, is to reduce the nation's dependence on foreign sources of petroleum through the "introduction of significant numbers of electric and hybrid vehicles into the transportation fleet." It is expected that rapid advancements in vehicle, battery, motor, controller and other component technologies will result from this program. Already on the road in this country are several hundred commerical EVs built by AM General (used by the United States Postal Service), GM (used by AT&T) and VW (used by the Tennessee Valley Authority), and many more are on the way.

Studies are also under way into the unique pollution and safety problems associated with electric vehicles. There are no "tailpipe emissions" from EVs, of course, but there is stationary pollution from the power plants producing the electricity to run them. And while these localized emissions should be easier and cheaper to control in the long run than millions of individual mobile sources, there are still some safety problems.

These involve ventilation of battery storage areas to prevent accumulation of heat and explosive gases, isolation of spark-producing components, safe handling of the fairly high voltages involved, protection from vehicle runaway in the event of electrical control failures, provision for safe heating of the vehicle's interior, water-splash protection for all electrical components and vehicle control with regenerative braking on ice among other considerations.

Finding solutions to these safety problems, of course, will not guarantee the success of the electric car as long as the problem of the battery remains. Today's cars and trucks may be sadly dependent on the gasoline or diesel pumps—fast-rising prices, occasional long lines, hassle and all—but at least they can get a lot farther away from those pumps than an EV can from its plug with some certainty of making it back. Build the ultimate battery, friend, and the world will trample that proverbial path to your door. ◻