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The future of the automobile? There is no point to asking anyone in Detroit to talk about it; they are mostly living in the past, focusing on seven liter engines, giant SUVs and commercial glories long gone. For a different perspective, we talked with a man who actually lives in the future, working tirelessly — and successfully — to transform science-fiction concepts into everyday reality. Burt Rutan — two-time winner of the Collier Trophy, the highest award in aeronautics, and of the Ansari X Prize for putting a man and ballast equal to two other people into space twice within two weeks — is not remotely interested in five hundred horsepower two-hundred-mile-per-hour ground vehicles we and our readers find fascinating. For as long as it was possible, he operated a General Motors EV1 as his principal means of ground transportation.

“Cars? Look, I’m working to get the public into space, I don’t really think much about cars. We did the Ultralite with GM, sure, but there is no interest in light weight or aerodynamics in the automobile industry.” However he was willing to discuss cars — after hours, of course — with an old colleague who had worked with him before his first man-carrying airplane design flew, thirty-four years ago. Since then, Rutan has designed and developed thirty-nine aircraft, every one of them innovative in form, function and construction. Not to mention designing space ships, an America’s Cup-winning rigid-sail yacht, that clever little Ultralite car, and quite a few other devices cloaked in secrecy.

Rutan now drives a Lexus. He bought his first one, an LS 400, immediately upon its introduction, persuaded by his clients at Toyota, for whom he had built an experimental airplane with their V-8 engine. “The only reason I bought the LS 430 is that I wanted GPS, and there was no way to put it in the old car.” When General Motors took away his EV-1, he first bought a new Mini, but after it broke down on the way home and kept giving him grief with its unreliability, he dumped it a few months later and added a second, used, ’98 Lexus GS 400. “They never give any trouble, so they’re pretty good. But the EV1 was the best car I have ever owned.”

It is a natural assumption that Rutan had had the GM electric car because of his connection with the company when the carbon-fiber Ultralite was being done in 1991 for the ‘92 Detroit show, but in fact that had nothing to do with Rutan’s choosing an EV1. “I liked the idea from the first, so I went down to Palmdale to lease one from the Saturn dealer. It wasn’t easy.” There was a check of his credit rating, and he had to show that he owned the approved battery charger, a \$2000 plus installation. And he even had to borrow his father’s address, because Mojave was outside the carefully delimited area in which the EV1s were officially available for lease, essentially coastal southern California and parts of Arizona.

“That car really taught me how to drive efficiently. You can even do some fairly long trips with proper planning. My wife’s mother has a place on Balboa Island down in Orange County. We would drive down to Palmdale, plug in while we were at lunch, then to a mini-mall with a charger near a golf course, play nine holes while the car was filling up, then go on to Balboa.” Proper planning is of course a critical skill for test pilots, Rutan’s role in Air Force and NASA service before he created his first home-built aircraft, the Vari-

Viggen. The Hollywood notion of a Clark Gable-like test pilot who “kicks the tires and lights the fires” is as far from reality as one can get. Method and meticulousness are what see a test pilot through to old age.

Very few people are prepared to plan an electric car trip as Rutan did. On the other hand, he insists that studies show that 60 percent of all trips undertaken in Southern California could be accomplished by electric cars with no more range than the EV1 had. “But if you want to go farther, then you extend the range. The EV1 weighed 1800 pounds, plus 1200 pounds of batteries. Take out 800 pounds of batteries, add an 18 horsepower gasoline engine and a seven gallon tank, and there would be no limit to your range.

“To go to Las Vegas, about 300 miles, you’d start with a full charge, and run on electricity until you got down to about half a charge. The most efficient way to use batteries is to discharge them at their charge rate. So you would have a small, optimized low-pollution generator that would come on to maintain charge. And of course you get power regeneratively every time you slow or go downhill. Sure, if it’s really an annoyance to limit your speed to the most efficient level, around 50 mph, you’d take another car. But there is something nice about getting a hundred miles per gallon of liquid fuel, and not having to fill your tank more than four or five times a year. And you would not care how much the fuel cost if you did not use much.

So Rutan is a strong proponent of what some people are calling “plug-in hybrids,” a kind of car you cannot buy today, but which are perfectly feasible. There are even a few Toyota Prius owners who have removed some batteries and added plug-in charging capability to their cars.

Direct experience with an electric car has colored Rutan’s appreciation of their virtues. “I drove the EV1 for seven years, and never took it to a service station. It was always full first thing in the morning. It gets to be 115° here in the summer (Mojave is in the California high desert), so when I went to lunch I didn’t turn the car off, just locked the doors. The A/C was on the whole time, operating on an electric heat pump, so I came back to a cool car, even if I had not been able to park in the shade. That cost about twenty cents, and used up 2 or 3 miles in range, but I always knew I could get back to the office. In comfort. It was the same thing in the winter. It gets down into the 20s here sometimes, so I programmed the car to start heating the cabin before I wanted to leave work.

“People are always asking about how long it takes to charge an electric car. My answer is three and a half seconds. I timed it. That’s how long it took to insert the paddle. It used no more electricity than a clothes dryer at home to have a car that was always full when I started my day. You know how long it takes to fill a gasoline car? Seven to twelve minutes, and you are engaged in the process the whole time, out in the weather, whatever it is.

“I’m not a tree hugger. I got the EV1 because I have an engineering bias in everything and I like efficiency. I really hated giving up the EV1. I thought about gathering up some of the stuff lying around here, burning it and pointing to the pile of ashes, and saying ‘There you are.’” He laughs, knowing that anyone who knows him understands that he is scrupulously honest, as one must be to create the airplanes he has, and not have any of them turn out to be wicked in any way. And it is no secret that Burt worships efficiency. He has designed two airplanes that were able to travel all the

way around the earth without refueling, the piston-powered Voyager that his older brother Dick Rutan and Jeanna Yeager flew in 1986 and the jet-powered Virgin GlobalFlyer that adventurer Steve Fossett flew solo last year.

Rutan says that he still regrets not having his EV1. He affirms that GM was absolutely correct in everything it did with its paying customers. There was a recall at one time, when all the cars in the fleet were taken away for six months. “Most of us thought that was it, but they brought the cars back and honored their commitments to the end of the leases. But they wouldn’t renew them, and they would not sell the cars. Most of us desperately wanted to buy our EV1s.”

Electric cars have been chimerical for more than a hundred years, always held back because of batteries. Another winner of the Collier Trophy, Dr. Paul MacCready, who worked on the Impact concept car that evolved into the EV1, once explained electric cars this way: “Get a Ford Taurus, fill the trunk and back seat with sand bags, replace the fuel tank with a one-gallon can with a tiny filler neck with a piece of inner tube over the end. Then fill the tank with a 5 cc hypodermic needle before you drive it. You’ll have the acceleration and range of an electric.” Rutan was shocked to hear that, saying “Paul is much in favor of electric cars.” So are we all, but only if we can go as far as we need to without mandatory long pauses.

One solution proposed for the by One of the GM engineers involved with the EV1 project proposed putting an auxiliary engine and its fuel supply in a small trailer for highway travel, using the car as a pure electric for daily driving in town or for commuting. Another aerospace engineer who had an EV1 rigged up a method for mounting a pair of tiny turbojet engines on the ends of stalks, the whole assembly mounting to the trunk floor, with the hatch partly opened to pass fuel lines and control cables. Once on a freeway, the intrepid engineer would fire up the 60 pound-thrust engines, and sail along polluting like a dragon, but extending his range. Rutan himself schemed up a rig that would have put two single-cylinder stroke engines on the ends of stalks, driving propellers. Again, not a tree-hugger solution, but one that could work for range extension, practically if not legally.

Rutan’s prescription for what ought to, as opposed to will, happen in the future is mainly electric cars with sharply reduced weight, no reduction in crash resistance or overall safety, using the highest-density batteries now available and a permanent on-board source of recharging power for range extension. The main source of energy would come from plugging in the car at night, when electrical utilities continue to produce power that is simply not used, and is thus available very cheaply. Leveling out power demand would be a positive social good, as would reduction in petroleum demand.

The smoothness, quiet and trouble-free nature of electrics can only be realized with range-extension techniques, and they must be socially acceptable, not like the fanciful jet engines. Extended-range electrics would be true hybrids with only one drivetrain but equipped with two means to provide energy to it. Rutan is scornful when he talks about presently available hybrids. “They are just underpowered gasoline cars with battery boosters for acceleration,” he says, and finds no merit in carrying around two heavy propulsion systems. Let electric motors drive the wheels at all times, keep the heat engine light and simple, limit the amount of fuel on board and most people will find such cars perfect for their real, as opposed to imagined, driving needs, including visiting

grandma in Kansas.

Will we see such cars? Perhaps, but certainly not from Rutan himself. He admits that he did sketch up a nice little three-wheel carbon fiber runabout with solar panels all over it for his daily commute. It would not have even had a plug, taking 100% of its power from the sun, but he has better things to do with his shop time. His only electric vehicle today is Golf Cart One, an old scrap unit totally refurbished by Burt's tight-knit crew of technicians. Painted with the distinctive blue stars on white ground scheme of Space Ship One, it was presented as a total surprise for the man who refuses to accept that anything is impossible.

Back in 1972, listening to a tall 28-year-old whose only flying designs were model airplanes talk about flying around the world non-stop with only on-board fuel merited a certain skepticism. Fourteen years later that was a done deal, and the talk was of getting into space without NASA and the government. That's done, too. Now the goal is getting civilians into orbit. "I don't know how to do that safely yet. Look, four percent of all the people who have left the earth's atmosphere have died. We will be able to let people get into space and have a few minutes of free fall, but that's it for now. We have to make sure that going into space is as safe as commercial air travel."

Anyone want to bet that Rutan won't do that? Or that the range-extended electric cars he champions will not give us as much pleasure and satisfaction in twenty years as we imagine our present overpowered supercars would today, if only we could get our hands on them?