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RIDEK, A MUCH BETTER CAR

By Gordon Dower

I remember attending a seminar on how to make money from real estate and one of the speakers, talking about foreclosures, said how remarkable it was that families facing foreclosure would sometimes carry on as usual until the day when their furniture was put out on the sidewalk and they had nowhere to go. Until the very end, they convinced themselves that something would turn up and the disaster would not happen. The truth being too unpleasant to accept, they went into a state of denial. How foolish! How irresponsible! We'd never do that or get into that situation. But sometimes things just happen that are beyond our control and the situation is forced upon us.

"Well," you say, "we'd not go into a state of denial, you can be sure of that!"

My friends, most of us are in that state right now. The atmosphere is foreclosing upon us and has been threatening to do so for the past 20 years—the world's biosphere will foreclose on half the world's population before the end of this century. There are those who deny it, and many of us find reassurance in that because we are in a state of denial, too. So what should we be doing about it?

We should be doing all we can and whatever is necessary, for our children's children to live. If this should require us to give up driving our CO_2–producing automobiles, using instead electric trains, trolley buses, and bicycles, we must do that, and the sooner the better. Of course, there will be many other changes. Energy consumption must decline until it is produced cleanly. There must be a concerted effort on all fronts.

The necessary changes in our transportation system may be the most disruptive because we have become so dependent upon the automobile. Cars are getting better all the time, gradually, but now they must get much better, quickly. They must not pollute or produce CO_2. Automobiles account for perhaps 50 percent of our pollution of the atmosphere and 100 percent of our worrying (and unsustainable) negative balance of trade. They must not use oil or its derivatives. They must be energy efficient. They must be as commodious as a minivan or an SUV, they must have excellent acceleration, and they must not cost more than the cars we have now.

Surprisingly, the only vehicle that meets these requirements is the battery-electric vehicle or BEV. Nothing approaches it in simplicity, durability, efficiency and cost of manufacture, and it can be fast. In the early days of the automobile, there were more electrics than gasoline cars. Electric energy is convenient and cheap but difficult to store. The EV part of the BEV was fine but the B wasn't. It was efficient but its storing capacity was less than one

percent that of a fuel tank. It was expensive, needed careful attention and had a short life.

Although there are now better batteries, they are expensive and do not allow the BEV to match the range of the gasoline car. The shortcomings of batteries have led to extensive governmental support for alternatives, such as the hydrogen car and biofuels.

Unfortunately, there are serious problems with these solutions. Hydrogen does not occur naturally in its free state and extracting it from, say water or natural gas, requires more energy than you get out of it.[1] If you use electricity to hydrolyze water, the energy efficiency is only 50 percent. The hydrogen must then be piped wherever it is needed. Some will leak away—there is nothing more leaky than hydrogen. Then it must be compressed into storage tanks or liquefied, both of which require much energy. The most efficient way of using it in a car is to feed it to a fuel cell, but the efficiency of this is only 50 percent. Fuels cells are far from perfected and prohibitively expensive so there is now a trend toward burning hydrogen in an internal combustion engine, much as natural gas is used. In this case, the efficiency will be much less than that of a fuel cell powering an electric drive. Industrial hydrogen is mostly derived from natural gas. If you go from that to the hydrogen coming out of the fuel tank in your car, you will have only about one sixth of the original energy, and you will still have to deal with the CO_2 used to produce the hydrogen.[2]

Biofuels create a different problem. When they fuel internal combustion engines, they give rise to CO_2, like any other fuel. Their redeeming feature, if you can call it that, is that the plants used to produce them took that CO_2 out of the atmosphere. But what about the CO_2 released by the machinery and infrastructure needed to grow and harvest them? And there is a more serious problem: the production of biofuels is now producing a food problem in the under-developed countries because ethanol and biodiesel can be made from corn, palm oil, sugar and other crops![3]

Let’s look at electricity. Although, in USA, 60 percent of it comes from burning coal, electricity can be produced cleanly without drastically disrupting our way of life. Its infrastructure already exists; it is safe, clean, cheap, and versatile. It can easily power trains and urban buses. The efficiency of transporting it over the grid is 95 percent. Electric motors have a similar efficiency. So do batteries for storing it. Surely this widespread and proven technology trumps hydrogen and biofuels. If batteries force us to accept cars that have only a short range, say 50 miles, and need an hour or so to recharge, then we must change our life style and get used to it. We must also accept that our cars will cost more because of their batteries. Unless…

There happens to be a completely unexploited solution to the problem—a solution that will cost not more, but actually less. It will not oblige us to use smaller vehicles because it can give us more roomy and user-friendly ones than we have now, and make them safer, too. Neither will they be less convenient than what we have now; they will be more convenient. This remarkable solution is the Ridek (ride-ek) modular car.

The Ridek is composed of two modules: the Ridon (ride-on) body and the Modek (motorized deck) chassis. Of course, there is nothing new in building a car out of chassis and body modules, brought together in the final stage of construction. However, being able to separate, exchange, and rejoin them in a couple of minutes is new.[4,5] It allows exchange of the powered unit (the chassis) for a freshly energized one in much the same way—economically and functionally speaking—as the tired horses pulling a stagecoach would be changed to allow the passengers to continue their journey with minimal delay. Thus the short range of the horse, or the BEV, becomes manageable. The Modek chassis, like the horses, now becomes a different economic unit from the Ridon body. Its needs are different, its lifespan is different, and its ownership may be different—indeed, it should be.

The life expectancy of the average car is 12 years. The greatest single expense of car ownership is depreciation. Owners with little mechanical knowledge tend to fear exploitation and may prefer to change their cars when the warranty expires. Maintenance costs can be high, and they are often unexpected. The situation is different with a Modek provided under a Modek Exchange Contract supplying a fully charged and serviced Modek, within minutes, at a Modek Exchange Station. There should be no waiting, and no need for a "courtesy car."

The modern automobile is a marvel of complexity and compactness, but it is expensive to work on because of inaccessibility. Contrast this with the Modek, whose complexity is far less while accessibility is far greater. So is the reliability of its electric motor compared to the internal combustion engine and its complicated transmission.

The life expectancy of a Modek, judging from that of electric trolley buses, should be 30 years because of the intrinsic reliability of its mechanism but also because of its easy maintenance and updatability. Few motorists would want to drive such an ancient car, unless in a rally, but the age of the well maintained Modek would not be apparent because only its wheels would be visible beneath the Ridon. Thus the operating cost of the more complicated component of the Ridek should be less than for a conventional car. Also the initial cost to the Ridon owner would be less because that would have no running gear.

The cost per mile of operating a car reduces the more it is used. (The same is true for a horse.) When a Ridon is idled for an extended period, the Modek may find employment elsewhere. An example might be the long-term parking lot of an airport—normally containing an abundance of idled machinery within the vehicles parked there. However, with suitable arrangements, the Modeks associated with parked Ridons could be used in taxies, rented cars, etc. Another example might be vehicles that are used seasonally. While the Ridons rest, the Modeks find other employment. The turnaround of the rental car is delayed by the need to clean it. Consequently, a car-rental agency might require fewer Modeks than Ridons.

But what about the range? The modern car packages its passengers as close to the surface of the road as possible, among the machinery, so there is little space for a battery to provide sufficient range. By contrast, with the passengers riding wholly above it, there is plenty of battery space in the Modek. With a lithium battery, the range could be well over 100 miles, perhaps 200. But there is no need for more than 50 miles because the Modek can be quickly exchanged for one that is freshly charged. Batteries are expensive and heavy so it is better to accept a minimal range rather than a maximal range. This is more economical and energy efficient. For most drivers, most of the time, 50 miles is enough, especially when the range can be extended by Modek exchange. However, until the necessary infrastructure of Modek Exchange Stations is established, another solution might be allowed: for long trips, the exchanged Modek could be gasoline-powered. This would not be a backward step so much as a necessary intermediate step toward weaning, like the plug-in hybrid car. But it is preferable because it avoids the complexity, expense, and unnecessary weight of a dual power plant. Instead of spatial hybridization, as in the plug-in hybrid, there would be temporal hybridization—much simpler and neater. The necessarily smaller battery in the plug-in hybrid results in a much more modest range, that is likely insufficient for most daily needs.

Clearly, the Ridek is a very different vehicle from the conventional automobile. It is also drastically different from any BEV. This difference extends to its appearance, user-friendliness, and safety. The Modek raises the passengers to the height they would be in a conventional SUV, and approximately the height they were in cars before the streamliners and stylists changed things. Of course, the Ridek must not be too tall; otherwise it will not fit into a parkade. Its height and length match those of an Astrovan and most SUVs, and it will have about the same amount of aerodynamic drag. In urban driving, this will not be too serious, and there is a compensating factor—the cost of

electricity works out to 35-50 cents per gallon of gasoline.

A disadvantage of the SUV is that it is more likely to roll over in an accident because of its high center of gravity. This is not a problem with the Ridek because it has a very low center of gravity.

Placing passengers above the bumper of a vehicle colliding from the side is much safer than seating them in line with it. This is well appreciated by the general public and no doubt accounts for a good deal of the SUV's popularity. But there is something else we can do to make them safer. Instead of separating the front-seats with a console, the Ridon abolishes the console and brings them close together, *away from the doors.* Cars are built to resist side impacts, but they still cave in before the impinging vehicle is stopped. Those few inches between passenger and door are more valuable than a console.

One must climb aboard an SUV using the steps provided, but those steps are small and set into the vehicle, where a descending foot may not find them—after all, feet point forwards, not backwards. Much thought was given to the Ridon's steps. Eventually, convenient user-friendly foldout steps were conceived, fashioned, and electrically deployed with gratifying results. The inboard positioning of the passengers in the front seats made this easier.

Another unusual, though not unique, feature of the Ridon is the use of a single large sliding door on each side instead of four separate doors. This makes entry to the rear seats extremely easy, using the same foldout steps. Ridon's windshield is remarkable although not quite unprecedented: it slopes forward as in many fishing vessels. Not only does this enhance the view and eliminate annoying reflections off the dash, it increases the area of the roof and shading from the sun. With the large roof there is space for a large solar panel, that can keep the Ridon cool in hot sun, even when the Ridek is stationary and unoccupied—a blessing when stalled in traffic. With an on-board heat pump, energy from the panel can maintain a comfortable interior without draining the battery—the battery may receive some charge from it.

As an exercise in demonstrating the amount of useful space that the Ridon can provide, its interior dimensions have been maximized. Its use as a taxi or commercial vehicle is foreseen. However, the present Ridon should be considered as just one out of a great number of possible designs, all fitting the standard Modek. Note will be made of its slab-sided appearance. The intent here was to allow the use of aircraft-type preformed carbon-fiber honeycomb panels because of their great strength, rigidity, and lightness. In the prototype mockup, plywood was used, rather than experiment with such costly panel. When the intended panels are used, the weight of the Ridon body shell will be two thirds lighter.

The EV1, featured in the movie *Who Killed the Electric Car*, had minimal aerodynamic drag in order to optimize its range. But it had only two seats and was far from roomy. The Ridon described above may be reasonably aerodynamic because of its rounded sloping nose, divided windshield, and smooth sides. Surprisingly, the squared-off rear has less drag than if it had rounded corners. The forward-sloping V-windshield design was used on a Boeing aircraft. However, wind-tunnel testing has yet to be done. This Ridek is essentially an urban vehicle, and will spend much of its time in slow-moving traffic. The design intent was for it to fulfill that role optimally. Nevertheless, its powerful motors will accelerate it smartly and propel it to highway speeds.

I've heard it said that if you can get three or four points across in a lecture that's pretty good. In preparing this presentation I made a list of the points I had to make: you have been at the receiving end of 34 points! You will not be surprised to hear that it takes a considerable time for the true value of Ridek to sink in.

I'd like to finish with an account of how it might be to use a Ridek instead a conventional car. It will drive like a conventional car, except that you will not hear an engine running when you stop at traffic lights. It will feel substantial and roomy. You will never have to buy gas: it will be recharged in your garage, where it will automatically plug itself in. You will not need to worry about tires: they will be supplied, correctly inflated, with the Modek. You will never need to concern yourself with brakes, oil changes, antifreeze or other servicing—just exchange the Modek. When the Ridon begins to look shabby, you can refurbish it, or customize it as you wish. When you enter the Ridek, after it has been standing in the sun, on a hot day, you will find it is pleasantly cool because of its shading roof, solar panel, and heat pump operating without draining the battery. When you outfit your Ridon as a mobile office or workshop, you will never have to leave it at a service station. When you add up your expenses over time, you will find you have saved money! This last may be the most important factor likely to make Ridek a success. But another may be that there is something for everyone: space, safety, convenience, economy, performance, individuality and GREENNESS—adopting Ridek puts us back in control of the amount of CO_2 emissions that we, as individuals, put into the atmosphere.

1. Zubrin, Robert: "The Hydrogen Hoax." *The New Atlantis*, Number 15, Winter 2007, pp. 9-20.
2. Goldstein, David: *Out of* Gas, W.W. Norton & Co., New York, 2004, (footnote quoting Alan N. Brooks, p.88).
3. Wall Street Journal: April 9, 2007, p. 1.
4. Dower, G.E.: Modular Vehicle Construction and Transportation System. United States Patent Number 6,059,058; Canadian Patent Application Number 2,302,761; European Patent Number EP 1,009,651 for France, Germany, Great Britain, Italy, and Switzerland.
5. www.ridek.com

Question: "You have emphasized the urgency and, by implication, the dispatch with which we should act, and you have presented what may be the most practical direction, so:

1. How long will it take to get Rideks on the road?
2. What further development is required?"

Answer: "With completion of the third road-licensed prototype, Ridek III, embodying the features I have described, presentation to various city governments becomes the next step, for them to order test fleets of Rideks, manufactured locally. Although Ridek III contains several innovations, it requires no new technology. The principle of modularity is the same, only the details are different."

Modek chassis

Ridon raised from Modek

Modek, door open, steps down