THE RIDEK MODULAR CAR www.ridek.com

The modern car is so closely integrated that the potential for modularization is not apparent and the advantages are not appreciated. The electric car brings the advantages of modularity to the fore because batteries are expensive, slow to charge, and give a shorter range than one expects from a tank-full of gasoline. It is well established that cars should cease contributing CO_2 into the atmosphere—not just reduce but **stop**[1]. This requires a practical alternative to the gasoline or diesel engine, but the choice is limited. By far the most practical choice is the electric motor. It turns out that cost, charging and range problems are successfully addressed by modularizing the car into a chassis and body if the chassis can be exchanged in a few minutes. The engineering requirements for doing this are neither onerous nor expensive, yet the benefits are extraordinary.

The running gear, including the engine, suspension, steering, and brakes are all in the chassis. These are the most durable parts of a car. Whereas the average life of a car is only about 10 years, its mechanical parts can last much longer. Electric motors are particularly durable so that the average life of a modular electric chassis should be 30 years, or even more because it can be updated when improvements appear. The biggest single cost of operating a car is depreciation, hence tripling the amortization period of its most expensive component, as a chassis module, makes economic sense and it leads to the concept of separate ownership for the chassis and body modules. When a car is idle for a prolonged period, its valuable machinery is idle, too, but the chassis of a modular car need not be, especially if it is provided under a contract with an agency controlling a pool of available chassis. The convenience of exchanging the chassis instead leaving one's car for servicing is an obvious benefit, and there are many others.

Although some electric cars have a range of several hundred miles, most drivers do not need much more than fifty, most of the time. The most economical arrangement is to provide a range that meets the driver's daily needs—usually this would be about 50 miles—with the option of extending the range whenever needed. The range of a modular chassis can be increased with larger and more potent batteries but providing a range that is much more than needed entails unnecessary expense. For inter-urban driving, where exchange of the modular chassis may not yet be available, a gasoline- or diesel-powered chassis would give the driver the versatility of the hybrid car without the expense of a dual power plant. The energy-storing capacity and lifespan of batteries are increasing and their cost and recharging time are decreasing but the CO_2 problem cannot wait, especially since the chassis module can be updated when better batteries come out. There are similarities between the quick-change modular car and a horse-drawn vehicle. Batteries are best fed overnight, when electricity costs are lower—and much less than the gasoline equivalent. If the battery does not give sufficient range, the chassis can be quickly changed for a fresh "horse."

If modularizing the automobile is simple and brings many benefits, why has it not been introduced? A patent for it was applied for in 1997 and awarded in 2000.[2] Since then, three prototypes have been built. The first was shown at Long Beach CA in 2003. It was a bare-bones affair but it was licensed and it demonstrated the practicality of the concept. It did not look like a conventional vehicle. The second was a modified Astrovan, and it looked completely

[1] This applies to power stations as well as transportation, which together contribute two thirds of carbon emissions in USA.

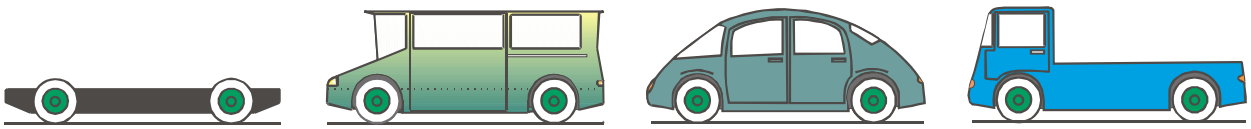
[2] US Patent 6,059,058, Modular Vehicle Construction and Transportation System, May 9, 2000, also patents in Britain, France, Germany, Italy, and Switzerland.

conventional—for a van. The excitement of the auto industry was barely discernable although General Motors publicized, in 2002, its Autonomy car and mentioned a "skateboard with snap-on bodies." The modular car may be too disruptive an innovation for the auto industry to gamble on. Interestingly, this leads to another and potentially important feature of modularization: distributed manufacture by local industry. The third prototype illustrates what may be done locally and how commodious and safe a modular car can be. It was shown as a wooden mock-up in Vancouver, Canada, in December 2005.

Some useful terminology: the chassis was a component of the early automobiles and could sometimes be bought separately from the coach, often made by a different company, but the result was not a modular car in the sense used here. The *exchangeable* chassis can be thought of as a motorized deck, or *Modek*. The body that rides upon it is a *Ridon.* The vehicle formed when the two are mated is a *Ridek*. Exchange of the Modek chassis takes place at a *Modek Exchange Station*. For demonstration purposes, Modek exchange of the third prototype (Ridek III) is accomplished on a trailer, which can be used to bring Modeks for exchange in the field. Normally, however, Modek exchange would use hydraulic jacks set into the ground at the Exchange Station and retracted into a level surface when not in use.

A practical economic model is for a Modek chassis to be provided at any convenient Modek exchange station under a Modek-availability contract, with a monthly charge taking into account the range, or battery size, the distance traveled and the number of exchanges. As a start, a city operating a fleet of Rideks could make Modek chassis available to Ridon-body owners in a system that could be expanded for taxis, car rental agencies, business fleets, etc. For the system to succeed, the overall cost of operating a Ridek would preferably be less than that of a private automobile. This should be possible because of the flexibility, low initial cost (of the Ridon body), longer amortization, reduced idle time, and easier servicing of the Modek chassis.

Gordon E. Dower (dower@whidbey.com) and Shelley Damewood
The Ridek Corporation, 2266 Sunrise Drive, Point Roberts, WA 98281 USA, phone & FAX: 360-945-0876



Modularization through quickly interchanged Ridon bodies and Modek chassis has value because:

1. It separates the Ridon body as a *private* environment from the more *public* Modek chassis, allowing these two components of the Ridek composite vehicle to have *different* lifetimes and be subject to *different* business plans.
2. The Ridon body would be owned and cared for like a private car but it would normally cost less to buy and maintain.
3. Modek chassis would be provided for the Ridon body as needed under a Modek-availability contract.
4. The city's unique control of Modek chassis would allow installation of various sensors and devices to aid traffic control and law enforcement, such as GPS, transponders, two-way communication, remote stopping (to avoid high-speed police chases).
5. Enhanced crime prevention and the detection of impaired or dangerous driving would increase safety and reduce insurance cost.
6. Rideks could be *taxed according to road use,* and Ridek commuters could use preferred lanes.
7. Parking and toll charges could be billed each month.
10. Seasonally stored Ridon bodies would incur no cost or deterioration.
11. Ridon bodies could be manufactured according to owners' specifications, using local labor. Specialized Ridon bodies for use as mobile offices or commercial or other purposes need not be retired from service because of obsolescence.
12. Modek chassis exchange would free Ridon body users from the servicing needs of conventional cars.
13. Standardization of Modek chassis would favor economies of scale.
14. Ridon bodies and Modek chassis could have different service lifetimes; Modek chassis, particularly, being invisible and always well maintained, should have little depreciation—avoiding a major cost of car ownership.
15. Modek chassis could have a variety of motive units and serve as useful test beds for improvements. Unlike cars, they could be *readily updateable.*
16. Ridon bodies would be particularly attractive to car-rental agencies where a major cost is delay for cleaning car interiors, putting the whole vehicle out of action.
17. Ridek passengers would sit at the level preferred in sport utility vehicles (but the low center of gravity of the Modek chassis would reduce the risk of rolling over), giving a better view of the road without compromising safety—enhanced by placing them above the point of impact from a car hitting from the side at an intersection.
18. By increasing the useful life of the Ridek's mechanical components (in the Modek chassis), the Ridek concept mitigates the growing disposal problem of old vehicles.
19. The ease and speed of Modek chassis exchange makes the battery-electric vehicle practical because it eases the range requirement giving, in effect, instant recharging, whenever needed, as well as facilitates battery management.
20. The ridek concept offers the best means for developing and implementing the *zero-polluting* vehicle.