

*NASA research is supporting the electric car revival and making bridges safer, among other advances in transportation.*

## new technology for transportation

The electric car is staging a comeback. It is clean and quiet, offering a potential environmental boon. It burns no gasoline, a major advantage to the individual and to the national aim of reducing petroleum imports.

In the United States and several other nations, researchers are taking a new look at the electrocar. They are predicting that current drawbacks can be remedied and that an efficient battery-powered auto can be available within a decade. And space technology is playing a part in reviving a once-promising vehicle.

If you're under 60, chances are you don't remember the electric auto. Invented in 1887, it provided strong competition for the gasoline-powered car in the first decade of this century. The "petrocar", as some called the gasoline-driven vehicle, was a noisy, rattly, smelly smoke-belcher. The noiseless electric car didn't frighten horses and it was advertised as safer. Its battery needed recharging every 20 miles or so, but that was not too great a disadvantage since nearly all auto travel was local.

After 1910, however, internal-combustion technology advanced rapidly while electric-auto technology stagnated. The electrocar still held the noise advantage, but its lack of range caused its downfall as

a network of roads and highways burgeoned and auto touring became the rage. Electric vehicles then faded gradually from view.

The key to the electrocar's possible comeback as a passenger vehicle is the battery, although advances are also required in design, controls, and drive trains. Studies show that a car capable of averaging 82 miles

*This Postal Service van is a test vehicle for a NASA-developed nickel-zinc battery that may spark the electric automobile's comeback. Based on space satellite battery technology, the nickel-zinc battery promises longer life and twice the range of existing commercially-available batteries.*



a day on a single battery charge would meet 95 percent of the need for a full-service urban vehicle in the United States. Present commercially available batteries, which have lead electrode plates in an acid solution, can't meet the range requirement.

NASA's Lewis Research Center undertook research toward a practical, economical battery with higher energy density. Borrowing from space satellite battery technology, Lewis came up with a nickel-zinc battery that promises longer life and twice the range of the lead-acid counterpart. Lewis researchers fabricated a prototype battery and installed it in an Otis P-500 electric utility van, using only the battery space already available and allowing battery weight equal to that of the van's conventional lead-acid battery.

In initial tests, the nickel-zinc battery delivered 190 stop-and-go driving cycles per charge, compared with 99 for the lead-acid battery. At a constant speed of 20 miles per hour—a test speed, not the ultimate expected—the nickel-zinc battery gave the van 55 miles on a single charge while the lead-acid battery yielded less than 30 miles.

Lewis is continuing research aimed at improving the nickel-zinc battery's performance, life and competitive cost. In a joint NASA-U.S. Postal Service field test program, nickel-zinc batteries will be installed in mail pickup and delivery vans. The Postal Service already has some 450 electric vans, and plans a large-scale expansion utilizing longer-range batteries.

NASA will further evaluate the new battery's potential for urban family use in a test vehicle. Lewis researchers feel that a nickel-zinc battery, producible within five years, could drive a car 120 miles at an average speed of 40 miles per hour on a single charge—exceeding the predicted requirement for a viable urban vehicle.

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*These toll booths, at the Evergreen Point Bridge near Seattle, Washington, have air purifiers whose design profited from NASA "clean room" airflow technology. The booth's airflow system retards infiltration of contaminated air and decreases the toll collector's inhalation of engine exhaust fumes.*

### **Toll-Booth Purification**

For many years, toll collectors on turnpikes and bridges have been subjected to a health hazard from engine-exhaust. Fumes are particularly strong at toll booths because drivers decelerate from high speeds then quickly accelerate after paying the toll. To counter the exhaust hazard, Washington state decided to equip its toll booths with air purifiers, but available purification systems were found unacceptable; they created severe drafts because uniform air flows could not be attained.

NASA's Technology Application Team at Stanford Research Institute searched available information and suggested a transfer of clean-room technology

