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Future (Re) Takes

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The September-October 2001 issue of *The Futurist* featured an article by Francis D. Reynolds, titled, "The Transportation System of the Future." Here is a short review of that article and an update.

Summary of Original Article

We will travel safer, faster, cheaper with less stress and without using gasoline or creating pollution. This futuristic dual-mode transportation system includes vehicles driven in the normal manner on streets and automatically driven on high-speed dedicated guideways while drivers use their time for anything but driving. This dual-mode system incorporates special automatic guideways with most of the artificial intelligence built into the guideway network and not into the vehicles.

The guideways will carry almost all of the categories of vehicles now used on streets and highways. Most of the traffic will consist of private vehicles, but also will include buses, rental cars, taxis, school buses, delivery trucks, cross-country freight delivery traffic and personal-rapid transit vehicles.

A high percentage of private dual-mode commuting vehicles will be small, two-passenger vehicles. Small cars tend to be more dangerous on highways, where they have to compete with heavier cars and trucks. Size won't affect safety on the guideways because all vehicles will travel at an identical speed. "Slick roads" won't be a problem. The automatic system will always "see" perfectly in any kind of weather. Driver will never fatigue or fall asleep.

Dual-mode vehicles will travel on streets and on the guideways. But cross-country buses and long-distance freight vehicles will be single mode, operating only on the guideways with no drivers. The driver-less freight vehicles will be more like autonomous cargo containers than trucks.

A constant speed of 60 mph in and around cities and 200 mph between cities will decrease travel time, increase safety and increase road utilization. Synchronized vehicles may travel less than one foot apart.

These speeds offer enormous system capacity. With vehicles moving at 60 mph, a single guideway lane could carry the traffic of 12 highway lanes; at 200 mph, one guideway lane would be equivalent to 40 highways lanes. The need to build more lanes will become a thing of the past, and one lane of guideway should cost far less than 12 or 40 lanes of conventional highway.

Vehicles enter the guideway system by driving onto an entry stop. The driver then shuts off their motor and enters the number of their desired guideway exit into a keypad on their dashboard. The exit number will tell the navigation computer where to send the vehicle and enable the billing computer to charge for the particular trip.

Computers in the entry stop will record the vehicle's identity by reading an on-board identification chip. Simultaneously, the automatic system will verify vehicle safety and emission requirements. The guideways system will denied access and returned all vehicles to the streets if the vehicles fail to pass these tests.

These preliminaries will take about 30 seconds. The vehicle will then automatically accelerate and merge with the guideway traffic. "Switching" action will initiate automatically in the vehicles, not by switching the tracks as is done on railroads. The vehicles will switch from one guideway to another at full speed, just as we enter and leave freeways at full speed today.

A global dual-mode system will solve most transportation and transportation-related environmental problems. Dual-mode systems will reduce highway traffic and traffic jams. Guideway vehicles traveling into the city will not exit on the downtown streets. These vehicles will automatically park directly from the guideways. The dual-mode system will alleviate or reduce street traffic and street-parking problems.

Dual-mode vehicles will be battery-electric or fuel-cell powered for street use. Since these vehicles will use guideway power for most of their travel, batteries or hydrogen tanks that are now inadequate for highway use will be more than adequate for dual-mode limited street use. However, in the early years of the system, vehicles with internal-combustion engines will remain in street use, since these vehicles will need to travel on existing highways until guideways are widely available.

Electricity for the guideways can come from any energy source, whereas internal combustion engines demand fuels that are environmentally damaging and in short supply. In the future, the percentage of electric power from wind turbines and solar arrays will increase, and nuclear fusion may also be a viable source. We will have many options in generating electricity; but with internal combustion automobiles we will have very few. Even if we burn more coal to boost power for the guideways, the overall dual-mode system will be roughly twice as efficient as automobiles. So transportation will burn less fuel and therefore generate less carbon dioxide than it now does.

Air-bearing technology (related to hovercraft) may support the vehicles on the guideways. Many dual-mode system inventors propose maglev guideways. The concept of magnetic levitation has interesting advantages for dual-mode systems. If the vehicles are floating with their street motors off, they won't be wearing out. Neither will the guideways wear, so they won't develop faulty rails or potholes.

The guideways will use linear synchronous motors, enabling all of the vehicles to run at precisely the same speed at all times; like boxes on a conveyor belt. The spacing between vehicles will never change, so it will be virtually impossible for collisions to occur. In a dual-mode system, synchronous propulsion will eliminate a large number of the sensors and controls needed to maintain individual vehicles' speed and distance from each other if the vehicles controlled the system instead of the guideways.

An interim period will exist when only part of the dual-mode guideways is complete, and only a few people will own the non-polluting dual-mode vehicles. In order to make the available guideways useful to all during this period, existing automobiles will drive onto pallets designed to run on the guideways. Even after most people have true dual-mode vehicles and most of the guideways are complete, classic automobiles, boats and other trailer loads will still use pallets.

A huge dual-mode system for the United States will cost $20 to $50 million per mile of guideway – hundreds of billions for the whole nationwide system. But unlike trains, the dual-mode vehicles will not belong to the guideway company, so the cost of the system will not include vehicles. Every vehicle that uses the guideway system will help pay for the system, and guideway-use fees will be far less than the cost of gasoline powered transportation in the future. Private vehicles and freight will pay the major cost of the guideway system. To encourage environment responsibility transit's share will be small.

Update

Denmark is currently studying the RUF EV (electric vehicle) Intelligent Auto/Transit concept. RUF means "go fast" in Danish. Small and medium-sized electric intelligent vehicles operate on the conventional roadway as well as on an automated guideways system. In the manual mode, vehicles are powered by on-board batteries that have a range of up to 50 km on the conventional street. A hybrid version of the vehicle has also been conceptualized that would extend this off-rail range. In the automated mode, the vehicles take power from the rail system and operate at high speed over longer distances. This combination of integrated operating modes would provide the user with the ability to reach the vast majority of destinations in a large metropolitan region quickly and without having to deal with the congestion delays and accident hazards that exist on conventional freeway/arterial systems.

The RUF concept also accommodates larger vehicles, called MaxiRUFs. These vehicles operate on conventional streets, in either a demand-responsive or scheduled mode, as well as the RUF-rail facility in an automated mode.

The RUF vehicle may be owned by both individuals and the public. Personal RUF vehicles would normally be kept at a person's residence or parked near their workplace. Public vehicles will be available at all rail system stations and could be rented as needed by individuals or small groups. Larger MaxiRUF vehicles would be operated like small buses (10 persons) on the automated rail system; special versions could be used by businesses to move goods.

This summer the first RUF prototype rolled onto a 24 meter-long test track outside of Ballerup, Denmark. Looking nothing like the sleek 1998 concept mockup that gave physical form to the idea or the more conventional-looking Z-9 and Z-11 concept vehicles, the RUF mechanical test bed sports a clear plastic canopy and a heavy steel tube frame. It boasts eight wheels; four normal road wheels and four smaller track wheels hidden discretely along either side of the vehicle's centerline. There are also separate steel drive wheels that propel the vehicle along the guide rail.

The RUF system is the brainchild of Danish inventor Palle Jensen. First presented in 1988, Jensen has successfully garnered the support of a number of major sponsors including three Danish ministries (Energy, Environment and Education) and a number of multinational corporations including Siemens, Hawker and Mannesmann.

According to RUF International's calculations, a single highway lane can accommodate a maximum of 2,000 vehicles per hour per lane. By contrast, they say the RUF system could handle as many as 3,600 vehicles per hour per rail. In addition, four rails can be installed in the same space as three highway lanes, making it possible to move many more passengers much more efficiently than our current system and with far less pollution and wasted energy.

As might be imagined, the RUF system will also be heavily dependent on smart vehicle technology that automatically routes the vehicle and directs its switching to other tracks. The *"driver"* simply programs into the vehicle where it is they want to go and the computer handles the rest. It will even communicate with other vehicles to see if they are going to the same destination and automatically form "trains" to increase traffic density and reduce energy usage by "drafting."