review of the U.S. transportation system commissioned under the Carter administration, and suppressed from publication by the Reagan administration. The following assumes a freight train carrying 2,000 short tons (1,814 metric tons)—about standard for the United States but heavier than most other systems—a standard 20 metric ton truck, and a standard jumbo barge of 1,500 tons organized in a 12-barge train.

The control systems are the signaling methods employed to regulate train movements, and together with numbers of tracks, determine line capacity. Manual or automatic block signaling assumes that the track is divided into blocks of a certain length relative to the headway of the trains, and that a train does not enter a given block until its predecessor has left it. Controls for stopping the train are onboard. Under central traffic control, the train, say for emergencies, can be stopped by orders issued from the central control. Central handling of movement permits better coordination and increases capacity. These comparisons apply to vehicles under way, and do not consider stopping and starting (see **Table 24**).

It requires 299 trucks to transport the same volume of ton-kilometers in an hour as 3.3 trains, or 4.5 barge trains, but they will only cover 7 kilometers each. With current U.S. speed limits, the trucks wouldn't actually travel at 127 kilometers per hour. And diesel-fueled trains, the freight-carrying workhorse in the United States, cannot technically exceed 125 miles per hour (200 km/hr). Other modes can be compared to this outline, for example those shown

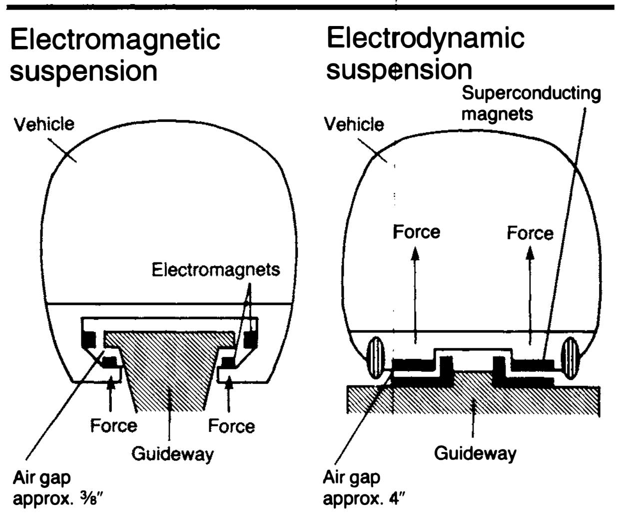
Magnetic levitation transport systems

Magnetic levitation (maglev) transport systems can revolutionize passenger and freight transportation by early in the next century. Moreover, the spinoffs which will follow the development of advanced maglev systems, such as giving impetus to high-temperature superconductor research, will have even more profound effects.

Maglev systems feature two basic types of propulsion and guidance systems: those in which the levitation magnets are onboard the vehicles and are superconducting, such as Japan's HSST models, and those which are propelled and controlled from the track on which the vehicles run, known as the guideway. Both the German TR-07 and the Japanese MLU-002 models make use of what are called passive systems. However, the German and Japanese programs make use of different electromagnetic principles to provide the suspension, propulsion, and guidance of their vehicles (see diagram).

The German Transrapid is based on the attractive power of permanent magnets, a system called Electromagnetic Suspension. The vehicle's underframe "wraps around" the guideway and pushes the vehicle up and off its rails. The Japanese make use of repulsive forces, a system called Electrodynamic Suspension, to lift the vehicle away from the guideway. These systems must employ an undercarriage-like landing-gear, for lift-off and landing, because the vehicles only levitate at speeds in excess of 25 mph.

Maglev technology is already developed to meet an array of transportation functions, from short-distance but relatively high-speed urban commutes (Japan's HSST can function at between 60 and 250 mph), to inter-city travel



at speeds in excess of 310 mph.

The Transrapid TR-07 is capable of carrying up to 200 passengers at speeds of 310 mph. With a one-minute headway between units, Germany's TR-07 can transport 10-20,000 people per hour. Japan's commercial design maglev train will consist of 14 cars capable of carrying 900 passengers, and is intended to move 75-100,000 people per day between Tokyo and Osaka, some 320 miles.

A maglev transport system compares favorably to aircraft in effective travel time for distances from 200 to 900 miles, and a maglev system can carry twice the number of passengers at half the cost of a Boeing 737. It uses electrical energy, rather than petrochemical fuels.

The maglev system is cheaper than the movement of passengers on today's railroad system. The best estimate of maglev operating and maintenance costs per passenger-mile is 5.2¢ in 1988 dollars. Today's U.S. Amtrak Metroliner service costs 16.2-36¢ per passenger-mile, depending on the bookkeeping methods used.