

14. Investigated radiative power transfer to tube vehicles on theoretical and subscale basis.
15. Studied feasibility of vehicle in evacuated tube system.
16. Developed system engineering and cost tools for future evaluation of alternate tube vehicle systems.

*Work to be done in unconventional transportation systems R&D*

1. Design, fabricate, and test a TACV research vehicle and guideway.
2. Conduct scale model tests of tube vehicles to gain further knowledge of system dynamics and of scaling effects prior to initiation of full-scale tests.

*Advanced technology R. & D.*

Advanced technology research and development is being done because—

High speed ground transportation systems can be no better than the subsystems of which they are composed, the construction methods by which they are built, or the materials of which they are made.

This R&D is being carried out in the following major areas: guideways, communications and control, power collection, obstacle detection, linear electric motors, and magnetic suspension, and planning for a high speed ground transportation test facility.

Significant advantages are to be gained by the use of subsurface routes for HSGT systems. Unfortunately, present costs for tunnel construction tend to make tunnels less attractive economically than surface routes. Wholly insufficient efforts have been devoted in the past, either by Government or by industry, to advancing scientific and engineering knowledge of tunneling. Advancements in tunneling technology create many possibilities for the future development of economically feasible subsurface systems.

High speed ground transportation will require improved communications to maintain safe and efficient operations. Unfortunately, there are an insufficient number of radio frequencies available to provide the necessary level of communications capacity. Research is therefore being carried out in nonradiating communications to determine their feasibility for HSGT systems.

For speeds above 200 mph, it is apparent that a stiff contact-rail approach or a noncontact technique for electric traction power pick-up is necessary. Studies have been performed on noncontact electric energy transfer. This work evaluates possible techniques for transferring large amounts of electrical energy without physical contact, such as through induction or arc plasma transfer. Results so far are not encouraging for the early use of noncontact methods.

Safety is one of the most vital aspects of a HSGT system, since the consequences of accident are more serious at higher speeds. HSGT systems must, therefore, employ a separate guideway having no crossings at grade. It may be necessary to have an obstacle detection system protecting against possible collision with foreign objects on the guideway to guarantee the safety required by the speeds envisioned for HSGT. Obstacle detection systems may have application to conventional railroads as well.

Propulsion of ground transportation vehicles is typically accomplished by transmitting power through axles and wheels to a roadway or rails. This method requires adhesion for the vehicle to accelerate or decelerate. To eliminate the need for adhesion for wheeled vehicles, or to propel an air cushion vehicle, research has centered on linear electric motors. Propellers and turbo-jet engines also eliminate the requirement for adhesion; however, they are less desirable because they are noisier, less safe, and create more air pollution.

Magnetic suspension is being evaluated for use in those applications where neither wheels nor air cushions are feasible. A high speed vehicle operating in an evacuated tube may be one case where a magnetic suspension system is required.

The final step in the evaluation of new ground vehicles and components must be full scale testing. Experimental vehicles, when tested at high speed, cannot be operated in close proximity to commercial traffic. A test facility is therefore needed where test and evaluation can proceed unhindered and without endangering public transportation.

Initial tests of the linear electric motor would require a track several miles long. Tests at 300 mph would necessitate a track from 10 to 20 miles in length. The TACV research vehicle would require tracks of the same length but of entirely different cross section. This facility may ultimately serve as the testing site for early tube vehicles.