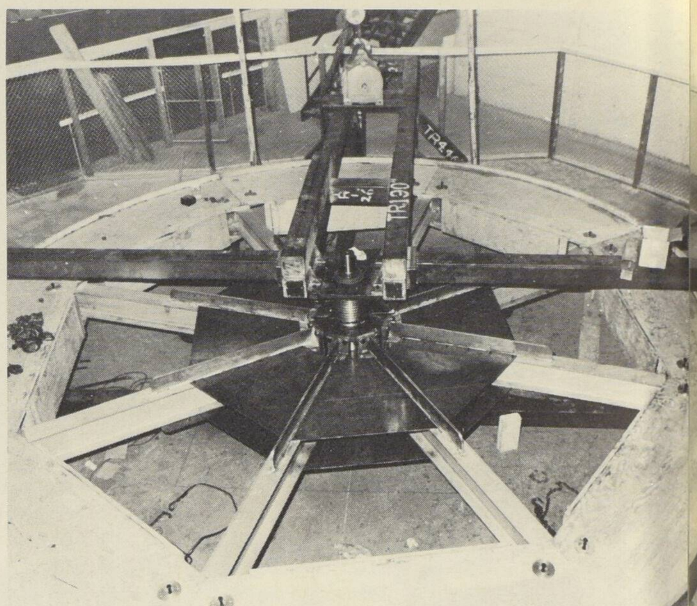
MAGLEV

Scientists associated with the Canadian Magnetic Levitation (MAGLEV) Research Group are constructing this test facility at Queen's University, Kingston, Ontario, to further probe the applications of magnetic levitation vehicles. The 25-foot diameter wheel will revolve at a peripheral speed of 70 miles per hour, with the proposed vehicle remaining stationary above an aluminum guideway at the wheel's perimeter. The facility will be completed and ready for testing



Each week, thousands of Canadian businessmen ply the nation's busiest corridor between Montreal, Ottawa and Toronto. Some of them fly the 400 miles, a few take trains and buses and some choose to drive a car. Air travel is the fastest, although commuters constantly complain of the distance between downtown sections of a city where they usually conduct business, and the airport. Travel by train and bus reduces this distance, while travel by car gives a commuter door-to-door convenience.

A means of travel which would be faster than flying and move commuters from downtown to downtown would serve an obvious need. Two alternatives may meet this demand; short takeoff and landing aircraft (STOL) flying from airstrips located close to downtown sections, or a high-speed ground transport system linking downtown cores.

A Negotiated Grant of $133,000 has been given by the National Research Council of Canada to the Canadian Magnetic Levitation (MAGLEV) Research Group to provide a facility with which to conduct some experiments in magnetic levitation and a linear synchronous electric propulsion system. Researchers from McGill University, the University of Toronto and Queen's University, Kingston, have been probing the possibilities of using magnetic levitation and its applications in terms of high-speed ground travel since late in 1971.

The NRC Grant was awarded in 1973. The group is also being supported by a contract from the federal Transportation Development Agency.

The theory behind the fundamental research being conducted through the NRC grant is simple and has been contemplated by scientists and urban planners around the world for many years. The idea for using magnetic levitation dates back to the turn of the 20th century when thoughts of suspending a vehicle above the ground, free from wear and friction, were first formulated. Permanent magnets such as the common horseshoe type, cannot produce sufficiently high magnetic fields for large suspension heights or heavy loads. Only recent technological advances resulting in the development of ultra-powerful superconducting magnets have made the proposal more attractive. Such magnets are capable of generating very large forces and consist of electromagnet coils of special superconducting material — such as niobium titanium — which, when cooled by liquid helium (−269 degrees Centigrade) loses its electrical resistance. High-strength fields can then be generated without the prohibitive amounts of electrical power required by conventional electromagnets.

Work in Canada on the possible future applications of magnetic levitation for ground transit systems started about five years ago. Britain, the United States, Japan, Germany and Canada are cooperating in regular exchanges of information on the subject.

The NRC Grant, for a period of two years, has been used for the construction of a test facility at Queen's University, under the guidance of Physics Professor David Atherton. The test bed will be completed this summer and will be used for experiments and basic research into magnetic levitation and its possible applications for high-speed ground travel systems. Research will be limited to actual levitation, with superconducting magnets being used to gather more data. Rather than using a linear track, which would take a great deal of space, the research group has designed a system using a stationary facility incorporating the magnets and a circular track. A guideway is located at the perimeter of a 25-foot diameter wheel. A 150-horsepower electric motor provides power to the wheel which at full speed turns 1.2 revolutions per second, giving a peripheral speed of 75 miles per hour. Aluminum spokes from the central hub support a wooden rim onto which fibreglass collar is fitted to withstand the centrifugal forces. The aluminum guideway is attached to this collar. The superconducting magnets, simulating the presence of a MAGLEV vehicle, are placed about six inches from the wheel and are expected to exert forces in the range of four tons.

Researchers say that work to date has indicated the need for an auxiliary wheel system on an actual vehicle. The vehicle proposed would weigh about 30 tons and carry up to 100 passengers. The wheels would be used at low speeds, but it is hoped that research using the test wheel at Queen's University will support existing beliefs that large repulsion forces by the superconducting magnets provide lift at modest velocities. Suspension heights of as much as 12 inches above the aluminum guideway may be feasible.

"We're breaking new research ground all the time," says Professor Atherton. "We chose the wheel system for our