Accomplishments in advanced technology

1. Started on construction of full-scale 2500 HP linear induction motor and test vehicle.
2. Undertook approaches to communications and control without use of radio frequency spectra.
3. Established feasibility of surface conduction line for communications and control.
4. Undertook design of optical laser system for obstacle detection.
5. Established feasibility of flame-jet tunneling system.
6. Established practicability of using lasers for fracturing rock.
7. Improved on technique of using chemical surfactants to weaken rock.
8. Pioneered use of high velocity fluid jets for fracturing rock.
9. Advanced the technique of using light gas gun for firing high velocity projectiles for fracturing rock.
10. Initiated study to improve materials and techniques for lining tunnels.
11. Examined use of cavitation for eroding rock.
12. Developed new methods of predicting nature of and magnitude of rock slippage.
13. Developed mathematical models to predict settlement of fills and heave of excavations.

Work to be done in advanced technology

1. Investigate various communication and control techniques including surface wave transmission lines, W-type continuous access communications waveguides, leaky waveguides, and millimeter waves in special waveguides.
2. Conduct studies to determine best configurations, voltage levels and supply point spacing for a stiff contact-rail system for power collection.
3. Continue to study noncontact techniques for power collection.
4. Test optical laser device for detecting obstacles on guideways.
5. Test prototype linear induction motor on wheeled research vehicle as preparation for installation of later model on TACV research vehicle.
6. Investigate feasibility of electromagnetic suspension, examining possible configurations, transient magnetic field effects, and cryogenic insulation strengths.
7. Continue rock fracture research using high power lasers.
8. Research the phenomena of rock weakening by chemical agents.
9. Conduct studies as to feasibility of using lasers and chemical weakening agents in combination with hard rock tunneling machines (moles).
10. Conduct system development and field testing of flame jet tunnelers.
11. Develop tunnel excavation systems using high velocity fluid jets.
12. Develop design for a high velocity water jet nozzle using multiple low-speed orifices.
13. Continue light gas gun fracture research by field experiments.
14. Continue anlysis of requirements and costs for tunnels in the Northeast Corridor.
15. Fabricate scale models of advanced-technique tunneling systems.
16. Conduct field experiments and demonstrations of new techniques on actual tunnel construction projects in Chicago, New York, and other locations.

Timing

The fulfillment of the growing transportation requirement places an increasing demand on the best possible use of technology. Continuing research and development is required to improve steadily the performance potential of HSGT subsystems. High priority is now being given to alternative system selection so that efforts can be focused on the more promising concepts. It is estimated that HSGT classes such as auto-train, high speed rail, and multi-modal systems could be operational in the early 1970's, tracked air cushion vehicle systems in the mid-1970's, and tube vehicle systems in the later 1970's. Research and development on advanced systems is now underway and includes analytical studies and small-scale laboratory experiments. This should progress to larger-scale experiments, prototype hardware and passenger demonstrations. Full-scale field experiments are already underway with the high speed rail research vehicles and track structures; and large-scale laboratory rail-vehicle dynamics experiments are planned to commence in FY71. Full-scale field experiments of a tracked air cushion vehicle are planned to commence in FY71 and of a tube vehicle in FY74. The present laboratory phase of the Advanced Technology research will likewise require larger-scale field experiments in the next few years.

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