necessary for analysis of current test results and for simulation of future operations.

Active vehicle suspension systems would offer a means of enabling rail cars to negotiate curves at significantly higher speeds than are presently practical. Schedules are seriously restricted by the need to slow down for existing curves. Elimination of curves in existing rights-of-way requires costly land acquisition and relocation. A successful "active" banking system would enable the vehicle body to lean into the curve at high speed. This concept would be useful for new systems as well as for rail.

Research results to date indicate that track structures must be improved for safe, comfortable, high speed rail passenger service. Theoretical studies and operations of the research cars thus far indicate that track structures maintained according to current railroad standards will not provide acceptable rides at very high speeds. There is also an indication, however, that conventional track installed to high standards may deteriorate less rapidly than widely supposed by the rail industry. An improved balance between installation cost and maintenance cost may therefore be found to exist. If more stable structural designs can successfully be developed, maintenance cost would be lowered, possible resulting in a basic reduction in rail service cost. The fruits of these efforts will also be applicable to future HSGT facilities.

Drive system investigations fall in two areas: power collection and on-board power conditioning and control. Intermediate speed systems for rail are included here; radical departures for very high speed work are being investigated in Advanced Technology.

Accomplishments in high-speed railroad R. & D.

1. Acquired four 150 mph rail research cars and establishment of specially upgraded and instrumented 21-mile high speed test track.
2. Developed instrumentation for four research cars, test track, and overhead catenary and initiated a comprehensive test program.
3. Evaluated track upgrading on Penn Central demonstration project.
4. Programmed track upgrading on New Haven Railroad demonstration project.
5. Supported testing of telephone service between New York and Washington for demonstration project.
6. Established feasibility of auto-train service and determined ride quality through actual test of automobiles in railcar.
7. Developed auto-train concept and supervised detail design.
8. Collaborated in developing pantograph modifications for Metroliner trains.
9. Developed computer simulations of railroad car, roadbed, and overhead catenary.
10. Initiated study to determine requirements of laboratory equipment for study of interaction and upper speed limits of steel-wheeled vehicles on steel rails.
11. Evaluated alternative means of noncontacting electric energy transfer.
12. Initiated design of servo-pantograph for high speed trains.
13. Determined aerodynamics of large freight cars and studied improvements thereto.
14. Initiated industry-Government study of automatic freight car couplers, trainlined control systems, and their resulting operational economics and flexibilities.
15. Designed surveillance equipment for high-speed rail vehicles.
16. Analyzed an developed new track structure designs.
17. Analyzed active suspensions and made initial design of prototype for rail applications.
18. Initiated study of adhesion improvement through rail cleaning by plasma torch.
19. Supervised technical progress of Metroliner and TurboTrain development programs.
20. Made initial design of 250 mph truck for the linear electric motor project.
21. Derived extension of theory of rolling contact.
22. Evaluated turbine drive concepts.

Work to be done in high-speed railroad R. & D.

1. Utilize Office of High Speed Ground Transportation rail research vehicles and previously developed computer simulation to study phenomena of: (a) truck stability and adhesion, (b) ride quality as a function of speed and guideway quality, and (c) pantograph-catenary interaction.