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91-59 HIGH-SPEED GROUND TRANSPORTATION EXTENSION

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HEARING  
BEFORE THE  
SUBCOMMITTEE ON  
TRANSPORTATION AND AERONAUTICS  
OF THE  
COMMITTEE ON  
INTERSTATE AND FOREIGN COMMERCE  
HOUSE OF REPRESENTATIVES  
NINETY-FIRST CONGRESS  
SECOND SESSION  
ON  
H.R. 17538 and H.R. 17573

BILLS TO EXTEND FOR ONE YEAR THE ACT OF SEPTEMBER  
30, 1965, RELATING TO HIGH-SPEED GROUND TRANSPORTA-  
TION, AND FOR OTHER PURPOSES

JUNE 11, 1970

Serial No. 91-59

Printed for the use of the  
Committee on Interstate and Foreign Commerce



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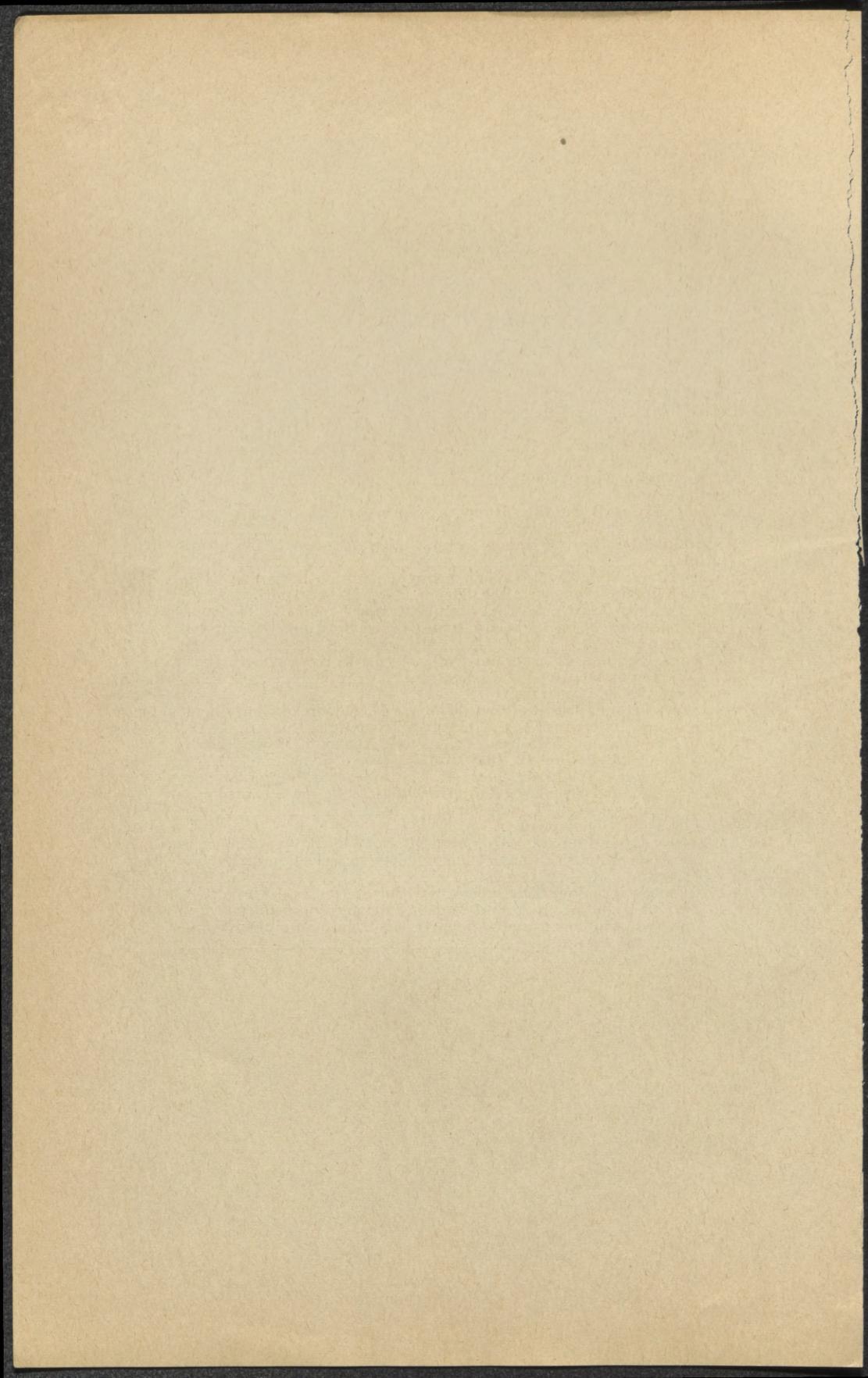
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# HIGH-SPEED GROUND TRANSPORTATION EXTENSION

THURSDAY, JUNE 11, 1970

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON TRANSPORTATION AND AERONAUTICS,  
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,  
*Washington, D.C.*

The subcommittee met at 10 a.m., pursuant to notice, in room 2123, Rayburn House Office Building, Hon. Samuel N. Friedel (chairman) presiding.

Mr. FRIEDEL. The subcommittee will please be in order.

The bills before us this morning, H.R. 17538 and H.R. 17573, would extend the act of September 30, 1965, relating to high-speed ground transportation for a 1-year period. It would also authorize \$21,700,000 for the fiscal year ending June 30, 1971.

The extension has been requested by the Department of Transportation. I am looking forward with interest to hearing from the Department as to the details of the experiments over the past 5 years with this new form of transportation.

(The text of H.R. 17538 and H.R. 17573, and departmental reports thereon follow:)

[H.R. 17538 and H.R. 17573, 91st Cong., 2d sess., introduced by Mr. Staggers on May 7, 1970, and Mr. Springer on May 11, 1970, respectively, are identical, as follows:]

A BILL To extend for one year the Act of September 30, 1965, relating to high-speed ground transportation and for other purposes

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That (a) the first sentence of section 11 of the Act entitled "An Act to authorize the Secretary of Commerce to undertake research and development in high-speed ground transportation, and for other purposes", approved September 30, 1965 (49 U.S.C. 1641), is amended (1) by striking out "and", and (2) by striking out the period at the end thereof and inserting in lieu thereof a semicolon and the following: "and \$21,700,000 for the fiscal year ending June 30, 1971."

(b) The first sentence of section 12 of such Act of September 30, 1965 (49 U.S.C. 1642), is amended by striking out "1971" and inserting in lieu thereof "1972".

EXECUTIVE OFFICE OF THE PRESIDENT,  
BUREAU OF THE BUDGET,  
*Washington, D.C., May 22, 1970.*

HON. HARLEY O. STAGGERS,  
*Chairman, Committee on Interstate and Foreign Commerce,  
House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: This is in reply to your request for the views of the Bureau of the Budget on H.R. 17538, to extend for one year the act of September 30, 1965, relating to high-speed ground transportation, and for other purposes.

(1)

H.R. 17538 is substantially identical to a draft bill which the Acting Secretary of Transportation transmitted to the Congress on March 20, 1970. For the reasons stated in the Department's letter of March 20, the Bureau of the Budget supports the enactment of H.R. 17538, which would be in accord with the program of the President.

Sincerely,

WILFRED H. ROMMEL,  
*Assistant Director for Legislative Reference.*

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DEPARTMENT OF COMMERCE,  
OFFICE OF THE GENERAL COUNSEL,  
*Washington, D.C., June 19, 1970.*

HON. HARLEY O. STAGGERS,  
*Chairman, Committee on Interstate and Foreign Commerce,  
House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: This is in further reply to your request for the views of this Department concerning H.R. 17538, a bill "To extend for one year the Act of September 30, 1965, relating to high-speed ground transportation, and for other purposes."

H.R. 17538 would extend until June 30, 1972, the Act of September 30, 1965, as amended (79 Stat. 893; 49 U.S.C. 1631 et seq.) relating to high-speed ground transportation. The bill would authorize the appropriation of \$21.7 million to carry out the provisions of the Act for the fiscal year ending June 30, 1971.

All functions, powers, and duties of the Secretary of Commerce and other offices and officers of the Department of Commerce under this Act was transferred to the Secretary of Transportation pursuant to Public Law 89-670, the "Department of Transportation Act".

While this Department has no objection to H.R. 17538, we would defer to the views of the Department of Transportation as to whether the bill should be enacted.

We have been advised by the Bureau of the Budget that there would be no objection to the submission of our report to the Congress from the standpoint of the Administration's program.

Sincerely,

WILLIAM E. MURANE,  
*Acting General Counsel.*

---

DEPARTMENT OF TRANSPORTATION,  
OFFICE OF THE SECRETARY,  
*Washington, D.C., June 8, 1970.*

HON. HARLEY O. STAGGERS,  
*Chairman, Committee on Interstate and Foreign Commerce,  
House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: This is in reply to your request for the views of this Department with respect to H.R. 17538, a bill to extend for one year the Act of September 30, 1965, relating to high-speed ground transportation, and for other purposes.

H.R. 17538 is a Department of Transportation proposal which was transmitted to the Congress on March 20, 1970. As you know, the proposal would extend the program for one year to June 30, 1972, and it would authorize appropriations in the amount of \$21,700,000 for the fiscal year ending June 30, 1971.

We strongly endorse the proposal, and will welcome the opportunity to appear before the Committee to present oral testimony in support of it.

Sincerely,

J. THOMAS TIDD,  
(For James A. Washington, Jr., General Counsel).

Mr. FRIEDEL. Our first witness this morning is Mr. Reginald N. Whitman, Federal Railroad Administrator. Mr. Whitman you may proceed with your testimony.

I understand that you are accompanied by Mr. Olsson, Deputy Under Secretary, and that you also have Mr. Smith, Mr. Mitchell, and Mr. Ward with you. If you will just mention their full names for the record.

STATEMENT OF REGINALD N. WHITMAN, ADMINISTRATOR, FEDERAL RAILROAD ADMINISTRATION, DEPARTMENT OF TRANSPORTATION; ACCOMPANIED BY JOHN P. OLSSON, DEPUTY UNDER SECRETARY, DOT; MYLES B. MITCHELL, ACTING DIRECTOR; EDWARD J. WARD, CHIEF, ENGINEERING RESEARCH AND DEVELOPMENT DIVISION; AND ROBERT T. SMITH, CHIEF, DEMONSTRATIONS DIVISION, OFFICE OF HIGH SPEED GROUND TRANSPORTATION

Mr. WHITMAN. Good morning.

Mr. Chairman, Congressman Kuykendall, I have with me this morning Mr. John P. Olsson, on my right, the Deputy Under Secretary of the Department of Transportation. On his right is Mr. Robert T. Smith, Chief of our Demonstrations Division in the Office of High Speed Ground Transportation. On my immediate left is Mr. Myles B. Mitchell, Acting Director, Office of High Speed Ground Transportation. And on his left is Mr. Edward J. Ward, Chief of the Engineering Research and Development Division, Office of High Speed Ground Transportation.

Mr. Chairman and members of the committee, I appreciate this opportunity to appear before you today in support of H.R. 17538 and H.R. 17573, the Department's bill extending for an additional year the statute establishing the high-speed ground transportation program.

H.R. 17538 contains two amendments to the existing law. One changes the expiration date of the statute to June 30, 1972. The other authorizes appropriations in the amount of \$21.7 million for fiscal year 1971. We have prepared a breakdown of how we propose to utilize these funds which we would like to submit for the record at this time. No other amendments, of substance or procedure, are proposed.

(The information referred to follows:)

OFFICE OF HIGH SPEED GROUND TRANSPORTATION ENGINEERING RESEARCH AND DEVELOPMENT

SUMMARY OF FUNDING

[In thousands of dollars]

Program	Obligation, fiscal year—				Available funds fiscal year 1970	5-year funding total	Budget request fiscal year 1971
	1966	1967	1968	1969			
Systems engineering.....	(130)	(3, 193)	(2, 861)	(2, 447)	(1, 486)	(10, 117)	(500)
High-speed rail research:							
Railroad research cars.....	2, 770	912	572	637	665	5, 556	830
Rail-vehicle dynamics.....			54	176	2, 183	2, 413	900
Vehicles and suspension.....	140	294	86	115		635	400
Track structures.....		105	40	82	675	902	580
Traction systems.....			211	136	54	401	550
Other rail.....		293	172	187		652	
Total.....	(2, 910)	(1, 604)	(1, 135)	(1, 333)	(3, 577)	(9, 907)	(3, 260)
Advanced systems:							
Tracked air-cushion vehicle systems.....	45	145	173	10, 16	5, 240	6, 619	8, 180
Tube vehicle systems.....	355	469	206	325	357	1, 712	300
Auto-related systems.....					200	200	200
Total.....	(400)	(614)	(379)	(1, 341)	(5, 797)	(8, 531)	(8, 680)

## OFFICE OF HIGH SPEED GROUND TRANSPORTATION ENGINEERING RESEARCH AND DEVELOPMENT—Continued

## SUMMARY OF FUNDING

[In thousands of dollars]

Program	Obligation, fiscal year—				Available funds fiscal year 1970	5-year funding total	Budget request fiscal year 1971
	1966	1967	1968	1969			
Advanced technology:							
Communications and control_	52	322	182	354	195	1,105	200
Power collection_		100	19	215	112	446	3,030
Obstacle detection_			359	29	175	563	100
Linear electric motor_	120	91	1,200	2,088	2,283	5,782	750
Magnetic suspension_					158	158	200
Tunneling and guideways_	90	555	422	469	986	2,522	600
Total_	(262)	(1,068)	(2,182)	(3,155)	(3,909)	(10,576)	(4,880)
Test site							
Total engineering R. & D_	(3,702)	(6,479)	(6,589)	(8,309)	(15,809)	(40,888)	(18,220)
OFFICE OF HIGH SPEED GROUND TRANSPORTATION DEMONSTRATIONS AND ADMINISTRATION							
Washington-New York_	(5,533)	(4,239)	(713)	(1,705)	(1,134)	(13,324)	(200)
Boston-New York_	(2,160)	(380)	(2,964)	(1,138)	(1,020)	(7,662)	(900)
Data collection_		(53)	(841)	(820)	(1,947)	(4,161)	(1,268)
Autotrain_	(15)	(1,766)	(1,076)	(12)	(10)	(2,879)	
Airport access_				(312)	(1,398)	(1,710)	
Dulles transit study_					(150)	(150)	
Total_	(7,708)	(6,938)	(5,594)	(3,987)	(5,659)	(30,115)	(2,368)
Administration_	(272)	(610)	(645)	(781)	(889)	(3,197)	(1,100)
Total, Office of High Speed Ground Transportation_	(11,682)	(14,027)	(12,828)	(13,077)	(22,347)	(73,971)	(22,688)

Mr. WHITMAN. If funds are appropriated to the full extent of this additional spending request for the fiscal 1971 budget, we shall have had a total appropriation of \$97.7 million for the 6 years of the program compared to the \$90 million initially authorized in 1965 for just the first 3 years.

I am sure you are very interested in why we are asking for only a 1-year extension of the act instead of one for a longer period.

We are pleased to report that many of the research projects begun early in the program have now reached completion. The results of this research are ready for transition into the development phases of the program preparatory to their reduction to usable, efficient, economical transportation hardware.

Many of the research projects initiated early in the Office of High Speed Ground Transportation R. & D. program will have great impact on the planning of similar advanced projects in other modes of transportation. Also, new research projects which we are about to initiate in high speed ground, must be coordinated with other programs affecting urban mass transportation, highways, and such aviation programs as the implementation of VTOL and STOL service. It is necessary, therefore, to have all of these programs in the proper sequence of planning and this 1-year extension request for high speed ground R. & D. will give us the opportunity to fully integrate the next year's planning into the total departmental picture.

Proper integration and utilization of the total departmental R. & D. facilities is also another consideration in our extension request. The Department will acquire on July 1, NASA's Electronic Research Center at Cambridge, Mass., which becomes the Transportation Sys-

tems Center. We will use this new capability for R. & D. on advanced systems and technological development. Also, the development of the high speed ground test site in Colorado will give us new testing and development capabilities. The research and testing programs of these two facilities must be closely coordinated and this 1-year extension will enable us to accomplish this.

Another factor not clearly definable at this time is the final congressional action on the proposal to establish a public-private corporation to run intercity rail passenger service. If the plan wins congressional approval, we will want to have the rail demonstration projects of the high speed ground program operated by the new passenger train corporation.

I would like to digress just a minute to point out that by operating we would presume that we, the Office of High Speed Ground Transportation would contract with the new rail corporation the same as we have done with the Penn Central, and they would then become the operating entity of the demonstration program.

Support for the High Speed Ground Transportation Act of 1965, both within the Congress and elsewhere, reflected a concern about the future of transportation in developing urbanized regions in the United States, particularly the densely populated northeast corridor between Washington, D.C., and Boston, Mass. Sharply increasing demands for transportation in the northeast corridor and the decreasing capability of existing transportation facilities to meet these demands was the major theme of two key reports—one in 1962 and one in 1964 which led to the High Speed Ground Transportation Act.

Both reports suggested that improved rail service might offer a short-term solution to the problem of increasing demand for transportation in the region. The clear need was also recognized for longer range analysis to ascertain future growth, exploration of possible new technologies, and identification of the transportation systems which would be the most effective in serving this growth. On the latter point, the Department has submitted the "Northeast Corridor Transportation Project Report of April 1970." This report provides a substantial amount of information about the prospects of intercity passenger service in the northeast corridor.

The report indicates that the automobile will continue to serve the vast majority of travelers, regardless of technological or service improvements in other modes. The report, however, suggests that in considering future transportation investment policies, attention should be given to various alternatives including more effective use of the existing rail capability, short-haul air technology, and more adequate supporting urban transit. High-speed ground systems were found to have the potential of attracting a significant number of passengers, but the investment costs are high. If the advantages of ground systems, such as relief of highway and airport congestion and greater safety, are to be realized, then more R. & D. to lower the cost is a solid investment for the future.

The improvement in predictive and analytical capabilities achieved by the northeast corridor transportation projects may, with additional refinement, improve our decisions with respect to large magnitude investments which in some cases could be as high as \$1 to \$2

billion over the next 10 to 20 years. In addition, those expenditures that are made might thus be more efficiently planned and managed.

I would like to put the work of the Federal Railroad Administration in some perspective so that we may review the high-speed ground program in relationship to the current and future transportation needs of the public.

In the last 5 years we believe we have demonstrated that good rail passenger service can assist in the near term solution to national problems. Intercity passenger service operators can make use of present technology by the purchase of new modern equipment. There is at the present time technology available to the manufacturers of passenger equipment to produce such equipment as the Turbo-Train and electric equipment of the same generation as that used on the Jersey Arrow, Delaware River Port Authority cars and the Metroliners. In fact, there are several hundred of the latter type presently in use. The British and French railroads have selected turbine powered trains for nonelectrified lines.

The Secretary's grant authority under the proposed legislation could be used to provide the new corporation with funding to obtain modern equipment within the next 2 years.

In the meantime, our research has led us to the point where the next generation of high speed ground vehicles will be unveiled in an advanced demonstration program, overlapping somewhat in time the use of equipment I have just described. I am speaking of the tracked air-cushion vehicle and I will discuss this program a little later.

Let me briefly provide a current status report on some aspects of both R. & D. and demonstration programs.

The High Speed Ground Transportation Act authorized the Secretary of Transportation to "undertake research and development in high-speed ground transportation." Major objectives of the proposal are:

- (1) To advance the technology of ground transportation including railroads as well as more advanced systems;
- (2) To conduct research and development to make possible the design and demonstration of advanced ground transportation equipment, systems, and services; and
- (3) To develop cost and performance data on potential systems for intercity transportation.

The high-speed ground transportation R. & D. program is structured to explore technology in several speed ranges. The higher the speed the longer the technology will require for development.

High-speed rail is considered satisfactory for speeds up to at least 150 miles per hour; tracked air cushion vehicles, TACV's, for speeds as high as 300 miles per hour; and tube vehicles are looked to for speeds up to 500 miles per hour.

High speeds are desired to lower travel time, but, as the corridor report points out, door-to-door average speed is far below terminal-to-terminal average speed due to the difficulty in traveling to and from terminals and delays in terminals. Therefore, the high-speed ground transportation R. & D. program includes an alternate approach to achieving lower door-to-door time—systems which combine the flexibility of the private automobile with a high-speed mode.

In the high-speed rail R. & D. program the four Department of Transportation rail research cars will continue to gather information on track, suspension and ride quality and improvement of components; the program to develop lower maintenance track will reach field test; and, under a joint program with UMTA, construction of a wheel rail laboratory will start for the testing of rail vehicle suspensions and running gear to assure safer and better riding equipment and realization of the full potential of steel wheel on steel rail technology.

As you undoubtedly know, the Department of Transportation has made a \$300,000 grant to the Los Angeles Department of Airports and this is aimed at providing the Nation's first passenger carrying tracked air cushion vehicle transportation system. This system will serve the airport by late 1972. The total cost of the 16.3 mile line, including guideways, stations, and other supporting facilities, is expected to be about \$50 million to be shared on a 50-50 basis by the Department of Transportation and the Los Angeles Department of Airports. This vehicle will have the capability of speeds of up to 150 miles per hour and will test the acceptability by the Department of this next generation of ground transportation services.

Concurrent with this demonstration, Office of High Speed Ground Transportation is designing an experimental TACV for construction in 1971. Information gained from tests of this vehicle will advance technology from the present prototypes of 150-180 miles per hour to 300 miles per hour. Data are needed on air cushions, secondary suspensions, aerodynamics, and propulsion.

Propulsion of the experimental vehicle will be through a linear electric motor. Electric propulsion has been chosen because of low noise and pollution; a linear motor is necessary for a vehicle without wheels. Meanwhile, we already have a 2,500 horsepower motor in a wheeled vehicle undergoing low-speed tests and design of an 8,000 horsepower motor for the TACV has been started. Fabrication of this motor and the associated power conditioning equipment is expected to start in 9 months.

During the coming year, work will begin on systems where the vehicle is suspended below the guideway. The vehicles may be wheeled or air cushion and the required elevated guideway may be cable supported or of more conventional rigid construction. Cable supported guideways hold promise of low cost. These systems are interesting because of an ability to take sharp curves at higher speeds combined with the prospect of improved esthetics over elevated systems with overriding vehicles.

In January 1970, Secretary Volpe announced selection of a site near Pueblo, Colo., for construction of a high-speed ground transportation testing facility. The wheel rail laboratory is to be constructed there in 1972. The linear motor vehicle will be moved to Pueblo as soon as a test track for high-speed testing can be constructed and will be the first test program to be conducted at the site, starting in early 1971. The TACV experimental vehicle is expected to follow in 1972, and automobile related systems, suspended vehicle systems and tube vehicle systems in subsequent years.

While it may be true that the ideal ground transportation system for the future will be under the surface, we fully realize that both

the technology for a tube system and a major reduction in tunneling costs are still a long way off. At this time, tube vehicle systems appear to be feasible; however, final conclusions cannot be drawn until further studies and research are completed in the fields of gas dynamics, high-speed wheel-rail interaction, and tunneling. We intend, therefore, to continue research in the tube vehicle program, which potentially could offer speeds up to 500 miles per hour with the use of evacuated tubes and magnetic-suspension system. The magnetic-suspension research is one of the projects to be undertaken at the Department of Transportation's Transportation System Center; that is the NASA Electronics Research Center to be transferred July 1, 1970.

Our tunneling research, which leads the field in this country, offers continuing encouragement that the cost barrier will eventually be broken. Studies to date indicate that, if the cost of tunneling can be reduced, tube vehicle systems will be cost competitive with other modal forms, and at the same time, will offer the advantage of increased safety, high-speed, and all-weather operation.

The automobile-related systems program is to be conducted in cooperation with the Federal Highway Administration and is geared toward the development of control systems and other hardware that can incorporate the privacy and flexibility of an automobile with the comparable safety, high speed, and low pollution levels of rail systems. The control concepts for reservations, merging, and headway are to be tested with small electrically powered vehicles as a first step towards prototype demonstrations.

With additional research, prospects appear excellent for development of the obstacle detection and communications systems that are essential to the safety of high speed ground operations, whatever the mode.

As an example of the wide range of technical effort in the high speed ground program and the northeast corridor transportation project, some 120 technical reports have been sent to the clearinghouse for Federal scientific and technical information during the last 2 years. Many of these reports serve as the basis of designs of experimental and prototype equipment.

As you know, two rail demonstration programs have been funded, from New York to Washington and New York to Boston. Also, a rail airport access demonstration is in planning for Friendship Airport serving the Baltimore-Washington area.

Despite the fact that the formal Metroliner demonstration has not begun, the level of operation conducted by the carrier itself has exposed significant service features to public reaction. These include the country's first two-way, continuous-route, commercial, on-train telephones; experimental passenger-and-luggage speedramp at Baltimore; Metroclub meals served at seat; and the first computerized reservations-and-ticketing system for rail passenger transportation service. Telephone inquiry and ticket-selling procedures are not yet completely satisfactory, but have been progressively improved since Metroliner service started.

In April, the latest month for which figures are available, the load factor on Metroliners averaged more than 70 percent. On-time performance is 86 percent.

I would like to say a word about passenger response to Metroliner service:

(1) About half of Metroliner passengers switched from private auto, plane or bus used on their latest prior trip.

(2) More than 85 percent of Metroliner passengers said they expect to use train service again the next time they make a trip on the route.

(3) Despite a long-term decline in train travel, there was an increase in noncommuter patronage on the Washington-New York route—including trips between intermediate cities—in 1969, of 7 percent over 1968 for a total of 7,483,000—605,000 which were on the Metroliners. On April 20, 1970, the Metroliners carried their one-millionth passenger.

(4) Metroliners have been especially effective in recapturing longer haul patronage as evidenced by an increase of 44 percent in the through Washington-New York traffic. Approximately a third of these passengers went by Metroliner.

At this point, I do not know when actual contract demonstration service with the Penn Central will begin, but hopefully it will be soon. We have been in continued contact with the railroad and are considering contract modifications as to frequency of service and ride quality.

If I may digress for just a moment from the prepared statement. The question has been asked why is the Metroliner formal demonstration necessary when so much experience has already been gained? My answer to that question is that, aside from the contractual commitment which exists, the Department of Transportation, the rail industry and the proposed new rail passenger corporation have much to learn from the 2-year experiment. Although the contract calls for experiments in frequency, fares and other operating conditions, there are two major areas to be developed: One is automated reservations and ticketing, and the other one is maintenance and reliability.

The real demand for Metroliners has not yet been revealed because of the difficulties of the public in getting tickets. Experiments such as the use of a computer have resulted in major improvements, but other experiments are needed.

The inability of the Penn Central to operate nine trains a day is partly due to deficiencies in the Metroliners and partly due to the need for improved maintenance. Modern rail equipment is needed to achieve the high level of reliability and on-time performance required to satisfy the public. The Penn Central only runs six trains a day now, but with development of improved maintenance and gradual up-grading of the Metroliners additional service can be achieved.

In the last extension legislation, you authorized the building of suburban intermodal stations at Lanham, Md., and Woodbridge, N.J. The Lanham Capital Beltway Station has been operating now for more than 2 months and appears already to have justified the public investment, both as a contribution to the relief of highway and air congestion and as an example of bimodal cooperation where buses and trains operate intercity service out of the same facility. It represents the combined efforts of Federal, State, and county governments. Approximately 80 rail passengers a day board at this new station, which is more than we estimated for the early stage of the project

based on seven trains which stopped only on weekdays. Recently, the number of trains stopping was increased to 13, with weekend service as well.

To maximize utilization of the station, we are conducting demonstration feeder bus service to Rockville, Md., via D.C. Transit and to Annapolis via Greyhound. The Greyhound Bus Company is doing equally as well in providing express bus service from Lanham to New York in less than 4 hours and serving other north-south traffic.

Ground has been broken for the Woodbridge station in New Jersey and it will be in operation before the end of the next fiscal year. It is located off the Garden State Parkway and will serve as a "beltway" type station for the New York-Newark metropolitan area.

The prototype TurboTrain has been in demonstration service for more than a year now between Boston and New York. The service is operated by Penn Central, utilizing two three-car-train sets built and maintained by the United Aircraft Corp., and leased for a 2-year period by the Department of Transportation. With only one round trip daily, the demonstration has not been so much a test of public response to service but a test of experimental equipment incorporating significant new design features. The train is providing important economic and technical data and operating cost information which reflect use of aircraft-type components and preventive maintenance techniques.

From April 8, 1969, through April 30, 1970, Turbos, operating one round trip daily, with "weekend specials" added in August and September, carried 90,000 passengers. The average number of passengers per train is 121 and the seating capacity is 144. The on-time performance of this train is 88 percent.

We have been unable to utilize the full high-speed capacity of the train to achieve the planned reduction in running time to 3 hours and 15 minutes because of the condition of the roadbed and the existence of many highway crossings at grade.

In summary, Mr. Chairman, I can assure you that the Department's interest in high speed ground research, development and demonstrations ranges far beyond the 1-year extension in authority and appropriations now before you. Once we have answered some of the questions we have asked ourselves about the future, we will be able better to advise you on what we believe to be the appropriate role for the high speed ground program in the full scope of transportation systems research.

I strongly urge your continuing support of the high speed ground transportation program which has had and will continue to have a significant role in solving the crises of urban and interurban transportation.

Mr. Chairman, that concludes my prepared remarks and we would be pleased to answer any questions the committee may have.

(The Northeast Corridor Transportation Project Report—April 1970, referred to, follows:)

NORTHEAST CORRIDOR TRANSPORTATION PROJECT REPORT, APRIL 1970  
Office of High Speed Ground Transportation, U.S. Department of Transportation

*Executive Summary*

CONCLUSIONS

The Northeast Corridor Transportation Project, through a comprehensive systems analysis approach, is engaged in analyzing and evaluating the transportation needs of the Northeast Corridor through 1980. This report presents some conclusions about the prospects of intercity passenger transportation in the Corridor and suggests ways in which transportation developments can be made more responsive to the Corridor's needs.

The following general conclusions about the future of intercity passenger transportation in the Corridor have resulted from analyses and evaluations conducted to date:

Auto transportation will continue as the strongly dominant mode of intercity Corridor transportation, at least through 1980, regardless of the improvements which can feasibly be made to other modes.

The effectiveness of intercity line-haul common carriers in improving door-to-door passenger service will be seriously limited in the Corridor's larger metropolitan areas by delays and relative slowness of local access to and egress from transportation terminals.

Without substantial action by the government agencies responsible for intercity passenger transportation in the Corridor area, the following results are probable in the Northeast Corridor:

- (1) Major capabilities for the provision of rail passenger service will not be used;
- (2) The potential for short and intermediate haul air transportation may not be exploited;
- (3) Downtown-to-downtown intercity passenger transportation will, in large metropolitan areas, contribute to congestion on urban transportation facilities;
- (4) Transportation facilities which present to travelers high personal accident hazard, which contribute heavily to air pollution, and which have heavy requirements for land will continue to expand;
- (5) Less populated areas of the Corridor—rural and suburban—will lose common carrier intercity transportation service;
- (6) The several modes of passenger transportation in the Corridor—auto, bus, air, and rail—will not be coordinated in ways which will improve service and raise efficiency.

The Northeast Corridor Transportation Project has depicted and evaluated several ways by which the Corridor transportation system could be made more responsive to the economic, political and social development of the region. Nine possible and widely different transportation systems which might be made operational in the Northeast Corridor in the 1975-80 period were analyzed and simulated, with the following salient conclusions:<sup>1</sup>

Boston to Washington rail passenger service approximating the level of performance of the Metroliners would achieve more efficient utilization of present rail capacity for mainline passenger service and would realize additional revenue in excess of additional costs. For several reasons, including the high cost of capital to the railroads in the Corridor, it is unlikely that the privately owned railroads in the Corridor will choose to provide such service without public support;

Improvements to the existing Boston-Washington mainline of the Penn Central Railroad costing up to \$1.3 billion would result in substantially better transportation service to the centers of major metropolitan areas of

<sup>1</sup> Such conclusions could, of course, change as further data and research results become available.

the Corridor and would yield additional revenues sufficient to cover additional costs, including capital costs of 10 percent per year. These improvements can be made on an incremental basis thus permitting at each step a testing of the attractiveness of better service. Since it appears that the difference between incremental revenue and costs would be greatest at a level of improvement far short of \$1.3 billion it seems even less likely that railroads would provide such a level of service without public support;

Short take-off and landing (STOL) and vertical take-off and landing (VTOL) aircraft modes would provide intercity transportation services throughout the Northeast Corridor yielding before-tax revenues sufficient to cover all non-government costs including capital charges at 10 percent per year. STOL and VTOL operation would require some improvement in air navigational technology and in environmental impact planning but only small technological improvements for aircraft;

Two new high-speed ground modes—one, a completely new rail system, and the second, a tracked air cushion vehicle system—would greatly improve intercity transportation along the spine of the Corridor. At the present stage in the analysis, it appears that neither of these two ground modes would be commercially viable within the next decade if a capital cost rate of 10 percent is required;

A combination of vertical take-off and landing (VTOL) air transportation and a high-speed ground mode would provide the widest choice of improved intercity passenger transportation in the Corridor, would generate the largest patronage, and would require the largest operating costs and capital outlays.

The analysis in the Northeast Corridor Transportation Project, to date, has been most useful when applied to the evaluation of the potential commercial viability of the nine alternative systems. An effort was made, however, as will be shown in the body of the report, to appraise each mode in terms of its environmental impact, dependence on improved terminal access-egress, dependability under all-weather conditions, improved safety, and flexibility to service occasional demand peaks. Depending upon the weighting of these considerations by public agencies, relative evaluations of the different systems may change.

The use of comprehensive systems analysis, such as carried on by the Northeast Corridor Transportation Project, can significantly reduce the probability of making capital outlays for transportation which are not responsive to public need or which may constitute inefficient ways of responding to public need.

#### BACKGROUND OF THE CORRIDOR TRANSPORTATION PROBLEM

The Northeast Corridor<sup>2</sup> is faced with growing demands for transportation which have been created by an expanding, ever more interdependent economy and an increasingly mobile society. Those who live, work and travel in the Corridor would probably regard such a conclusion as obvious. What is not so clear is how best to deal with the challenge that this pattern of growth presents. The problem is not in knowing that transportation facilities in the region need to be expanded and improved, but in deciding what improvements should consist of; where they should be located; when they should be introduced; and how they should be managed, financed, and operated.

##### *Past Approaches*

Traditionally, decisions of this nature have largely been made either by the private sector or, where private enterprise has not been practical or has not functioned in the public interest, by independently exercised local and state initiative, with some modicum of Federal involvement. This approach has worked fairly well in the past. After World War II the explosion in automobile production and ownership, accompanied by a shift of population to the suburbs, quite clearly pointed to the need for an expanded highway construction program. The opportunity to exploit, for civil purposes, the great advances in aviation technology gained during the war stimulated public support of airport and air navigation development.

<sup>2</sup> Figure S-1 shows the Northeast Corridor region as it has been defined for purposes of the Northeast Corridor Transportation Project.



FIGURE S-1—The Northeast Corridor Transportation Project Region

As a result of emphasis and encouragement through public policy, both air and highway transportation have in the past two decades enjoyed consistent and substantial rates of growth and have unquestionably satisfied great public needs. Strong trends in the growth and distribution of population and economic activity in the Corridor have, however, tended to change the region's needs for transportation. These two trends are (1) the increasing concentration of population and employment in Standard Metropolitan Statistical Areas (SMSA's) defined as communities having populations of 50,000 persons or more, and (2) dispersal of population and employment away from urban cores into the suburbs.

#### *Population and Employment Trends*

By 1980, over 46 million people will live in SMSA's in the Corridor and about 8.3 million in rural areas. The distribution of population and employment between suburban and core areas through 1980 is more difficult to predict. While there have been pronounced population shifts into the suburbs in the last decade, there have also been large migrations into the Corridor's urban cores from regions outside the Corridor. Nevertheless, between 1950 and 1960 the major urban cores in the Corridor lost about five percent in both population and employment while the suburbs gained over 40 percent. The effects of these changes, even if their pace were slowed, will have important impacts on the Corridor's life patterns for years to come.

### *Changing Needs for Transportation*

The trends of population and employment toward metropolitan areas and from the metropolitan cores to their suburbs are undoubtedly responsible for many of the complaints of congestion and delay persistently leveled against the transportation system of the Corridor. Neither highway nor air transportation in their present forms are well suited to the increasingly tight constraints of space in the Corridor; both modes require for efficient operation relatively large amounts of space per unit of traffic. Air transportation's primary advantage, namely speed, is being seriously diminished for short and intermediate trips within the region by congestion in the air and on the ground. In the Corridor, gate-to-gate times between major airports have remained essentially unchanged over the past dozen years—and have risen in some instances—despite a 30 to 40 percent increase in aircraft cruising speeds.

A comparable situation is emerging in highway transportation. The toll roads built in the early 1950's and the facilities constructed under the Interstate highway program have expanded the flow of intercity highway traffic in the Corridor considerably, especially in suburban and rural areas. But congestion in and around metropolitan centers, particularly during peak periods, has tended to reduce the advantages of freeway travel. New roads and highways, constructed to relieve congestion, have often encouraged new traffic to the point that delays in related parts of the highway network have been increased rather than reduced. Public frustration, a sense of crowding, and concern over wasted resources are all natural responses to this cycle of temporary relief and chronic congestion. Thus, the approaches to transportation problems which seemed to be so obvious 20 years ago do not seem so clearly to meet the Corridor's needs today.

### *The Impact of Urban Congestion*

A major reason for the present inadequacy of short and intermediate intercity passenger transportation is that we have not yet managed to cope effectively with the problems of transportation within large urban areas. Since the Northeast Corridor is preeminently a region of large cities, a very high proportion of all intercity travel in the Corridor involves one or more large metropolitan areas. Hence, the quality of intercity transportation in this region depends in large measure on the relative ease of circulation within metropolitan areas.

The nature and extent of improvements in urban transportation are highly uncertain, and this uncertainty must inevitably impinge upon decisions which might be made about the intercity system. For example, a policy of enhancing, through continued development of urban beltways, the accessibility of suburban (as contrasted to inner-city) portions of metropolitan areas would tend to pre-dispose intercity transport development toward modes such as V/STOL which would be oriented to the metropolitan periphery. If, on the other hand, greater emphasis were placed on enhancing accessibility to the city core through improving developing radial urban rapid transit, then building intercity high speed ground modes which would penetrate to city centers would be more appropriate.

### *Problems of Coordination*

Uncertainties about the directions which should be followed to make intercity transportation more effective in meeting the Corridor's needs are heightened by the region's loose and largely uncoordinated decision-making structure for transportation. Ten States plus the District of Columbia and well over a dozen major regional agencies have responsibility and authority for transportation planning and investment in the Corridor. To the authority and responsibilities which these agencies have, must be added the interests of the Federal Government and a myriad of private firms. Few statutory procedures exist which could bring coordination to the planning of transportation improvements in the Corridor. The result is that decisions are often made in one jurisdiction without adequate consideration of their effects on other jurisdictions. It is reasonable to assume that the bottlenecks and discontinuities in the Corridor transportation system today will not be dealt with satisfactorily without increased attention devoted to coordination between agencies in the Corridor involved in transportation.

All things considered there are no obvious solutions to the problems of intercity transportation in the Northeast Corridor. Additions to highway and air facilities have come to contribute less and less to the effectiveness of transportation systems in heavily urbanized regions. Railroads, once the mainstay of the

Corridor's intercity passenger transportation, have had declining passenger patronage since World War II. The decision-making structure is fractionated and does not focus on transportation as a system, and even if it were to, neither tools nor data have been available for comprehensive approaches to transportation planning.

#### ADOPTION OF A SYSTEMS APPROACH

Recognition of the growing ailments of the transportation system of the Northeast Corridor and of the shortcomings of existing policies as remedies led in 1964 to establishment of the Northeast Corridor Transportation Project. In a deliberately experimental way, the Corridor project was to be a systematic attempt at determining the intercity transportation facility requirements of a major region of the Nation. In making this attempt, the project was charged (1) to analyze the complex interactions between transportation and structure of economic and demographic development of the Corridor, (2) to forecast the demand for intercity transportation services by mode in the Corridor, (3) to describe the characteristics of transportation services that might be supplied, and (4) in doing all this to give full consideration to the potential of dynamic, innovative transport technology.<sup>3</sup>

#### *Development of a Model System*

In five years, starting at a very inchoate level of knowledge and methodology, the Northeast Corridor project has fulfilled many, although clearly not all, of these assignments. Using systems analysis techniques and newly developed computer capabilities, progress has been made in developing and applying a comprehensive, general approach to regional transportation analysis. The most important achievement of the Corridor project up to now has been to develop, link together, and operate several models in an interactive process which simulates the forces of transportation supply and demand in the Corridor. The resulting system of models permits examination of the effects of changes upon the competitive interrelationships among modes, and also of interactions between transportation and other sectors of the Corridor economy. A dynamic model process of this nature has not been applied before to regional transportation in the U.S. The basic elements of the model system are as follows:

An econometric model which forecasts population, income, employment, and land use for each of 131 analysis districts (mostly counties) of the Northeast Corridor.

A demand model which predicts intercity passenger travel in the Corridor by city pairs and by modes of travel.

Supply models for air and high speed ground modes which are sensitive to changes in output levels.

Cost models which, based on parametric relationships, predict elements of mode and system cost.

Impact models which predict the effect of transportation changes on population, employment, income and land use in county-size analysis areas.

Supply-demand balancing techniques which make possible simulation of supply-demand equilibrium.

#### *Usefulness of the Model System*

The individual models suffer from many shortcomings and hence the results of the model/simulation process should be treated with caution. Nevertheless the performance of the models in evaluating the transportation system alternatives discussed in this report is satisfying both to intuition and to experience. With few exceptions the models produce results which are credible when related to real world situations and their use almost certainly can enhance our ability to make better decisions. Moreover, the process of modeling the Corridor transportation system has substantially raised the level of insights into the workings of the transportation system particularly in application to subareas of the Corridor such as states and counties. It would on the other hand, be a mistake to accept too literally the results of the model simulation process.

The models for forecasting transportation demand have proved their capability to predict the "split" of demand among several competing modes. This allocation of demand among the modes is based not on each mode *per se* but on three basic

<sup>3</sup> This approach was recommended in an executive agency task force report in late 1962.

characteristics of transportation service; namely, trip time, user cost and frequency of service. By approaching the modal split in this way it becomes possible to predict the response of the travel market to totally new modes such as tracked air cushion vehicles (TACV). Reliance by the model on three characteristics of transportation to determine modal split undoubtedly omits some of the factors which influence travel behavior. In the analysis of transportation alternatives in this report other considerations such as comfort, safety, and fashion have been assumed to be equal among the modes. When these attributes differ to a degree which significantly affects modal split, the Corridor demand model becomes less useful.

The development of techniques to forecast impacts of transportation on population, employment, and other economic variables by area has been the major thrust in the attempt to measure the interaction between transportation and its social, political and economic environment. The Corridor impact models show only small effects resulting from the intercity passenger travel changes evaluated in this report. This was to be expected. Indications are that the impact of changes in freight transportation would be much greater. At this time, however, data on freight movements do not exist in the Corridor or elsewhere upon which to test the predictive capability of the impact models. Reliance for model formulation and calibration on patched and stitched-together data must raise an element of uncertainty about results and suggests strongly the need for continued emphasis on a transportation data program.

The development of the Corridor models and procedures is continuing with the goal of producing a set of tools generally useful for the comparison and evaluation of transportation system improvements. The Corridor models can be applied to Corridor transportation in a longer time frame than has been done in this report; they can, with further development, also be applied to the evaluation of freight transportation systems. It should be pointed out, however, that while the models can, with relatively small but necessary recalibration, be applied to intercity passenger movement in other Corridor-type regions of the U.S., they cannot be used in their present form to predict intra-urban passenger traffic. Intra-urban travel and the behavior patterns of commuters are subject to many other influences than those used in determining intercity transportation.

#### *Application of the Models to Alternative Transportation Systems*

It was understood at the outset of the Corridor project that transportation system changes tend to have wide implications for regional development and for many other aspects of public policy beyond the sphere of transportation. It was clearly not appropriate for the Northeast Corridor project staff to decide which of these public policies should be pursued. Therefore, a basic premise of the Corridor project has been that the project would evaluate and report on a number of alternative transportation systems which would be responsive to a wide range of policy options. This strategy was intended to permit responsible officials at the Federal level and in the Corridor to relate transportation to fundamental policy objectives. For purposes of the evaluations reported on here the following public policy options were emphasized:

- (1) *Degree of technological innovation*—ranging from continued evolutionary development of the present set of modes and services to a quite radical departure involving the introduction of a combination of advanced ground and air modes;
- (2) *Emphasis on suburban or central city service*—ranging from ground modes penetrating the city core via tunnels to air systems largely serving the periphery of metropolitan areas;
- (3) *Magnitude of capital cost*—ranging from minimal investment in new equipment to multi-billion dollar new investment in fixed facilities and equipment;
- (4) *Service characteristics*—ranging from high capacity modes operating on fixed rights-of-way to more flexible systems capable of providing service over a wide area;
- (5) *Degree of private vs. public investment*—ranging from systems which could be sustained by private investment and ownership to systems which would require Government support for their construction and operation;
- (6) *Requirements for institutional change*—ranging from alternatives which would require only nominal intergovernmental coordination under existing statutory authorization to those which would require new legislation and extensive coordination at Federal, State, and local levels.<sup>4</sup>

<sup>4</sup> See Table S-2 for the relationship between these six policy options and the nine alternative transportation systems analyzed by the project.

ALTERNATIVE PASSENGER TRANSPORTATION SYSTEMS FOR THE NORTHEAST  
CORRIDOR, 1975-80

The nine alternative systems start with the existing transportation system of the Northeast Corridor projected to 1975-80, and add five new modes in varying combinations with the existing system and with each other—as shown in Table S-1. The designed service pattern of each alternative is generally north-south between Washington and Boston. Each of the high speed ground modes—demonstration rail, high speed rail A, high speed rail C and tracked air cushion vehicles—was designed to serve terminals at Washington and Boston and seven intermediate points in Providence, western Connecticut, New York City, northern New Jersey, Trenton, Philadelphia and Baltimore. The air and highway modes serve more dispersed patterns based on existing networks.

*Alternatives I and II*

Alternatives I and II would require capital expenditures by 1975 of about \$70 million for equipment and grade crossing elimination.

Both alternatives would expand the present fleet of Metroliners and Turbo trains in accordance with increases in demand. Relatively small improvements in roadbed would focus primarily on eliminating highway-rail grade crossings. The annualized equipment cost and roadbed improvement costs would be less than half the additional revenues realized from the DEMO level of operation. (See Summary Table S-4). Although patronage of rail passenger service to Boston-Washington and intermediate points would increase between 1968 and 1975, rail passenger patronage as a whole in the Corridor would decline. The breakdown of the Corridor intercity travel market by modal shares in 1968 and 1975 is shown in the following:

SHARES OF CORRIDOR INTERCITY TRAVEL MARKET BY MODE

[Percent passenger-miles]

ALTERNATIVE I

Year	Auto	Bus	Rail	Air
1968.....	68	8	13	11
1975.....	73	9	9	9

Although alternatives I and II do no more for the ground modes than add demonstration rail, even this minimal action would probably require Federal legislative action of some kind. It is not certain that without such legislation the present Metroliner and Turbo train services inaugurated for two years in response to Federally supported high speed ground transportation demonstrations would continue and, in response to demand, expand through 1975.

TABLE S-1.—9 PASSENGER TRANSPORTATION SYSTEM ALTERNATIVES FOR THE NORTHEAST CORRIDOR

Alternative	Modal composition
I.....	Auto, bus, conventional air (CTOL), demonstration rail (DEMO) <sup>1</sup> —125 miles per hour.
II.....	Auto, bus, CTOL, DEMO, short takeoff and landing air (STOL)—370 miles per hour.
III.....	Auto, bus, CTOL, STOL, high speed rail "A" (HSRA)—150 miles per hour.
IV.....	Auto, bus, CTOL, STOL, high speed rail "C" (HSRC)—200 miles per hour.
V.....	Auto, bus, CTOL, STOL, tracked air cushion vehicle (TACV)—300 miles per hour.
VI.....	Auto, bus, CTOL, STOL, DEMO, vertical takeoff and landing air (VTOL)—265 miles per hour.
VII.....	Auto, bus, CTOL, STOL, VTOL, and HSRA.
VIII.....	Auto, bus, CTOL, STOL, VTOL, and HSRC.
IX.....	Auto, bus, CTOL, STOL, VTOL, and TACV.

<sup>1</sup> Demonstration rail assumes that the present Metroliner and Turbo train services will be expanded and extended through 1975.

TABLE S-2.—RELATIONSHIP BETWEEN TRANSPORTATION SYSTEM ALTERNATIVES AND PUBLIC POLICY OPTIONS

Alternatives	New modes <sup>1</sup>	Degree of technological innovation	Orientation to metropolitan area	Policy options			
				Capital cost	Service characteristics	Public support required	Institutional change required
I.....	DEMO	None	Center city	Low	Fixed linear	No	Little
II.....	DEMO and STOL	do	Center city and suburbs	do	Mixed	No	Do.
III.....	HSRA	Some	Center city	Medium	Fixed linear	Yes	Large
IV.....	HSRC	do	do	High	do	Yes	Do.
V.....	TACV	Much	do	do	do	Yes	Do.
VI.....	VTOL	Some	Suburbs	Low	Flexible dispersed	No	Little
VII.....	VTOL and HSRA	do	Center city and suburbs	Medium	Mixed	Yes	Large
VIII.....	VTOL and HSRC	do	do	High	do	Yes	Do.
IX.....	VTOL and TACV	Much	do	do	do	Yes	Do.

<sup>1</sup> Auto, bus, and conventional air are included in all alternatives; STOL is included in alternatives II through IX.

Under alternative I total new public capital expenditures between 1968 and 1975 for intercity passenger transportation in the Northeast Corridor would be \$3 billion. Most of this outlay would be for expansion of the existing highway and air modes.<sup>5</sup>

Across the board, alternative I would make only small improvements in the quality of transportation service in the Corridor. Alternative II, as well, would offer only limited improvement in the quality of intercity passenger service in the Northeast Corridor although it would emphasize the provision of STOL service to the periphery of metropolitan areas. Traffic attracted to STOL would tend to reduce the share of CTOL below its share in alternative I. The share of Corridor traffic going to air, auto, rail and bus would change between alternative I and alternative II as follows:

SHARES OF CORRIDOR INTERCITY TRAVEL MARKET BY MODE IN 1975

[Percent passenger-miles]

Alternatives	CTOL	STOL	Auto	Rail	Bus
I.....	9	73	9	9	9
II.....	3	12	68	8	9

Since STOL service in alternative II (as well as in alternatives III through IX) would be commercially viable, new Federal Government expenditures would be required only to provide supplemental air navigation facilities.

*Alternatives III, IV, and V*

Alternatives III, IV, and V would introduce major improvements in city-center-to-city-center high-speed ground transportation. The high-speed ground mode in alternative II would rely on existing railroad rights-of-way; the high-speed ground modes in alternative IV and V would require completely new rights-of-way. Alternative III would require capital expenditure for all new modes of \$1.8 billion; alternative IV, \$2.8 billion; and alternative V, \$3.5 billion.

HSRA would require only moderate technological advance; HSRC would require substantial R & D expenditure to bring rail operating speeds up to 200 mph; TACV would require an extensive program of R & D to achieve 300 mph operating capability.

Alternatives III, IV, and V would utilize centrally generated electric power and would operate underground in urban areas. Therefore, their effect on land use, noise, and air pollution would be minimal.

The share of total intercity passenger traffic in 1975 which would be captured by the high-speed ground modes is shown in the following:

SHARES OF CORRIDOR INTERCITY TRAVEL MARKET BY HSGT MODE

[Percent passenger-miles]

Alternative II (DEMO)	Alternative III (HSRA)	Alternative IV (HSRC)	Alternative V (TACV)
8	12	15	18

Forecasts for the three new ground modes indicate that they would not be commercially viable in the year 1975, assuming a capital cost of 10 percent, and would probably not be commercially viable for the 10 to 15 years beyond 1975. In the year 1975, largely as a result of interest charges on the initial investment in right-of-way and track, HSRA in alternative III would incur a deficit of \$27 million; HSRC in alternative IV, a deficit of \$67 million; and TACV in alternative V, a deficit of \$103 million. Thus, at least at the outset, the high-speed ground modes would presumably require substantial public support. This could be achieved through subsidy to a private corporation, establishment of an authority, charter of a public corporation, or through outright Federal ownership.

It should be emphasized that the high speed modes, because of their high capital costs, are highly sensitive to the interest rate chosen and passenger demand

<sup>5</sup> All the alternatives assume that current plans for highways and CTOL will be implemented.

actually realized. For example, if the cost of capital were lowered to six percent, the ground modes could be commercially viable in 1975; on the other hand, a rise in the cost of capital above ten percent would intensify the magnitude of the potential deficit. Similarly, if the actual demand were in error by 12 to 25 percent, the deficit would disappear or intensify.

#### Alternative VI

Alternative VI would add VTOL to alternative II. The performance characteristics of VTOL would be responsive to the migration of Corridor population and employment from center city to suburbs. The resulting combination of the existing modes and VTOL would emphasize service to suburban areas. Heliports and flight paths could be located so as to minimize the adverse impact of noise. Where practical, VTOL would be designed to provide service to downtown as well as to the suburbs; however, emphasis in alternative VI would be on frequent service to heliports located on the periphery of metropolitan areas.

Revenues from VTOL service would be sufficient to cover research and development and terminal costs. This analysis did not include some additional expenditure, presumably public, which would have to be made on VTOL for the development and implementation of air navigation facilities and air traffic control techniques. Also, although it was not included as a cost of VTOL operation in alternative VI, research and development to reduce aircraft noise appears necessary. In comparison with the total cost of the VTOL mode, these additional costs do not appear to be large.

Since VTOL in alternative VI could be self-sufficient, presumably service would be provided by one or more privately financed, certificated carriers.

The shares of traffic which would result from alternative VI as compared to alternative II are shown in the following:

SHARE OF CORRIDOR INTERCITY TRAVEL MARKET BY MODE

[Percent passenger-miles]

Alternative	CTOL	STOL	VTOL	Auto	Rail	Bus
II.....	3	12		68	8	9
VI.....	2	10	14	60	7	7

#### Alternatives VII, VIII, IX

These three alternatives would combine VTOL with HSRA, HSRC, and TACV respectively. The resulting systems would greatly improve transportation service to the downtown areas of the cities "on line" between Boston and Washington and, like alternative VI, would provide better service to the suburbs of metropolitan regions in the Corridor.

VTOL would continue to be self-sufficient in all three alternatives. Capital cost for the ground modes would be slightly less than in alternatives III, IV, and V. Annual deficits, however, would increase as shown in Summary Table S-4. Thus, public support would have to be provided for construction and operation of the ground modes.

Total transportation service in the Corridor would be increased substantially in its quality and probably in its use. Projected shares of intercity Corridor passenger traffic under alternatives VII, VIII and IX are shown in the following:

SHARES OF CORRIDOR INTERCITY TRAVEL MARKET BY MODE

[Percent passenger-miles]

Alternative	C/STOL	Auto	Bus	VTOL	HSRA	HSRC	TACV
VII.....	11	58	7	14	10		
VIII.....	11	56	7	13		13	
IX.....	10	55	7	13			15

### *Second Order Rail Alternatives*

The ground modes in alternatives II and III represent the minimum and probably the maximum improved conditions applicable to the existing Penn Central Railroad route between Washington and Boston. Almost a continuum of possible improvement options exists, however, between these extremes. In order to obtain an indication of the economic feasibility of these improvements, the Corridor model system was applied to nine intermediate levels of improvement between alternatives II and III.

The analysis was conducted by delineating a number of separate projects such as laying welded rail, easing curves, rebuilding bridges, and building new tunnels and bypasses, and determining the costs and running time savings attributable to each project. By using the passenger loadings for each link of the DEMO mode in alternative II, the passenger-minutes saved per dollar of expenditure for each project were calculated and the projects were ranked according to this ratio.

For the analysis, nine levels covering the range of improvements were selected. For each of these levels calculations were made using the NECTP model system to determine additional patronage, gross additional revenues, additional operating costs, annual charges for new investment, and additional net revenues.

The conclusions to be drawn from this analysis are as follows:

1. The maximum benefits to the operator would occur at a level of improvement representing a capital expenditure of \$186.5 million (including \$78.2 million for vehicles). Annual gross revenues at this level of improvement for 1975 would be \$25.9 million more than rail (DEMO) in alternative II, while annual systems costs would be \$18.3 million higher than the DEMO costs. The total surplus of additional revenues in 1975 over additional costs annualized for 1975 would be \$83 million. This level of improvement results in a 25 percent patronage increase over rail in alternative II.

2. Up to a capital expenditure of \$1.3 billion, 1975 annual gross revenues (additional) would exceed annual systems costs (additional). At this investment level, representing a 50 percent increase in patronage over DEMO, annualized additional costs and gross 1975 revenues would be equal.

3. From the level of improvement representing maximum net revenues to the operator to the level of improvements represented by HSRA in alternative III, net revenues would drop. At the upper levels of improvement, costs of capital would become a very significant element of total cost.

### *Intermodal and Intergovernmental Coordination*

Each of the nine transportation system alternatives would require some degree of intergovernmental cooperation for effective planning and implementation. In a broad sense, the efforts represented in this report reflect the need for a coordinated "system" approach to transportation planning. Thus, each alternative should be regarded in a real sense as a system, requiring coordination among the modes if maximum benefits are to be achieved. The degree of coordination needed would vary with the mode in question. Both STOL and VTOL would require coordinated action on the part of the Federal agencies involved (presumably the Department of Transportation and the Civil Aeronautics Board) and the private carrier or carriers, and with the local jurisdictions in which STOL ports or heliports would be located. DEMO and HSRA would require extended cooperation between the Penn Central Railroad and the Federal Government for funding and, perhaps, operation of services. HSRC and TACV both require extensive intergovernmental coordination for acquisition of new rights-of-way and for construction and operation.

All systems would benefit from continuous central coordination by the Federal Government or by a regional agency to assure effective and efficient matching of facilities and services of the modes with each other and with demand as a whole.

Following in Tables S-3 and S-4 are summaries of performance and operating characteristics of the nine alternative systems.

TABLE S-3.—SUMMARY OF MAJOR CHARACTERISTICS OF NECTP TRANSPORTATION SYSTEM ALTERNATIVES

Alternatives	New modes	Sustainable top speed, miles per hour	Average speed <sup>1</sup>		Total corridor intercity travel, billion passenger-miles <sup>2</sup>
			Terminal to terminal, miles per hour	Door to door, miles per hour	
I.....	DEMO.....	125	72	46	19.4
II.....	DEMO.....	125	72	46	20.3
	STOL <sup>2</sup> .....	370	141	63	
III.....	HSRA.....	150	109	58	21.1
IV.....	HSRC.....	200	152	71	21.7
V.....	TACV.....	300	198	79	22.3
VI.....	VTOL.....	265	147	74	20.3
	VTOL.....	265	151	70	
VII.....	HSRA.....	150	109	57	20.8
	VTOL.....	265	152	70	
VIII.....	HSRC.....	200	157	70	21.5
	VTOL.....	265	144	70	
IX.....	VTOL.....	265	144	70	22.1
	TACV.....	300	205	78	

<sup>1</sup> Statistical averages computed for each mode by dividing total passenger-hours into total passenger-miles. Note the controlling influence of access-egress time on door-to-door speeds.

<sup>2</sup> Includes auto.

<sup>3</sup> STOL is included in alternatives II through IX.

TABLE S-4.—SUMMARY OF FINANCIAL CHARACTERISTICS OF NECTP TRANSPORTATION SYSTEM ALTERNATIVES

Alternatives	New modes	Total capital cost, \$×10 <sup>6</sup>	Incremental annualized costs \$×10 <sup>6</sup>	Annual revenues \$×10 <sup>6</sup>	Annualized surplus or (deficit) in 1975 <sup>1</sup> \$×10 <sup>6</sup>
I.....	DEMO.....	70	\$61	\$144	83
	DEMO.....	69	60	141	81
	STOL <sup>2</sup> .....	195	244	244	0
III.....	HSRA.....	1,590	240	213	(27)
IV.....	HSRC.....	2,600	355	288	(67)
V.....	TACV.....	3,340	452	349	(103)
VI.....	VTOL.....	1,060	318	318	0
	VTOL.....	966	310	310	0
VII.....	HSRA.....	1,580	230	175	(55)
	VTOL.....	971	292	292	0
VIII.....	HSRC.....	2,590	340	240	(100)
	VTOL.....	966	291	291	0
IX.....	VTOL.....	966	291	291	0
	TACV.....	3,330	440	292	(148)

<sup>1</sup> STOL and VTOL service and fare levels were set to achieve break-even operation at a 10-percent return on investment; HSRA, HSRC, and TACV service levels were set to maximize profits (revenues less costs); DEMO figure represents the difference between incremental revenues and incremental costs to provide DEMO service. It does not reflect any allocation to DEMO service of costs currently borne by the railroad.

<sup>2</sup> STOL is included in alternatives II through IX.

#### CURRENT APPLICATIONS AND FUTURE DIRECTIONS

The creation and successful application of the Northeast Corridor Transportation Project model system constitute a significant step forward in multi-modal transportation investment evaluation. A model structure capable of depicting the interactions of the major elements of a transportation system has now been applied to a set of real-world problems in a highly industrialized region.

In addition to the applications and results presented in this report, the model system already is being used to provide inputs to Department of Transportation policy planning and decision-making in a number of related areas. For example, NEC models have supported work on (1) future utilization of STOL and VTOL aircraft; (2) initial planning for TACV demonstration; (3) identification of HSGT research and development priorities; and (4) the rail passenger network problem. In these applications, the model/simulation system has demonstrated a capability for projecting patronage, as well as demographic effects of major transportation system changes, at levels of detail and precision useful for planners.

A complete description of potential applications of the models and methodology would encompass support to almost all regional freight and passenger transporta-

tion policy responsibilities of the Department of Transportation itself. Figures S-2, S-3, and S-4 present specific examples of applications of Project capabilities. These are tabulated by time period to portray (1) current applications; (2) new uses after interim improvements in the model are completed by 1971; and (3) longer term developments and applications for 1972 and beyond.

The "Current" columns of the figures show a wide range of current uses of Corridor work, and emphasize the contribution to planning studies now underway.<sup>6</sup> The following questions taken from the broader more detailed list in the Figures illustrate current project capabilities:

What effect would introduction of high speed rail service have on the economic viability of STOL in the Corridor?

What city-pairs would benefit most from STOL service?

Can the declining rail patronage trend in the NEC be reversed through application of new technology and/or service improvements?

In future developments, Corridor work will be focused on near term efforts to extend the work at hand and strengthen utilization of Corridor models and data base within the Department. Evaluation methodology will be improved to integrate more fully the external costs and benefits over the life-cycle of the systems. The "1971" columns of the Figures show the progression of Corridor work through time, and show how the applications listed quickly lead to increased use of the model system outputs for decision-making. For example, extended work will contribute significantly to resolution of the following questions:

Which modal research and development efforts will have largest potential payoffs for short-haul passenger service?

What are the benefits and costs of improving urban access to intercity transport services?

What mix of CTOL-VTOL-STOL services should Government investment policy encourage?

Under what conditions would TACV be commercially successful in the Northeast Corridor?

In the more distant future, as the work is expanded to include examination of other corridors and other modes using improved techniques, many important

<sup>6</sup> Black dots and underlining in the Figures highlight decision points; lack of underlining points out general study work; and boxes delineate present and planned project outputs and methodological developments of the Corridor group.

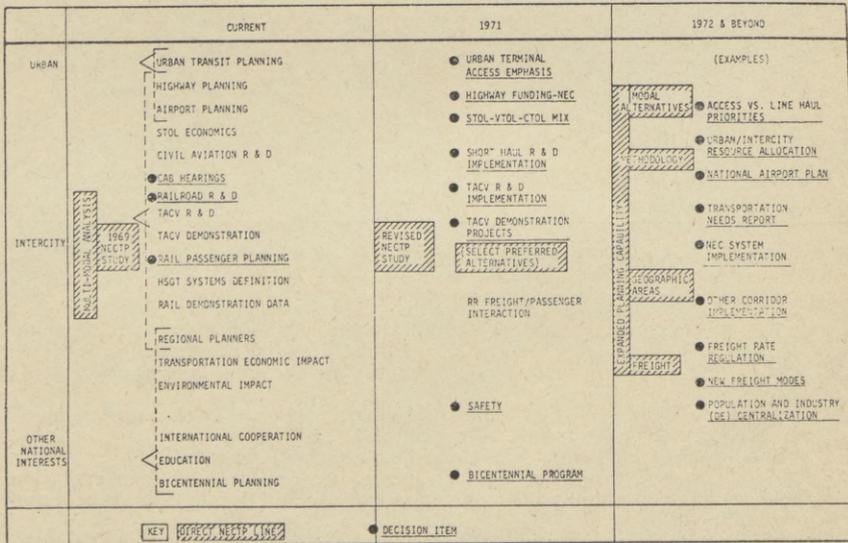


FIGURE S-2 CURRENT APPLICATIONS AND FUTURE DIRECTIONS

	CURRENT	1971	1972 & BEYOND
INTERCITY	<p><u>PASSENGER</u></p> <p><u>NEW TECHNOLOGIES</u> WHICH NEW TECHNOLOGIES ARE ECONOMICALLY VIABLE?</p> <p><u>HIGHWAY PLANNING</u> TO WHAT EXTENT CAN INTERCITY HIGHWAY TRAFFIC BE DIVERTED TO COMMON CARRIERS?</p> <p><u>AIRPORT PLANNING</u> IDENTIFY CTOL AIRPORTS IN NEC WHOSE AIR TRAFFIC MIGHT BE REDUCED BY THE INTRODUCTION OF ALTERNATE MODES.</p> <p><u>STOL ECONOMIC TASK FORCE</u> WHAT EFFECT WOULD THE INTRODUCTION OF HIGH SPEED RAIL HAVE ON THE ECONOMIC VIABILITY OF STOL IN THE NEC?</p> <p><u>CIVIL AVIATION R &amp; D</u> WHAT WOULD BE THE BENEFITS FROM ALTERNATIVE R &amp; D EXPENDITURES?</p> <p>● <u>CAB STOL HEARINGS</u> WHAT CITY PAIRS WOULD BENEFIT MOST FROM STOL SERVICE?</p> <p>● <u>RAILROAD R &amp; D</u> WHAT SPECIFIC AREAS OF R &amp; D HAVE MOST PAYOFFS FOR RAILROAD PASSENGER INVESTMENTS (SPEED, FREQUENCY, COMFORT, TERMINALS, TO EASE ACCESS)?</p> <p><u>HSGT R &amp; D</u> WHAT SPECIFIC AREAS OF R &amp; D HAVE MOST PAYOFFS FOR PASSENGER INVESTMENTS?</p> <p><u>TACV DEMONSTRATION</u> WHAT KINDS OF INFORMATION SHOULD THE TACV DEMONSTRATION BE DESIGNED TO PRODUCE?</p> <p>● <u>RAIL PASSENGER PLANNING</u> CAN THE DECLINING RAIL PATRONAGE TREND IN THE NEC BE REVERSED THROUGH APPLICATION OF NEW TECHNOLOGY?</p> <p><u>HSG SYSTEM DEFINITION</u> WHAT CONFIGURATIONS AND OPERATIONAL CHARACTERISTICS SHOULD HSG SYSTEMS HAVE?</p> <p><u>RAIL DEMO DATA</u> WHAT KIND OF INFORMATION SHOULD BE PRODUCED AND WHAT EXPERIMENTS SHOULD BE PERFORMED?</p> <p><u>FREIGHT</u></p>	<p>● <u>HSG - V/STOL</u> WHAT MIXES OF TRANSPORTATION ARE MOST APPROPRIATE FOR DIFFERENT REQUIREMENTS?</p> <p>● <u>HIGHWAY FUNDING</u> WHAT WOULD BE THE EFFECT OF DIVERSION BE ON HIGHWAY REQUIREMENTS?</p> <p>● <u>CTOL-VTOL-STOL MIX</u> WHICH MIX OF THESE SERVICES SHOULD GOVERNMENT INVESTMENT POLICY ENCOURAGE? SPECIFICALLY- LOCATION &amp; UTILIZATION OF SUCH SERVICE.</p> <p>● <u>SHORT HAUL R &amp; D IMPLEMETATION</u> WHAT R &amp; D EXPENDITURES HAVE THE LARGEST POTENTIAL PAYOFFS FOR PASSENGER SERVICE?</p> <p>● <u>TACV PROJECTS</u> WHAT CONDITIONS ARE REQUIRED FOR AN ECONOMICALLY SUCCESSFUL TACV MODE IN THE NEC?</p> <p>RR FREIGHT/PASSENGER INTERACTION IS HIGH SPEED, HIGH FREQUENCY PASSENGER SERVICE COMPATIBLE WITH PERI-CENTRAL FREIGHT OPERATION?</p>	<p>● <u>R &amp; D REQUIREMENTS</u> WHICH R &amp; D TASKS HAVE BIGGEST NET PAYOFFS? HOW IS INTERMODAL INTEGRATION BEST ACHIEVED? HOW IS THE UTILIZATION OF SURFACE RIGHTS-OF-WAY BEST DESIGNED TO SERVE MULTIPLE MODES?</p> <p>● <u>RAIL PASSENGER PLANNING</u> CAN THE APPLICATION OF NEW TECHNOLOGY AND/OR SERVICE IMPROVEMENTS REVERSE THE RAIL PATRONAGE IN LESS CONGESTED CORRIDORS?</p> <p>● <u>R &amp; D PLANNING &amp; PRIORITIES</u> WHAT PRIORITIES SHOULD BE ASSIGNED TO RESEARCH AND DEVELOPMENT IN FREIGHT TRANSPORT?</p> <p>● <u>INVESTMENT PLANNING</u> SHOULD NEW MODES OF FREIGHT TRANSPORT BE DEVELOPED AND IMPLEMENTED?</p> <p>● <u>COMMODITY RATE AND ALLOCATION DECISIONS</u> IS RATE REGULATION NECESSARY? IF REGULATION, SHOULD THERE BE MARGINAL COST PRICING OF FREIGHT RATES?</p> <p>● <u>REGIONAL IMPACT</u> WHAT IMPACT WOULD IMPROVED FREIGHT TRANSPORT HAVE ON EMPLOYMENT, INCOME, LAND-USE AND POPULATION TRENDS AT LOCAL AND REGIONAL LEVELS?</p>

FIGURE S-3 MULTI-MODAL ANALYSIS APPLICATIONS -INTERCITY

decisions facing the Department will be affected by the improved ability to predict the impact of alternative courses of action available. Policy issues which would be addressed with expanded methodology are illustrated by the following questions:

How should investments be phased to balance line-haul improvements with better urban access?

Can application of new rail technology and/or service improvements reverse rail patronage trends in less congested corridors?

Should new freight modes be developed and implemented?

What impact would changes in passenger and freight transportation facilities have on employment, income, land use and population at local and regional levels?

Examples of additional decisions which could be supported by long-term expansion of capabilities are shown as underlined items in the "1972 and Beyond" columns of the Figures.

In summary, through the Northeast Corridor work, the Department has taken a step forward in its attempts to resolve a number of the complex problems in-

	CURRENT	1971	1972 & BEYOND
URBAN	<p>URBAN PLANNING</p> <p>WHAT INTERCITY TRANSPORTATION SERVICE IS MOST COMPATIBLE WITH THE MOVEMENT OF POPULATIONS TO THE SUBURBS?</p> <p>HIGHWAY AND MASS TRANSPORTATION PLANNING</p> <p>WHAT LOADS DOES INTERCITY TRAVEL IMPOSE ON URBAN SYSTEMS?</p> <p>TO WHAT EXTENT WOULD CAPITAL INVESTMENTS IN URBAN TRANSPORTATION SYSTEMS BENEFIT INTERCITY TRAVELERS?</p> <p>TO WHAT EXTENT WOULD CONSIDERATION OF 500M-TO-500M TRAVEL REQUIREMENTS MODIFY URBAN TRANSPORTATION PLANS?</p> <p>AIRPORT PLANNING</p> <p>CAN HIGH SPEED GROUND MODES REDUCE AIRPORT BUILDING REQUIREMENTS?</p>	<p>● <u>URBAN PLANNING</u></p> <p>WHAT IS THE IMPACT ON METROPOLITAN DEVELOPMENT ATTRIBUTABLE TO INTERCITY TRANSPORTATION?</p> <ol style="list-style-type: none"> <li>1) CENTER CITY TO SUBURBS</li> <li>2) NEW CITIES</li> <li>3) RETAIN GREEN BELTS AND RURAL AREAS</li> <li>4) OUTSIDE CITIES AND TOWNS</li> </ol> <p>● <u>HIGHWAY AND MASS TRANSPORTATION FUNDING</u></p> <p>WHAT ARE COSTS AND BENEFITS OF IMPROVING URBAN ACCESS TO INTERCITY SERVICES?</p> <p>ARE SPECIAL-USE TERMINAL ACCESS FACILITIES WORTHWHILE?</p> <p>● <u>STOL, VTOL, CTOL MIX</u></p> <p>WHAT MIX OF STOL OR VTOL WITH CONVENTIONAL AIR WILL MINIMIZE LOADING OF URBAN FACILITIES?</p>	<p>● <u>COORDINATED PHASING OF ACCESS AND LINE INFRA INVESTMENT</u></p> <p>HOW SHOULD INVESTMENTS BE PHASED TO BALANCE LINE HALL IMPROVEMENTS WITH BETTER URBAN ACCESS?</p> <p>● <u>URBAN/INTERURBAN RESOURCE ALLOCATION</u></p> <p>WHAT DIVISION OF INVESTMENT BETWEEN URBAN AND INTERURBAN TRANSPORTATION PROVIDES MAXIMUM OVERALL BENEFITS?</p> <p>● <u>NATIONAL AIRPORT PLAN</u></p> <p>WHAT SET OF AIRPORTS BEST COORDINATES INTERCITY NEEDS WITH URBAN FACILITIES AND GROUND MODE CAPABILITIES?</p>
OTHER NATIONAL INTERESTS	<p>REGIONAL PLANNERS</p> <p>WHAT TRANSPORTATION NETWORKS ARE COMPATIBLE WITH SPECIFIC REGIONAL PLANS? (NEW ENGLAND REGIONAL PLANNING COMMISSION) (DELAWARE VALLEY REGIONAL PLANNING COMMISSION)?</p> <p>TRANSPORTATION ECONOMIC IMPACTS</p> <p>HOW DOES TRANSPORTATION AFFECT THE ECONOMIC AND DEMOGRAPHIC DEVELOPMENT OF NORTHEAST CORRIDOR SUBREGIONS?</p> <p>ENVIRONMENTAL IMPACT</p> <p>WHAT ARE THE SHORT AND LONG RANGE EFFECTS OF TRANSPORTATION ON THE ENVIRONMENT? (NOISE, POLLUTION, WATERSHED ALTERATION, ETC.)</p> <p>INTERNATIONAL COOPERATION</p> <p>WHAT NEW AND USEFUL INFORMATION CAN BE EXCHANGED WITH FOREIGN PLANNERS?</p> <p>EDUCATION</p> <p>WHAT NEW TECHNIQUES MIGHT FORM A DOT TEXTBOOK ON TRANSPORT MULTIMODAL PLANNING?</p> <p>BICENTENNIAL PLANS</p> <p>WHAT ARE THE FEASIBLE MODES FOR USE IN THE U.S. BICENTENNIAL CELEBRATION?</p>	<p>● <u>SAFETY</u></p> <p>WHAT ARE THE TRADE-OFFS BETWEEN "COSTLY-SAFE" MODES AND "LESS COSTLY-UNSAFE" ONES?</p> <p>● <u>BICENTENNIAL PROGRAM</u></p> <p>WHAT MIX OF MODES WILL COMPRISE A SYSTEM TO BEST REPRESENT U.S. PROGRESS, PROVIDE SERVICE TO VISITORS AND RETAIN LATER UTILITY?</p>	<p>● <u>OTHER CORRIDOR IMPLEMENTATION</u></p> <p>WHAT INVESTMENT DECISIONS ARE APPLICABLE TO OTHER CORRIDOR REGIONS?</p> <p>● <u>FREIGHT RATE REGULATION</u></p> <p>CAN REVISION OF FREIGHT RATES PROVIDE BETTER OVERALL UTILIZATION OF FACILITIES AND ENHANCE REGIONAL GROWTH?</p> <p>● <u>POPULATION AND INDUSTRY (DE) CENTRALIZATION</u></p> <p>WHAT TRANSPORTATION NETWORK CONFIGURATIONS ENHANCE DESIRABLE REGIONAL GROWTH PATTERNS FOR POPULATION AND INDUSTRY?</p>

FIGURE S-4 MULTI-MODAL ANALYSIS APPLICATIONS  
-URBAN AND OTHER NATIONAL INTERESTS

involved in allocating transportation resources. The new analytical tools and experience gained from the Corridor work will be one of the major building blocks around which a significantly strengthened Departmental multi-modal analysis and planning capability can be constructed.

Further development and application of the model system and methodology will offer major opportunities to improve transportation investment decision-making and the planning and management of the implementation of those decisions. Considering the magnitude of the resources involved, improvements in decisions growing out of the generation of improved information could well lead to significant savings.

Mr. FRIEDEL. I want to thank you, Mr. Whitman, for a very, very fine statement.

I have a few questions.

Where can the TACV be used in the country?

Mr. WHITMAN. We believe that the TACV can provide intercity passenger service in all of the densely populated areas of the country. There are probably as many as 20 of these corridors which we believe can use the TACV type of passenger service within the next 15 years.

Mr. FRIEDEL. You have described a good deal of the long-range research and development and the fact that the high-speed program has been in effect for some 5 years. What have you done to date that can be applied in the immediate future to help solve the mounting transportation problem facing the country; in particular the intercity movement of people?

Mr. WHITMAN. The Office of High Speed Ground Transportation, through its research, engineering and demonstrations divisions over the past years has developed a technology base necessary to provide these near-term solutions to the intercity transportation problem. Both the Metroliner and the TurboTrain represent good prototype equipment, and although both trains suffer from some equipment problems, these have been well identified and can readily and rapidly be corrected. Working closely with the new rail passenger corporation, if it is brought into being, the Office can provide the technical guidance necessary to implement good reliable train service between cities which have an immediate need.

This technical base encompasses the ability to identify and measure the quality of railroad track as well as specific new equipment design.

Mr. FRIEDEL. What is the cost of the tracked air cushion vehicle as compared with other service transportation modes?

Mr. WHITMAN. We have checked with various people and as near as we can determine, new freeways, including those in rural areas, have an average cost of \$800,000 per mile. If you consider only the urban areas average costs will go as high as \$6 million per mile. To build a new railroad, exclusive of the land, and at ground level, the cost would be about \$1.2 million per mile. To elevate the rail line, such as Japan's Tokaido Line, would cost about \$2 million a mile in rural areas and about \$3 million per mile in urban areas. For TACV, guideway construction at grade, the cost would be about \$1½ million per mile. However, it would have to be elevated, and would cost about the same as rail; that would be about \$2 million in rural areas and about \$2½ to \$3 million in the urban areas.

The cost figures would not be too much different for the high-speed TACV, although you might have to strengthen the guideway.

Mr. FRIEDEL. You speak about the proposed rail passenger corporation and the high speed transportation that we now have; would they, if the proposed Railroad Corporation bill passes, work in conjunction?

Mr. WHITMAN. Yes, we think so. At first I think it should be emphasized that the high speed ground program has its own particular function, that of researching and developing and testing new high speed prototype ground concepts, and this function goes beyond the railroad passenger corporation's interest in intercity rail service to include all ground-related modes and their differing technology. At the same time the high speed ground program would be invaluable to the corporation in developing new equipment design.

The demonstration program will also be able to provide essential data in such critical areas as ridership, opinion service, market

analysis, fare experiments, and promotion which we have already done, and to undertake demonstrations in which the financial risks are too high for the corporation.

Therefore, we would expect to continue our present demonstration programs and launch additional demonstrations, both for improved rail and advanced systems. Contracts for rail demonstrations, such as the Metroliner and the TurboTrain, we think would be with the rail corporation in about the same manner that we now contract with the Penn Central.

Mr. FRIEDEL. On page 10 of your prepared statement, you say, "In January 1970, Secretary Volpe announced selection of a site near Pueblo, Colo." How much area would that be?

Mr. WHITMAN. Mr. Ward, who is in charge of this program is here, and I might ask him to address himself to this question if he would, please.

Mr. WARD. It is an area of approximately 5 miles wide and 9 miles long; approximately 45 square miles. It is well over 30,000 acres.

Mr. PICKLE. Is this Government property?

Mr. WARD. This is property which the State of Colorado is providing on lease to the Department of Transportation at a nominal fee. The land originally was predominantly owned by the State of Colorado, and what few sections of land were privately owned are being purchased by the State and included in the lease to the Department of Transportation.

Mr. FRIEDEL. When do you expect to break ground or start operating on the new site in Colorado?

Mr. WARD. The ground breaking is scheduled to take place sometime about the middle of July. It depends on the award of the first contract for earth moving and the invitation for bid for that contract will go out within the next few days.

Mr. FRIEDEL. What will be at this site, all kinds of switches, tunnels, over-bridges, or what?

Mr. WARD. The first installation at the site will be a standard, more or less standard because it is very high quality, railroad track modified for the linear motor test vehicle. This will be approximately 6 miles long, and may be extended later as we need to go to higher speeds. The second project is the tracked air cushion research vehicle for which a concrete guideway will eventually traverse the complete 22 mile oval track planned for the site.

We will have operation, maintenance, and support buildings along with it. There will be a wheel rail dynamics laboratory for the testing of running gear in full size conventional rail cars. Possibly this laboratory, later on, could also test some of the more advanced systems. And there will be some tracks for testing of conventional rail equipment, where the tests would be too hazardous or time-consuming to be run on an operating railroad.

Mr. FRIEDEL. What is the nature of the land? Is it flat, or are there hills or mountains?

Mr. WARD. It is generally rolling, and it consists entirely of grass. There is not a tree on the site and the soil ranges from sand to clay. We have a chart over on the stand there which gives a general picture of it and shows the first test programs.

The circle in the upper left shows the linear motor test vehicle; the upper right is the tracked air cushion vehicle; and at the lower left is the conventional rail.

We expect to have eventually three ovals around the track for conventional rail, linear motor test track, and the air cushion research vehicle.

Mr. KUYKENDALL. Would the Chair yield for a question?

Mr. FRIEDEL. Yes.

Mr. KUYKENDALL. Are you not anticipating a test of the linear motor with air cushion?

Mr. WARD. The air cushion research vehicle will be powered by an improved linear motor.

Mr. KUYKENDALL. The linear motor you have now is generated by a turbo?

Mr. WARD. Yes.

Mr. KUYKENDALL. Are you going to, in this test site, be able to activate the linear from outside and not have the turbo?

Mr. WARD. Yes. The air cushion vehicle will pick up the electric power from a wayside distributor.

Mr. KUYKENDALL. So you are going to have an air cushion linear motor on this test site?

Mr. WARD. Yes.

Mr. KUYKENDALL. You were referring to the jet propelled as the only air cushion, and I happen to feel that your future is more in line with LIM air cushion than you are with jets.

Mr. WARD. I am sorry, Mr. Congressman. The picture on the chart is a little misleading. The vehicle is not jet propelled. Those gas turbines you see are for air supply to the air cushions and not for the primary propulsion, although they do have some excess thrust which we could use. The real propulsion is by the linear motor, and the turbines are there because we have not yet developed electric compressors. That comes a little later.

Mr. KUYKENDALL. For the sake of the record—and I think this is important—approximately what speed, and what distance, would the LIM be practical to be levitated above the ground and at what speed and what distance would it be more practical to let it ride on tracks for short distances? I feel that the air cushion is not economically feasible. It is better to leave it on the track and motivate it with the LIM. But at what speed is the break-even point there?

Mr. WARD. We believe that this break-even point is about 150 miles an hour.

Mr. KUYKENDALL. And, therefore, approximately what distance? Fifty or 100 miles, what do you think?

Mr. WARD. The air cushion vehicle, on a nonstop basis from 25 to 50 miles stage length, becomes economical.

Mr. KUYKENDALL. Is it not true that what we are talking about here is that it costs a certain amount of energy, therefore, money, to float the thing and, therefore, you have to carry it a certain distance to make it pay, is that correct?

Mr. WARD. Yes.

Mr. KUYKENDALL. Thank you, Mr. Chairman.

Mr. FRIEDEL. One other question and I will turn it over to the next member.

On page 12 of your statement in the third paragraph, you say, "A rail airport access demonstration is in planning for Friendship Airport serving the Baltimore-Washington area."

Can you give me an idea about when this might be started?

Mr. WHITMAN. Yes. Mr. Mitchell, would you direct yourself to that?

Mr. MITCHELL. I am sorry, I didn't hear the question.

Mr. FRIEDEL. In Mr. Whitman's statement, he says, "A rail airport access demonstration is in planning for Friendship Airport serving the Baltimore-Washington area." I would like to know when you are planning to start or how far you have gone with it, bring us up to date?

Mr. MITCHELL. The primary purpose of the Friendship Airport access project is to determine whether the existing rail routes, with specifically designed rolling stock, will attract sufficient traffic to justify the capital cost of an airport access ground facility. Since the chosen rail access route would connect Friendship with both Washington and Boston, and logically could be adapted for through service, an important byproduct of the project will be traffic, economic and operational data on fast, frequent rail service between these two cities. Thus far, there have been completed detailed studies on present and projected auto, taxi, bus traffic, to and from the three Washington-Baltimore airports, and an economic feasibility study of the rail access to Friendship, using three different types of rail vehicles for comparison.

We now have underway the feasibility study of the rail route of the additional facilities required, such as rail route to the air terminal and equipment needs. Both Penn Central and Baltimore & Ohio lines, as well as the combination of the two, are being considered.

The final report on this phase is expected some time this year. If it is favorable, the next step would be a detailed engineering study to provide information for cost/benefit estimates. We hope to have, by the end of this month, the results of the study that is going on in this area.

Mr. FRIEDEL. You have the right-of-way all the way through on the Penn Central track, and don't you just need a spur into Friendship?

Mr. MITCHELL. Yes, sir; the right-of-way is available. There is some question whether the track that is there today has sufficient capacity for this access.

Mr. FRIEDEL. Would that be on the main track there?

Mr. MITCHELL. Yes, sir.

Mr. FRIEDEL. Is this the Metroliner?

Mr. MITCHELL. They may feel that they have to add on one additional track, and that is a part of this study.

Mr. FRIEDEL. Thank you.

Mr. Cunningham?

Mr. CUNNINGHAM. I have no questions.

Mr. FRIEDEL. Mr. Kuykendall?

Mr. KUYKENDALL, I don't know which of you gentlemen want to answer this question, so we will take pot luck, Mr. Chairman.

The corporation—and I am glad you anticipated our questions con-

cerning the corporation because you are aware that is also pending before this subcommittee. It is a very challenging thing.

It is in the record of maybe a week and a half ago that I questioned Secretary Volpe about the ability of the corporation to get involved in futuristic plans, and he is quite confident that the mandate of the corporation does give it full authority to cooperate with you in this field.

Generally speaking, and I don't want to get specific here, generally speaking, do you anticipate that the real estate now owned by the railroads will be adequate for the ground transportation plans, say, of the 20-year future?

Mr. WHITMAN. I have always felt that the rail transportation rights-of-way that we have now are probably one of our greatest transportation assets. Whether in 20 years it will be sufficient to handle the full volume, I don't know. I would rather think that it might be, especially by also using the air rights over the rights-of-way. I believe with proper arrangements for the air rights, they could probably be used for tracked air vehicles.

These rail corridors are very, very important. If we were to develop a tube system, as an example, it seems entirely practical to me to use the same ground without disturbing a lot of urban localities, communities, and so on. If we go to TACV, something overhead, we can do the same thing and we have always had the capability of additional tracks on the existing corridor, the existing rights-of-way.

So I do think that these are such an important part of our transportation assets that they should be preserved, by all means.

Mr. KUYKENDALL. Would you comment further in the same area—and maybe one of your scientific types would like to carry this a little bit further? Early this week I had a member of the transportation authority of one of the major cities, it was the New York Port Authority, sitting at a table with me at the Pan Am-Sikorsky luncheon, and we were talking about LIM air cushion vehicles, and so forth. And he said, "Well, it is impossible for us to ever get the land." And I said, "Well, I anticipate that the railroad rights-of-way will be perfectly capable of handling these things and I think the existence of the new corporation will make that entirely possible." And we had quite an interesting discussion. But the point I think would be good for the record here is to point out rather scientifically in this record, first, the elevation and how little space this would take on the ground by buying what you have just coined—and I think that is a good phrase to start using in this whole discussion—the air rights. That term has never been used as far as I know in this committee before, Mr. Chairman—the term, "air rights."

I would like for you to get into that, if you will, what you mean by air rights, and discuss for a moment how little land this would take and why it is feasible to think about using existing rights-of-way for elevated tracks.

Mr. WHITMAN. Well, sir, if you want a scientific answer, I will turn it over to Mr. Ward.

Mr. Ward, would you please direct yourself to that?

Mr. WARD. Yes. The land which is required is the land for the footings to support the piers on which the elevated structure would

rest. Now, for a double track system, these piers, in my opinion, would be 12 to 15 feet wide and probably in the nature of 5 to 6 feet thick along the right-of-way. And minimum spacing would be 70 to 75 feet, with the possibility of going much farther apart.

One of the attractive features of the proposed cable suspension is that it allows much longer spans. But it is still very much in the development stage.

Mr. KUYKENDALL. How can you have an air cushion on a cable vehicle?

Mr. WARD. It is like a suspension bridge; in other words cables would hold up the concrete running surface, and thus allow the piers to be spaced further apart.

One thing that I think we really should point out here is that not only are the railroad rights-of-way available but we believe that the interstate and other dual highways will have some capability in the air rights of building these piers in the median or on the shoulders.

Mr. KUYKENDALL. May I interrupt you there?

At Friendship—or some of these days we are going to make it Friedel Memorial Airport. This is one of my goals in this body, to get it named Friedel Memorial Airport.

As an example, the median of the highway between here and the cutoff would be a perfect location for an elevated air cushion vehicle.

Mr. WARD. Yes, I believe it would.

Mr. KUYKENDALL. In the present state of the art which is demonstrated by Metroliners and the TurboTrain, first using the existing tracks and the existing state of the art, about what is the maximum portal-to-portal speed available? Not right now, but using this whole set of circumstances.

Mr. WARD. The speed will depend on several things. First is the right-of-way. Of course, the straighter the right-of-way, the higher the speed.

Mr. KUYKENDALL. Would you yield there? I mean with the present railroad tracks and rights-of-way.

Mr. WARD. The point is, with the present curves, you would have to slow down fairly frequently. And it appears that with a vehicle traveling 150 miles an hour at cruising speed, your station-to-station average is going to be between 75 and 80 miles an hour, if the right-of-way is not straightened. And this is true for the interstate highway to a somewhat lesser extent. You might be able to have a slightly higher average speed on the interstate highway.

Now, by straightening curves and bridging in some places, you could raise the average speed of that 150-mile-an-hour cruising speed vehicle up to well over 100 miles an hour. This includes, of course, the acceleration and deceleration in and out of the station.

Mr. FRIEDEL. What is the highest speed they make between New York and Washington on the Metroliner?

Mr. WARD. 120 miles an hour.

Mr. FRIEDEL. What is it on the one they are running from New York to Boston?

Mr. WARD. 110 miles per hour.

Mr. KUYKENDALL. I have one other question here. An opinion from the Administrator, Mr. Whitman.

One of the railroads, which is a moneymaking railroad, therefore is not quite as helpless in whether or not it does or does not join the corporation as the total losers are—they are relatively helpless, they must join the corporation—mentioned something to me the other day that I would ask the whole panel to discuss, but I am mainly aiming this at the Administrator.

In the bank necessary on a curve to produce 150–160, say, 120 miles on the curves—of course, you have to pull that outside track way up in the air. And I am told that on a long freight train trying to use the same track that the cars will be pulled off the track. So, therefore, don't we have a conflict here?

Mr. WHITMAN. Yes, this is a problem. Elevation on a curve, which is necessary for speed, is necessarily a compromise between high-speed passenger trains and the average freight train speed. It is particularly a problem if the train were to stop on such a highly elevated curve; everything shifts, as you know. This is why the Japanese, I believe, went to the Tokaido Line, which they dedicated only to passenger service. So they did not have to bother with this compromise that we have to bother with where we carry both freight and passengers.

Mr. KUYKENDALL. Mr. Whitman, the way you read the legislation that we are looking at, and we are not through with it yet certainly, who has the final say-so in the contracting and negotiating for the status of that curve? Would the corporation have it or would the railroad have the final, absolute say-so, or is there an outside judgment involved?

Mr. WHITMAN. Well, there could be. But there is engineering data available as to what would be a safe compromise speed for both freight and passengers. I don't think it would be a real problem. If it got down to an argument, they may bring in an outside engineering firm; but I don't visualize this as being a real problem. I think they would agree amongst themselves.

Mr. KUYKENDALL. But you are, in your mind, obviously facing up to something that we haven't really been talking about too much, and that is that in the future really satisfactory service for people is going to be on a different track than really satisfactory service for freight?

Mr. WHITMAN. I am sure that is correct. And that is why we kind of look at the TACV as the breakthrough in this respect. There may be places where rail transportation will be satisfactory for short distances, lower speeds, but for the real intercity passenger travel, we think, as you do, that it has got to be a different guideway, whether it be on the ground, whether it be elevated, whether it be TACV, or rail, it should of necessity be dedicated to the passenger.

Mr. KUYKENDALL. Thank you, Mr. Chairman.

Mr. FRIEDEL. I would like to ask one question.

Have you had any figures on the Metroliner, whether it is making money or losing money; the cost figures on it?

Mr. WHITMAN. We know the revenue figures, Mr. Chairman. We do not have the operating costs. However, they would be of little use at this time, because they have had so much difficulty with the cars that the maintenance is inordinately high. We think that with the

new R. & D. that we will have to put into these cars to make them perform properly this maintenance cost will go down to the point where we have every hope that they can make money.

Mr. FRIEDEL. But at the present time you don't have the figure?

Mr. WHITMAN. No.

Mr. FRIEDEL. How long do you think that will be before you have the figures?

Mr. WHITMAN. At the start of the demonstration I think we can put together some figures within a year, that ought to give us a pretty good rundown.

Mr. FRIEDEL. Within the year?

Mr. WHITMAN. Within a year after we start the demonstration. I think we would have to have a full year's figures in order to prove this. Anything less than that would be pretty much of a guess.

Mr. FRIEDEL. Mr. Pickle?

Mr. PICKLE. Mr. Whitman, with respect to the demonstration project in Colorado, am I to understand that none of the land involved in this 30,000-acre district has been purchased by the Federal Government?

Mr. WARD. That is correct, no land has been purchased by the Federal Government.

Mr. PICKLE. And the land was publicly owned previously, or was it entirely owned by the State?

Mr. WARD. The land was predominantly owned by the State; I think approximately 85 to 90 percent of the land is owned by the State. There are three small parcels, two privately owned and one owned by the Bureau of Land Management of the Department of the Interior.

Mr. PICKLE. What kind of lease arrangements do you have for the tracks or that portion that is being leased?

Mr. WARD. The draft lease calls for a 50-year lease with an option, at a dollar-a-year type of lease.

Mr. PICKLE. How are you coming with the money that has been appropriated? We extended this act 2 years ago and now we are asking for \$21 million, I believe, in this present bill.

First, have you expended the funds that were appropriated previously for this demonstration project?

Mr. WARD. The funds which have been appropriated as of our projections for June 30 of this month, we will have approximately \$2 million, perhaps \$1¼ million to \$2 million of R. & D. funds unobligated.

I think Mr. Smith can say how much of the demonstration's funds are unobligated.

Mr. SMITH. \$3½ million.

Mr. PICKLE. Have we paid for the tracks, the LIM, TACV, the other approaches, have they been bought and installed and paid for?

Mr. WARD. The contract for the linear motor test vehicle with the Garrett Corp. was signed a year and a half ago. The vehicle has been built and paid for. The money now on contract is for the initial testing. The contract for the construction of the linear motor test track is expected to be signed before the 30th of June. The contract for the design of the air cushion research vehicle was signed with

Grumman Corp. in March; the money for the fabrication of the vehicle is being requested in the 1971 budget.

Mr. PICKLE. The demonstration project at Los Angeles is conducted by the Garrett Co.?

Mr. WARD. We do not have a demonstration; we have a test vehicle and the money from this bill was used to contract with the Garrett Corp. for the linear motor and the test vehicle, which is now undergoing low speed tests in California.

Mr. PICKLE. Actually, you are treading a fine line there when you say no demonstration but a test vehicle. You have got to test a vehicle if you create a vehicle, do you not?

Mr. WARD. But we have been trying to differentiate between the test of an experimental, non-passenger carrying vehicle.

Mr. PICKLE. Are you going to move those tracks to the Pueblo location?

Mr. WARD. There is a quarter mile of track at the location near the Garrett plant. There is on that quarter mile of track the aluminum reaction rail which is part of the linear motor. We will move that quarter mile of aluminum reaction rail to Pueblo.

Mr. PICKLE. What length of track will you have at Pueblo after you move the Garrett installation and add to it such other additional things that you might contemplate? What would be the straight runway of the LIM track then?

Mr. WARD. There will be a straight and curved portion. The straight portion is approximately 3 miles and the curved portion is approximately 3 miles. It will be on the right of way of the test oval. It will be just slightly over 6 miles in total length.

Mr. PICKLE. As I recall it, it was the intent of this committee that when this demonstration site was to be selected that this was to be checked with the appropriate committees of Congress. I do not know whether you checked with anybody on the Hill when this site was selected and work proceeded. Did the Department of Transportation or the Office of High Speed Ground Transportation check with us or clear this with the committees on the Hill?

Mr. WHITMAN. I am sure they did, Mr. Congressman. However, I will check that specifically and furnish it for the record.

Mr. PICKLE. Did the chairman of the subcommittee get any information about where the demonstration site was to be held? Did the full chairman or the subcommittee chairman get any notice of where that site was to be located?

Mr. FRIEDEL. Only from the testimony today. And I think they hope to break ground some time this year on the start of this demonstration site.

Mr. PICKLE. The committee report indicates that these things were to have been cleared with Congress before you proceeded. I am asking you, was it cleared?

Mr. WHITMAN. I am sure that we have, Congressman. I know that they were cleared with the Appropriations Committee. Whether this committee was so notified, I can't say specifically. But I am of the opinion that Secretary Volpe did notify the committee that the Pueblo site had been selected. Now I am not sure about that and I will furnish that specifically.

(The following letter was received for the record:)

DEPARTMENT OF TRANSPORTATION,  
FEDERAL RAILROAD ADMINISTRATION,  
OFFICE OF THE ADMINISTRATOR,  
Washington, D.C., June 23, 1970.

HON. SAMUEL N. FRIEDEL,  
Chairman, Subcommittee on Transportation and Aeronautics,  
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: On June 11, 1970, I appeared before your subcommittee in support of H.R. 17538 and H.R. 17573, legislation which would extend for an additional year the high speed ground transportation program.

During the hearings Congressman Pickle inquired if the Department had notified the Committee when the test site at Pueblo, Colorado had been selected. I advised that while it was my recollection that such notice had been given, I would verify it and notify the committee.

Notice was given to your committee on January 19, 1970. I am pleased to enclose a copy of a letter of that date from Acting Secretary James M. Beggs to Chairman Staggers.

On the same date notification was given to Chairman Boland and Stennis of the respective Appropriations Subcommittees.

I trust that this information answers the questions raised during the hearings.

Sincerely,

R. N. WHITMAN, *Administrator.*

Enclosure.

DEPARTMENT OF TRANSPORTATION,  
Washington, D.C., January 19, 1970.

HON. HARLEY O. STAGGERS,  
Chairman, Committee on Interstate and Foreign Commerce,  
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: It is my understanding that several years ago when authorization legislation extending the High Speed Ground Transportation Act was passed that your Committee Report called for this Department to notify and clear with your Committee any purchase of land for a test track facility.

We have now decided to place the facility in Pueblo, Colorado. However, no purchase of land is involved. We have assurances from the State of Colorado that the land will be provided to the Federal Government without cost. Even though this fact relieves us from the responsibility of clearing the site with your Committee, I wish to give you the notification of our decision because of your great interest in the subject.

Sincerely,

JAMES M. BEGGS, *Acting.*

MR. PICKLE. Does the Director of the Office of High Speed Ground Transportation know whether this notice was given publicly?

MR. MITCHELL. To the best of my knowledge, the notice was given and approval received, both from the House and the Senate Appropriations Committees.

MR. PICKLE. Would counsel check the source of this notice to be certain that that was done?

As you contract on these different demonstrations, whether it is in the field of research or actual demonstration, by law are you to notify the Congress of what contracts are being carried on and what work is being carried on to be sure that we are informed?

If so, is this being done?

MR. WHITMAN. To the best of my knowledge, it is.

MR. KUYKENDALL. Would the gentleman yield?

MR. PICKLE. Yes.

MR. KUYKENDALL. Where is the Grumman test going to be done?

Mr. WHITMAN. That will be at Pueblo.

Mr. KUYKENDALL. I don't mean the test. Where will that vehicle be built? Where is the Grumman plant?

Mr. WHITMAN. They are in Long Island.

Mr. PICKLE. You are asking for \$21 million. For what period of time? I see, that it is for 1 year.

What will you use those funds for?

Mr. WHITMAN. We have furnished a breakdown of that. Do you have that Mr. Mitchell?

We did supply this for the record. I could go over it if you would like to.

Mr. PICKLE. I want it submitted for the record.

Mr. WHITMAN. It was submitted, yes, sir.

Mr. PICKLE. I want it submitted for the record to show how you would expend the funds.

Mr. WHITMAN. Yes, sir. (See p. 3.)

Mr. PICKLE. And you have then a carry over of funds in the pipeline of between \$3 and \$4 million?

Mr. WHITMAN. Approximately \$5 million.

Mr. PICKLE. Do you feel, any of you gentlemen, that we are moving fast enough in this area?

Mr. WHITMAN. We never think we are moving fast enough, Mr. Pickle. One of the things that has held us up was the selection of the high speed test site. Had we had that a year earlier, as you know, we could have moved a little faster. I think with the congestion that is occurring it is obvious that we are probably 5 to 10 years behind in getting started on this work.

Mr. PICKLE. According to the plans that you have stipulated here or outlined here, it seems to me that you still are just laying out tracks and trying to physically get set up hopefully by the end of this year.

Mr. WHITMAN. Yes, sir.

Mr. PICKLE. But we really won't have any runs, of course, for at least a year. Can we expect by January 1971 that you will have meaningful tests underway?

Mr. WARD. Yes. We expect by January of 1971 to have the wheeled linear motor test vehicle running at Pueblo at the test site.

Mr. PICKLE. At what speed?

Mr. WARD. We will start at speeds of about 30 miles an hour and gradually work up. And I would expect in a few weeks we would be up to speeds of 150 miles an hour, perhaps 180.

Mr. PICKLE. The highest speed that you have run this linear vehicle in Los Angeles has only been about 28 miles an hour. Is that not correct?

Mr. WARD. Yes, that is right.

Mr. PICKLE. How do you anticipate you can go in 6 months' time up to 150?

Mr. WARD. The limiting factor in Los Angeles is the track. We only have a quarter mile, and the vehicle has to be braked almost after it is started. If the track were longer, we could run at much higher speeds today.

Mr. PICKLE. So the length of the track is a major factor?

Mr. WARD. Yes, sir.

Mr. PICKLE. Did you say the size of this demonstration site was only 5 miles long?

Mr. WARD. The test site is 9 miles long by 5 miles wide, and the test tracks at the test site are in the shape of an oval, which is 21.8 miles around.

Mr. PICKLE. Due to the fact that you anticipate a track of a 5-mile length now for this type of vehicle, can you extend that on for a much further length and not lose any efficiency?

Mr. WARD. Yes, sir, that is right. The 6-mile track is on the right-of-way of the oval and can be extended the full length of the oval.

Mr. PICKLE. I have the feeling that you are doing business as usual, and that you are not proceeding with enough speed. I think we will all admit we lost nearly 2 full years on the selection of the site. Part of that delay was in the previous administration. But a full year to a year and a half was in this administration. We have lost 2 precious years. We are trying to save the passenger rail system. We will probably vote some kind of measure this year to try to save the existing system.

If we are going to find an answer in this area, it will probably be the LIM or tracked air cushion or a combination, and it perhaps may be submerged. To do that, though, we have got to really demonstrate and find new answers, because the rail passenger service system is not going to be maintained by continuing the same type of motivation on the same type of roadbed.

Mr. WHITMAN. We agree with you.

Mr. PICKLE. I just assume that Pennsylvania has never qualified for the demonstration because they never met the specifications on both the grade and roadbed and crossing, and whatever they do they run the risk of being beaten up by the freight system and within 30 days or less time it is back where it was. So I don't know how we are going to get ahead unless we find some kind of a new system.

Here we are trying to save the old system and we are not proceeding with enough speed on the new types. How can we speed it up more? Would more money make it possible or what?

Mr. MITCHELL. Mr. Pickle, we certainly agree with you 100 percent on what you are saying. We feel that we have the technology at hand today for a 150-mile-an-hour tracked air-cushion vehicle program. Therefore, we are starting almost immediately with such a demonstration in the Los Angeles area. We hope to have the demonstration starting by late 1972 carrying passengers as revenue service between the Los Angeles Airport and the San Fernando Valley, a distance of 16.3 miles, with the future extension of that system going to Palmdale where the new airport will be located. The State of California has a desire to also extend that system all the way down to San Diego and hopefully later on go to San Francisco, which would develop a corridor then from San Diego to San Francisco with a tracked air cushion vehicle.

Mr. KUYKENDALL. Would the gentleman yield for a question?

Mr. PICKLE, Yes.

Mr. KUYKENDALL. What would have been the earliest possible date that you could have used the LIM vehicle in Pueblo had the track been there?

Mr. Pickle and I saw this vehicle in January. It probably was almost ready, but not quite. What is the earliest date you could have moved it there?

Mr. MITCHELL. We probably could have moved the vehicle the very day you saw it. If you recall, I was with you on that particular trip. We feel that we have gained some very valuable information, had the opportunity to check out the vehicle itself, the trailer, all the systems that went with it at the facility where they had all the additional tooling and equipment. So we don't really feel that we lost too much.

Mr. KUYKENDALL. When will you move it?

Mr. MITCHELL. We will be moving that vehicle when the track is finished, probably in December of this year.

Mr. KUYKENDALL. So you will have lost actually a full year; for all practical purposes, a year.

I think this is the way to really put it on the record: When could you move it and when will you move it and it looks like a year?

Now, the second generation LIM vehicle, is anybody building it right now?

Mr. MITCHELL. When you say the second generation——

Mr. KUYKENDALL. The one without the turbo.

I think it is good to warn the members of the Congress that when they go out to see this thing that it is supposed to not make any noise, but it is noisy because it is run by turbine. Are we building that type of vehicle?

Mr. MITCHELL. Yes, sir, that is making quite a bit of noise. We did that in order to expedite the technology.

Mr. KUYKENDALL. Where is that?

Mr. MITCHELL. That is the tracked air cushion research vehicle, built by Grumman.

Mr. KUYKENDALL. So Garrett is not building that?

Mr. MITCHELL. Garrett has the contract for the LIM motor for that vehicle.

Mr. PICKLE. Mr. Chairman, I was called out of the room on three separate occasions this morning during the testimony and I missed a lot and I regret it. This may be a repetition.

But did I understand you to say that you hoped to combine or are you trying to combine the tests with respect to the LIM and the tracked air cushion? Can they use the same rail, the same type of system?

Mr. MITCHELL. No, sir, they cannot use the identical system. The LIM research vehicle is the research program to develop the linear induction motor. We will check the motor out, get the performance of it and learn all that we need to know so that we can, when we produce a tracked air cushion research vehicle, increase the size of the motor that came out of the LIM and put it into the other vehicle. One is the research tool, the other is, of course, headed for application.

Mr. PICKLE. The LIM, though, it is propelled by linear induction propulsion, still rolls with wheels, but the wheels are primarily just a guide?

Mr. MITCHELL. That is correct.

Mr. PICKLE. Why couldn't you come within that with the tracked air cushion program and make it all on one track?

Mr. KUYKENDALL. Could you put tracks here?

Mr. MITCHELL. You could put tracks under there, and of course we would be right back to our LIM research vehicle.

Mr. KUYKENDALL. Would it not be a dual purpose thing?

Mr. MITCHELL. We certainly see the possibility of using a vehicle like the LIM research in revenue application, using steel wheels on steel rail. When we start talking about the higher speeds, of course, the 300 mile an hour speeds, then we would prefer not to have the wheels.

Mr. KUYKENDALL. I realize that.

I remember the first time I saw the variable wing on the SST. I saw the size of that and I said that it will waste too much and it has got to go. On short runs, when you see what it costs to lift this thing off the ground, you realize that you would be better off with the wheel. And why not put in both?

Mr. MITCHELL. That is true. We are developing the technology base that we could go either way or combine the two. And in addition we have wheel/rail facilities that we are putting in at Pueblo that will allow us to study the interaction of wheel and rail at higher speeds. From that we could probably find the end point of where we could use a wheeled LIM vehicle.

Mr. PICKLE. Mr. Chairman, I know that I am using more than the allotted time.

I say again, gentlemen, that it is highly important, and I know they share this feeling that we develop a new approach in the field of movement of mass bodies of people. The answer very likely does not lie in improving our present system.

You agree with that, do you not?

Mr. WHITMAN. Yes, sir.

Mr. PICKLE. We have to find a different approach. We really don't have a higher priority, then, in the area of transportation than we do in trying to find a better answer to this. The Congress is just screwing up its courage to pass a rail pact or rail passenger service system that will keep the passenger trains alive, hoping that time won't kill us on it. This may be good money being poured after bad. We need the new system.

I don't make an accusation, because I am not in a position to know this, but I think you ought to exercise greater speed in the development of these vehicles out there. And if you need more money, you should not be timid; you ought to ask for it.

I think also that your organization, speaking as one member only, has not kept the Congress informed about what you are doing. Perhaps you have told someone on the committee, the chairman or someone, but I rather doubt that the members of this subcommittee know anything of what is going on in this area of these demonstrations except that which we might just pull from you.

I got a very fine letter from Mr. Mitchell. But it was in response to a specific inquiry.

Now, this committee ought to know what you are doing. We ought to know how much money you need. We want to know where these contracts are being let. We want to know how we can cooperate. I am specifically requesting that you inform the individual members of this committee when you enter a contract.

I think the group, and this includes the DOT, has been keeping everything close to their vest and being quiet about it. I caution you not to do that. And if you need more money or if you have bolder items on this thing, let's get with it and see if we can do it, because we are moving along at a pace that inexorably will put us farther and farther behind.

Mr. WHITMAN. I am glad to hear you say this, because this is the way we feel about it; that we have got to speed up.

Now, we did make a report in 1962. We made another report in 1964 and we have one in the making.

When will that be finished?

Mr. MITCHELL. August or September of this year.

Mr. WHITMAN. We will have a third report which will bring you up to date and, of course, you will be furnished a copy of this. If we have not kept you informed, I am sorry.

Mr. FRIEDEL. Who did you file the report with?

Mr. WARD. The report we are speaking of is the third report to Congress. We have made three reports to Congress. The third report was given to every Member of Congress last July, and the fourth is now in preparation.

Mr. KUYKENDALL. Would the gentleman yield?

Mr. PICKLE. Yes, I yield.

Mr. KUYKENDALL. May we go off the record?

Mr. FRIEDEL. Off the record.

(Discussion off the record.)

Mr. FRIEDEL. On the record.

I noticed that you said earlier in your testimony that you reported to the Appropriations Committee. And in one of your statements, I forget what the question was, you said that you reported to the Appropriations Committee and not to this committee?

Mr. WHITMAN. That may be right, Mr. Chairman, and I may be absolutely wrong. I was of the opinion that your committee had been notified of the Pueblo test site selection, but if it has not been, then it was simply an oversight and it was probably my fault.

Mr. PICKLE. If we were notified, it was one of these sliding announcements. It is important to keep the Appropriations Committee informed. They, I think, specifically said that these sites should be cleared with them and somebody in DOT may have checked with them. But we are the authorizing committee for this legislation and if we are not informed or brought in full partnership, you are going to have friction on the Hill.

What we need is a new, innovative approach.

Mr. FRIEDEL. A little closer liaison with the subcommittee and full committee.

Mr. WHITMAN. If we have not done this, we are certainly wrong and we will watch it.

Mr. FRIEDEL. This is a very, very important program and every member of the committee is sold on it. We want to see it progress and we feel it is not going fast enough. Perhaps you can work a little faster.

If there are no other questions, the subcommittee now stands adjourned.

(The following letters and statement were received for the record:)

ASSOCIATION OF AMERICAN RAILROADS,  
Washington, D.C., June 10, 1970.

HON. SAMUEL N. FRIEDEL,  
*Chairman, Subcommittee on Transportation and Aeronautics, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: I want to express the strong support of the railroad industry for H.R. 17538 and H.R. 17573, extending the high-speed ground transportation program of the Department of Transportation.

It is highly important to continue the Federal Government's commitment to research and development in high-speed ground transportation. Efforts on the part of both private industry and government are needed if we are successfully to attack and ultimately solve the complex problems of intercity travel.

Under the High-Speed Ground Transportation Act, which would be extended by these bills, the Secretary of Transportation is authorized to undertake research and development and, when appropriate, to do so in cooperation with private industry. He is authorized also, under the Act, to contract for demonstrations to determine the contributions that high-speed ground transportation can make to more efficient and economical intercity transportation systems. Such demonstrations, in the words of the Act, shall be designed "to measure and evaluate such factors as the public response to new equipment, higher speeds, variations in fares, improved comfort and convenience, and more frequent service."

Acting under these provisions, the Department of Transportation and the Penn Central have been engaged cooperatively in demonstration projects developing and testing a new kind of high-speed rail passenger service in the Northeast Corridor. These projects—Metroliner service between New York and Washington and the TurboTrain operation between New York and Boston—show positive signs of promise, but they have not been completed and the results are not yet conclusive.

The Northeast Corridor demonstrations should be continued, and the way should also be left open for the Department to press forward with its other programs in high-speed ground transportation. The Act covers a wide range of research and development activities, including such things as material components, aerodynamics, vehicle propulsion and control, communications and guideways.

The government's participation in research, development and experimentation of these kinds involves a relatively small investment, considering what is at stake. The returns on that investment could be enormous in terms of finding ways to meet the traveling public's future needs.

I ask that this letter be made a part of the record of your subcommittee's hearings on H.R. 17538 and H.R. 17573.

Sincerely,

THOMAS M. GOODFELLOW,  
*President.*

NATIONAL ASSOCIATION OF RAILROAD PASSENGERS,  
Washington, D.C., June 12, 1970.

HON. SAMUEL N. FRIEDEL,  
*Chairman, Subcommittee on Transportation and Aeronautics, Committee on Interstate and Foreign Commerce, Rayburn House Office Building, Washington, D.C.*

DEAR MR. CHAIRMAN: The National Association of Railroad Passengers strongly supports the extension of the High Speed Ground Transportation program. The popular success of the Metroliner service has proved the good judgment of the Congress in originally establishing this program. The solid evidence that people would use modern and efficient train service is in great part responsible for the renewed determination to provide good passenger service throughout the nation. The technology and knowledge developed under this program will be of great benefit to the Rail Passenger Corporation which would be created by legislation now pending before your Subcommittee.

While NARP favors the prompt passage of this extension so that the Appropriations Committee can act on the Fiscal '71 budget of the Office of High Speed Ground Transportation, we are concerned about the relatively small allocation in the budget for "conventional" railroad trains compared to the amount ear-

marked for research into advanced means of surface transportation. The FRA proposes to spend only 1.1 million on the ongoing demonstration projects involving the Metroliner and the TurboTrain, in contrast to 18.3 million on advanced research. Clearly, new modes of transportation such as the Tracked Air Cushion Vehicle should be developed, but a considerable period of time will pass before this equipment is ready for everyday use. In the meantime, as the hearings on passenger service legislation before your Subcommittee demonstrated, there is an immediate need for rapid intercity service which for the time being must rely on existing technology.

The TurboTrain has never been given a fair test of its designed capabilities, yet this train or other turbine propelled trains, such as those developed by French National Railways, could be used in urban corridors all around the country on existing railroad tracks, e.g., New York-Albany, Chicago-St. Louis, or Los Angeles-San Diego. We recognize the need for research into the transportation forms of the future, but we do not think that this research should be at the expense of the fullest experimentation with high speed equipment already in being.

The fundamental impediment to effective use of the most modern high speed equipment is not one of inadequate vehicle design but the more mundane problem of inadequate roadbed and trackage. Neither the Metroliner nor the TurboTrains are able to operate at their maximum speeds because of track conditions and the numbers of grade crossings along their routes. It therefore seems logical that OHSGT should devote more of its budget and attention to a problem which curtails high speed rail passenger service—the condition of railroad rights of way.

Hearings on the Rail Safety bill focused a spotlight on the deplorable condition of much of the nation's railroad trackage. Making improvements to roadbed is obviously not the primary task of the High Speed program, but the practical fact of trackage inadequate for high speed operation of passenger service today should be as important a concern as the creation as new and dramatic means of surface transportation for tomorrow.

In conclusion, we hope you will act promptly and favorably to extend the High Speed Ground Transportation Act.

Yours, sincerely,

ANTHONY HASWELL, *Chairman.*

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STATEMENT OF JAMES C. PONTIOUS, MARKETING MANAGER, TRANSIT, PULLMAN-STANDARD, CHICAGO, ILL., AND CHAIRMAN, PUBLIC MASS TRANSPORTATION COMMITTEE OF THE RAILWAY PROGRESS INSTITUTE, WASHINGTON, D.C.

Mr. Chairman and members of the committee, I appreciate this opportunity to submit to you the views of the Railway Progress Institute in support of H.R. 17538 and H.R. 15573, which would extend for an additional year the statute establishing the High-Speed Ground Transportation Program.

The Railway Progress Institute, known also as RPI, is the national trade association of the railroad supply and equipment industries. RPI is comprised of nearly 200 member companies, located throughout the United States. Our members provide the nation's railroads with locomotives, freight cars, components, tracks, signals and many other kinds of equipment and services.

As outlined in previous testimony by Reginald N. Whitman, Federal Railroad Administrator, H.R. 17538 contains two amendments to the existing law. One changes the expiration date of the statute to June 30, 1972—an extension of one year. The other amendment authorizes appropriations totaling \$21.7 million for fiscal year 1971. This amount would bring to \$98.7 million the total appropriation made for the six years of the program compared to the \$90 million initially authorized in 1965 for just the first three years.

We at RPI believe that the research, development and demonstration projects undertaken by the Office of High Speed Ground Transportation can lead the way in bringing about a much more balanced system of transportation throughout the nation. The projects have occasioned commitments of resources by private industry far in excess of appropriations made by Congress in support of the High Speed Ground Transportation Act back in 1965.

The Penn Central Railroad, for instance, has pinpointed more than \$67 million to the Metroliner project, compared with the \$12.4 million earmarked by the Federal Government. The Metroliner, running between Washington and New York and the TurboTrain operation, between New York and Boston, represent

the first major commitment to rail passenger technology made in this century by the Federal Government.

Yet the money allocated to these projects is a pittance compared with the billions of dollars spent on highways, air travel and waterways.

Going far beyond these projects, the High Speed Ground Transportation research and development program is geared to explore technology in several speed ranges. The higher the speed the longer the technology required for development, as Federal Railroad Administrator Whitman has pointed out.

RPI and its membership have been impressed with the plans underway in the Office of High Speed Transportation to provide a catalyst in the changes to come that will provide the nation with a better and more balanced intercity transportation system. Money is needed to continue that program. These bills provide the legislative authority for that continuance. We at RPI urge its passage.

(Whereupon, at 11:50 a.m., the subcommittee adjourned.)



