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HIGH-SPEED GROUND TRANSPORTATION EXTENSION—1971

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BEFORE THE

SUBCOMMITTEE ON

TRANSPORTATION AND AERONAUTICS

OF THE

COMMITTEE ON

INTERSTATE AND FOREIGN COMMERCE

HOUSE OF REPRESENTATIVES

NINETY-SECOND CONGRESS

FIRST SESSION

ON

H.R. 8107, H.R. 8302, and S. 979

BILLS TO EXTEND THE ACT OF SEPTEMBER 30, 1965, BY
REMOVING THE TERMINATION DATE THEREOF,
AND FOR OTHER PURPOSES

OCTOBER 13, 1971

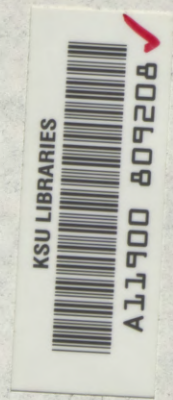
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HIGH-SPEED GROUND TRANSPORTATION EXTENSION—1971

WEDNESDAY, OCTOBER 13, 1971

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. John Jarman (chairman) presiding.

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

This morning the Subcommittee on Transportation and Aeronautics is beginning hearings on three bills relating to high-speed ground transportation. These bills are H.R. 8107, by the chairman of the full committee, Representative Staggers; H.R. 8302, by the ranking minority member of the full committee, Mr. Springer; and S. 979.

These bills would extend the act of September 30, 1965, by removing the termination date of that act and by limitations on annual appropriations authorizations.

In considering this legislation, the subcommittee will be glad to receive a progress report on the achievements so far under this legislation, and on the plans which the Department of Transportation has for the future if this legislation is extended as suggested in the bills before us.

(The text of H.R. 8107, H.R. 8302, and S. 979, with departmental reports thereon, follow:)

[H.R. 8107, 92d Cong., first sess., introduced by Mr. Staggers on May 5, 1971, and H.R. 8302, 92d Cong., first sess., introduced by Mr. Springer on May 11, 1971, are identical as follows:]

(1)

A BILL

To extend the Act of September 30, 1965, relating to high-speed ground transportation, by removing the termination date thereof, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 That (a) section 11 of the Act of September 30, 1965 (49
4 U.S.C. 1641), is amended by striking out all after "Act"
5 and inserting in lieu thereof a period.

6 (b) Section 12 of such Act (49 U.S.C. 1642) is re-
7 pealed.

I

[S. 979, 92d Cong., first sess., referred to the Committee on Interstate and Foreign Commerce on June 16, 1971]

AN ACT

To extend the Act of September 30, 1965, as amended by the Acts of July 24, 1968, and October 13, 1970, relating to high-speed ground transportation, by removing the termination date thereof, and for other purposes.

Be it enacted by the Senate and House of Representa-
2 *tives of the United States of America in Congress assembled,*

3 That (a) the first sentence in section 11 of the Act of Sep-
4 tember 30, 1965, as amended (49 U.S.C. 1641), is further
5 amended by striking all after the word "Act" and inserting
6 in lieu thereof a period.

7 (b) Section 12 of such Act (49 U.S.C. 1642) is
8 repealed.

9 (c) Section 8(a) of such Act is amended—

I

1 (1) by redesignating paragraphs (2) and (3) as
2 paragraphs (3) and (4), respectively, and by inserting
3 before such paragraphs the following:

4 “(2) In considering proposals or applications for re-
5 search and development and demonstration projects under
6 this Act the Secretary shall give highest priority to those
7 proposals or applications which will substantially increase
8 employment in labor areas (as those areas are described by
9 the Secretary of Labor in title 41 of the Code of Federal
10 Regulations).

11 “(A) which are experiencing a rate of unemploy-
12 ment of 9 per centum or more of the area's work force,
13 or a rate of unemployment of 150 per centum or more
14 of the federally determined unemployment rate for the
15 entire United States; or

16 “(B) which have experienced a 1 per centum in-
17 crease in unemployment as determined by the Secretary
18 of Labor of the available work force as a result of the
19 termination of a federally financed or supported program
20 and such increase in unemployment continues to exist.

21 In the event that two or more entities from the same labor
22 area are in competition for assistance under this Act, priority
23 shall be given to the proposal or application deemed by the
24 Secretary to have the greatest potential impact in reducing
25 the amount of unemployment in such labor area.”; and

- 1 (2) by striking out "To" in such redesignated para-
 2 graph (3) and inserting in lieu thereof "Except as pro-
 3 vided in paragraph (2) and to".

Passed the Senate June 15, 1971.

Attest:

FRANCIS R. VALEO,

Secretary.

EXECUTIVE OFFICE OF THE PRESIDENT,
 OFFICE OF MANAGEMENT AND BUDGET,
 Washington D.C., May 19, 1971.

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

DEAR MR. CHAIRMAN: This is in reply to your request for the views of the Office of Management and Budget on H.R. 8107 a bill "To extend the Act of September 30, 1965, relating to high-speed ground transportation, by removing the termination date thereof, and for other purposes."

H.R. 8107 was originally presented to the Congress by the Department of Transportation on February 12, 1971. For the reasons given in the transmittal letter of the draft proposal, we would recommend enactment of this bill.

Sincerely,

WILFRED H. ROMMEL,
Assistant Director for Legislative Reference.

EXECUTIVE OFFICE OF THE PRESIDENT,
 OFFICE OF MANAGEMENT AND BUDGET,
 Washington, D.C., June 30, 1971.

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

DEAR MR. CHAIRMAN: This is in reply to your request for the views of the Office of Management and Budget on H.R. 8302, a bill "To extend the Act of September 30, 1965, relating to high-speed ground transportation, by removing the termination date thereof, and for other purposes."

This bill was originally presented to the Congress by the Department of Transportation. For the reasons given in the transmittal letter of the draft bill, we recommend enactment of H.R. 8302.

Sincerely,

WILFRED H. ROMMEL,
Assistant Director for Legislative Reference.

DEPARTMENT OF TRANSPORTATION,
 OFFICE OF THE SECRETARY,
 Washington, D.C., July 22, 1971.

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

DEAR MR. CHAIRMAN: Your Committee has asked for the views of this Department on H.R. 8107 and H.R. 8302, identical bills to extend the Act of September 30, 1965 relating to the high-speed ground transportation, by removing the termination date thereof, and for other purposes.

The Act of September 30, 1965, as amended (49 U.S.C. 1631-1642), contains annual authorizations for appropriations, and a termination date of June 30, 1971. The proposed legislation would remove the annual authorization now contained in Section 11 of the Act. It would also delete the termination provision contained in Section 12 thereof. Thus the Act would become permanent legislation with no annual appropriations authorization limitation.

As Secretary Volpe pointed out in his letter of February 12, 1971, to the Speaker transmitting this legislation, the high speed ground transportation program has, in many areas, begun the transition from research to the development phase. The development phase will involve undertakings which will extend over a period of years. The removal of the termination provisions and the placing of the program on a permanent basis, will enable the program to achieve its objectives more efficiently and more fully. Accordingly, the Department strongly supports the enactment of this legislation.

There is a technical matter we wish to call to your attention. The draft bill submitted by the Secretary inadvertently omitted the words "the first sentence of" from subsection (a) of the bill. The correct language of subsection (a) should read:

"That (a) *the first sentence of* Section 11 of September 30, 1965, as amended (49 U.S.C. 1641) is further amended by striking all after the word 'Act' and inserting in lieu thereof a period." (Omitted language italicized.)

The Senate has passed S. 979, a companion to H.R. 8107, with an amendment which would require the Secretary, in considering proposals or applications for research and development and demonstration projects under the Act to give highest priority to those proposals or applications which will substantially increase employment in labor surplus areas as determined by the Secretary of Labor.

The purpose of the amendment is sound. We are very concerned about the need to utilize labor from these labor surplus areas to the maximum possible extent. The last few years have been particularly difficult for many areas which had previously enjoyed full employment. Maximum utilization of labor from these areas, in many cases some of the most highly skilled work forces in the country, must be made at every opportunity. It is an appropriate federal concern. We do not believe, however, that insertion of the language of the proposed amendment is suitable for a particular piece of authorizing legislation such as the High Speed Ground Transportation Act. At the present time the Department is considering some 25 bills or portions of bills dealing with labor surplus areas and employment matters. It is more appropriate to consider the labor surplus areas issue as part of our over-all economic strategy and not in the context of this particular bill. This is the approach which this Administration is taking. Accordingly, we do not believe that the amendment should be included in the present legislation.

If the Committee feels, however, that an express statement is necessary with respect to the utilization of excess manpower in these labor surplus areas, we believe that the language of the amendment should be clarified. We note that the Senate Report accompanying S. 979, as amended, states that: "The Committee's intent is simply to accomplish the goals of the High Speed Ground Transportation Act using excess capacity in the labor force where available" Senate Report No. 92-147, p. 3. We recommend that the amendment be revised by inserting after the word "shall" on line 6 page 2 of the bill, as reported, the words "consistent with the purposes of this Act and applicable procurement laws and regulations" and by striking the word "highest" on line 6 page 2 and inserting in lieu thereof the word "high". This would assure that while high priority is afforded labor surplus areas in connection with the program, the basic purposes of the High Speed Ground Transportation Act will be preserved. We believe that this proposed change of language is consistent with the purposes of the amendment.

The Office of Management and Budget advises that from the standpoint of the Administration's program there is no objection to the submission of this report to the Committee.

Sincerely,

J. THOMAS TIDD,
(For John W. Barnum, General Counsel).

Mr. JARMAN. Our witnesses this morning are the Honorable James M. Beggs, Under Secretary, Department of Transportation, accompanied by Hon. John W. Ingram, Administrator, Federal Railroad Administration, Department of Transportation.

Gentlemen, it is good to have you with us.

STATEMENT OF HON. JAMES M. BEGGS, UNDER SECRETARY, DEPARTMENT OF TRANSPORTATION; ACCOMPANIED BY HON. JOHN W. INGRAM, ADMINISTRATOR, FEDERAL RAILROAD ADMINISTRATION

Mr. BEGGS. Thank you, Mr. Chairman.

Mr. Chairman and members of the committee, I appreciate this opportunity to appear before you today to discuss H.R. 8107, the bill submitted by the Department to extend the act of September 30, 1965, relating to high-speed ground transportation, which I shall refer to hereafter as the "High-Speed Act."

Before beginning my testimony, I would like to introduce, as you did, the new Administrator of the Federal Railroad Administration Mr. John W. Ingram, who is on my left. I am very pleased to have Mr. Ingram on the Department team.

The High-Speed Act is now 6 years old. The original act provided total appropriations authorizations for the 3 fiscal years 1966 through 1968 of \$90 million. At the end of that period the act was extended for 2 additional years, with a total appropriations authorization of \$37.4 million. Last year it was extended for 1 year, with an appropriations authorization of \$21.7 million. The legislation proposed by the Department would remove the annual appropriations limitations now contained in section 11 of the act and would delete the termination provision contained in section 12. Thus, the act would become permanent legislation with no annual appropriations limitation.

We believe that the time has come to place the program on a permanent basis. First, we believe that the establishment of permanent authority would stimulate greater investment in the advancement of surface transportation technology by private firms. Consistent with the policy stated in the High-Speed Act, we have sought to obtain maximum participation by private industry in connection with our high-speed demonstrations. We also attempt to do this in our research and testing programs as well. However, our program planners and engineers report to us that they are constantly frustrated by their inability, without the existence of permanent authority, to convince private industry that the program will continue. The enactment of H.R. 8107 would alleviate this situation. Secondly, the addition of the quality of permanency to the program is important to the improvement of our internal planning process. It would increase our ability to relate our high-speed efforts to the other R. & D. efforts of the Department, including mass transit and V/STOL programs. The result would be better research planning and program implementation. Finally, we believe the value of the program is firmly established and there will remain a substantial need for its continuation for the foreseeable future. At this juncture, we envision the high-speed ground transportation research of the current decade as the basis for the surface transportation systems of the 1980's and 1990's.

When the High-Speed Act was up for renewal last year, we pointed out that many of the research projects begun early in the program were approaching completion. Thus, 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. A list of the major achievements of the program is attached as exhibit A (see p. 8). Among the most notable of these achievements are the Metroliner and Turbotrain demonstrations, and advances in Tracked Air Cushion Vehicle Technology—TACV—and linear electric motor propulsion.

These advances of the R. & D. program have particular relevance in light of the recommendations contained in the Department's staff study entitled "Recommendations for Northeast Corridor Transportation." That staff report has already been submitted to the Congress and to this committee. I should note here that the report recommends, in part, further research in TACV, magnetic levitation, and tunneling, to determine the technical, economic, social, and environmental implications of these advanced technologies for the 1980's and subsequent years.

Now I would like to review our current high-speed R. & D. activities and outline for you some of the major projects we are conducting.

TACV: There is a four-step evolution in advanced high-speed ground projects. These steps are: (1) basic research; (2) development; (3) testing; and (4) public demonstration. After several years of research, the TACV program is now in the hardware phase. We expect to conduct a test program to evaluate various cushion designs, linear electric motor propulsion, high-speed transfer of power from the wayside to the vehicle, power conditioning on board the vehicle, and vehicle dynamics and track alignment. For this purpose, a test bed vehicle—the tracked air cushion research vehicle, TACRV—has been designed and is now being fabricated by the Grumman Corporation. Testing is to start in the summer of 1972 at the High-Speed Ground Test Center in Pueblo, Colo. We intend to investigate performance at speeds up to 300 miles per hour. As evaluation of one subsystem is completed, another will be substituted.

Tunneling: Tunneling techniques are major factors in the development of safe environments for advanced high-speed ground systems. During fiscal year 1971, we completed the design of a water cannon to fire very high pressure pulsed jets of water to fracture rock. This year we expect the fabrication to be completed and a test program initiated. The testing will start with blocks of various types of rock and, if the results are as expected, testing will be moved to a quarry to determine the effect of the water cannons on a solid rock face.

Also, during this fiscal year we hope to resume other tunneling research, such as combining laser beams and mechanical boring devices, and expanding our computer modeling of tunnel construction to include soft ground as well as hard ground tunneling.

Magnetic Levitation: We believe that research may reveal that magnetic levitation has the potential for very high speeds and may be the only promising system for the suspension of vehicles in evacuated tubes at high efficiency. During this fiscal year, we expect to continue this research.

High-Speed Ground Test Center, Pueblo, Colo.: Considerable progress has been made at the High-Speed Ground Test Center. The first

test track has been built. This is a 6-mile track for the wheeled linear electric motor vehicle, or LIM test vehicle. The vehicle has been moved from the Garrett Corp. plant in Torrance, Calif., and we have been operating it on the test track at gradually increasing speeds to evaluate the LIM performance. A temporary maintenance building has been erected at the end of the track for work on the vehicle. A telemetry van and antenna are now available for the data system. The design of the first permanent building at the test site is complete and construction of the building has begun.

May I add here, Mr. Chairman, we believe this test center will be the finest in the world. While this Nation is quite late in construction of such a test center by comparison with the Europeans and Japanese, we think we will have a center superior by far to any other.

Metroliner: The Metroliner demonstration program began officially on October 1, 1970. The demonstration will continue for 2 years, with the option to renew for 1 year. Actual service by Metroliner cars was started by the Penn Central on its own on January 16, 1969, with one round trip, and was progressively increased to the present service of nine round trips on weekdays. This year, the principal effort with respect to the Metroliner demonstration is a program to improve the reliability and the ride quality of the equipment.

Turbotrain: The turbotrain demonstration between New York and Boston originally operated seven round trips weekly with four additional round trips on weekends and peak periods. A new 2-year contract became effective on January 23, 1971. It provides for limited maintenance for five trips weekly for 15 months, equipment refurbishment and modification, and expansion of train sets to five cars for an operating unit seating capacity of 240 passengers. During the final 9 months of the contract period, the Government will lease—or exercise its option to purchase—the two expanded trains.

Both the turbotrain and the Metroliner demonstration routes are included in the Basic National Rail Passenger System operated by Amtrak. Amtrak has agreed with Penn Central to permit Penn Central to continue these demonstration programs with the Department. At the present time, we are engaged in preliminary negotiations with Amtrak with respect to enabling Amtrak to increase its involvement in, and coordination of, the demonstration programs. In addition, in any further authorized demonstrations, we will be working closely with Amtrak.

The projects I have outlined provide a general indication of the scope of the transportation research being conducted pursuant to the High-Speed Act. Enactment of permanent legislation will facilitate the further development of our programs pursuant to the mandate of the act.

(Exhibit A, entitled "Major Accomplishments Under the High-Speed Ground Act," follows:)

EXHIBIT A.—MAJOR ACCOMPLISHMENTS UNDER THE HIGH-SPEED GROUND ACT

1. The Northeast Corridor Project was carried on in the Office of High-Speed Ground Transportation and all of the system alternatives, other technical inputs and cost estimates were from high-speed ground R&D.

2. Metroliner demonstration has shown that there is a demand for improved rail passenger service.

3. The Turbotrain demonstration has successfully demonstrated improved rail passenger technology.

4. A High-Speed Ground Test Center has been put into operation for rail advanced high speed intercity ground transportation and rail transit testing.

5. Tunneling R&D has been undertaken which has opened a number of new approaches to reducing the cost of tunnel construction.

6. A railroad track measuring instrumentation system has been developed which will make possible improved inspection at frequent intervals of the entire National rail network trackage.

7. An obstacle detection system is under development which has already had a major technology spinoff in the field of security.

8. Tracked air cushion technology has been advanced to the point where the early British and French lead is rapidly disappearing.

9. A network control system is under development which appears to be the most promising control system for a number of ground systems, including the dual mode vehicle for urban application.

10. The first-large scale linear electric motor has been built and preliminary testing completed to verify theoretical analysis. This project has provided the propulsion systems for the urban TACV developments and may well be the propulsion system of the 1980's.

11. Joint projects in railroad technology are under way providing for the first time industry/Government cooperation in railroad R&D.

Mr. BEGGS. Mr. Chairman, that concludes my prepared statement. Now I will be pleased to answer any questions the committee may have.

Mr. JARMAN. Thank you, Mr. Secretary. I think the particular comment I would make, and the question I would like to ask now is this: It has been the policy of this committee to limit programs of this type to 3 years and to impose annual authorization of appropriations limitations, and I have no reason to believe that the committee will deviate from this policy in this legislation.

If that be true, has the Department developed estimates of dollar limits for the next 3 years which the Department is prepared to justify?

Mr. BEGGS. Yes, sir; we have. I can give you very roughly the totals today and then submit further details as backup.

For the next 3 years, the program we anticipate to carry out the purposes of the act would run about \$100 million a year. This is the result of the bringing to fruition of a number of our research efforts and the approach of the development and test and operational phases of a number of the programs I mentioned in my prepared statement.

While it is a large increase over the authorizations of previous years, it is not too much, I believe, to bring to a point of operational usefulness these very important programs.

Mr. JARMAN. Your rough estimate is that it would be \$100 million for each of the next 3 years?

Mr. BEGGS. That is correct, sir.

Mr. JARMAN. Your appropriation is what?

Mr. BEGGS. Mr. Chairman, if I may add one thing, in addition to that, there is a \$25 million appropriation for the current fiscal year, fiscal year 1972.

Mr. JARMAN. There is a current one?

Mr. BEGGS. Yes, sir.

Mr. JARMAN. Did you say \$25 million?

Mr. BEGGS. \$25 million; yes, sir.

Mr. JARMAN. In the legislation extension last year, it was for a 1-year period, with an appropriation authorization of \$21.7 million.

Mr. BEGGS. That is correct, sir.

Mr. JARMAN. You indicated that. Well, it will certainly be helpful to the committee if you can give us as much detailed information as possible, and justification for the proposed \$100 million per year for 3 years.

Mr. BEGGS. Yes, sir; we will back that up with quite a lot of detail. (The following information was received for the record:)

HIGH SPEED GROUND TRANSPORTATION PROGRAM FISCAL YEAR 1973-FISCAL YEAR 1975

RESEARCH AND DEVELOPMENT

Systems engineering

Cost benefit comparisons of candidate high speed ground transportation systems are needed to choose those which can best meet the requirements for future transportation in densely populated corridors. The systems engineering analyses will reveal what technology is available and what R. & D. is needed. Thus, these studies will be used to plan the HSGT R. & D. program.

Test center

Support facilities.—As new test facilities are constructed and new test projects begin, support facilities such as roads, fences, service buildings, water systems, warehouses, maintenance shops, instrument shops, etc., will be needed to support the testing activities. In addition, the operation and maintenance (O. & M.) of the Center includes: a contractor for logistics, housekeeping, and test support activities; support from the Pueblo Army Depot; civil engineering/facilities engineering support from FHWA; purchase of consumable materials and supplies; and the cost of utilities.

Wheel rail dynamics laboratory.—Construction of the final segment of the laboratory and the start-up of operations will be funded in fiscal year 1973. Tests of full scale railroad and urban transit equipment for vehicle suspension dynamics studies and wheel rail interaction investigations will be conducted during fiscal year 1974 and fiscal year 1975.

Railroad test tracks.—A complex of conventional railroad tracks is needed to provide a test site for both freight and passenger equipment experiments in the areas of safety and economic efficiency. Some destructive tests are planned, including derailment and collision. Approximately 15 miles of track with critical curves, grades, switching and a hump yard are included. A small number of vehicles, locomotives, measurement car, "stunt" cars for derailments and typical freight cars are needed. Construction will continue through all three years; however, testing is planned to start in fiscal year 1973.

Railroad track improvement test cars.—Four instrumented test cars owned by DOT have been utilized to measure track geometry and vehicle accelerations at high speed. Continued development of this system into a prototype inspection car is planned. Additional self-propelled test cars, which won't need an electrified rail system, are needed for general surveillance of track geometry. In addition, improvements are needed in the present techniques to detect flaws in rails to prevent derailments from broken rails. Present methods are too slow and miss some types of flaws. The fiscal year 1973 costs include fabrication of the new equipment while fiscal 1974 and fiscal year 1975 costs are for field testing and debugging.

Alternate track structures.—Field experiments on improved track structure are underway and will continue for the next three years. Additional test sections will be constructed each year and field measurements of stability of ballast rails and ties will be made for several years to achieve optimum results.

Welded rail stability.—Analysis of stress in long welded rails and the influence of the supporting surface (ballast or new concepts) on the susceptibility to buckling from thermal effects are needed to determine the contributions these new technologies might make to safe and efficient operations. The three year program includes analytical research and laboratory tests.

Improved passenger train.—Development will be undertaken in propulsion, braking, suspension, guidance and adhesion to assist in design of equipment for improved passenger train demonstrations.

Tracked air cushion vehicles (TACV).—The largest project in OHSGT is the Tracked Air Cushion Research Vehicle (TACRV). The TACRV is now being built for testing at the High Speed Ground Test Center. Fiscal year 1973 and

fiscal year 1974 funds are needed for construction of the experimental guideway and start of testing. To achieve speeds up to 300 mph for reasonable periods of duration testing a test oval 22 miles around must be built. Various subsystems will be installed and tested: several configurations of air cushions, suspensions (both active and passive), and power conditioning.

Studies of improved designs, such as use of ram air to reduce air supply power consumption, will be continued through the three years.

If the results of the TACRV are satisfactory, a design of a prototype commercial vehicle consisting of the best subsystems will be started in fiscal year 1974.

Suspended vehicle systems.—Design of a suspended vehicle and test guideway for construction at the High Speed Gound Test Center will be undertaken with fiscal year 1973 funds. Construction is planned in fiscal year 1974 and testing in fiscal year 1975.

Tube vehicles.—Research on tube vehicles will progress to design of a large scale experimental facility for the Test Center in fiscal year 1973. Construction will start in fiscal year 1974 and testing in fiscal year 1975.

Power collection.—Stiff rail power collection will be tested by the TACRV. Fiscal year 1973 funds are needed to install conductor rails to distribute power around the 22 mile oval. Testing will start in fiscal year 1973 on the initial segment of guideway and continue through fiscal year 1974 and fiscal year 1975.

Research will continue at the Transportation Systems Center for improved techniques. Modifications to the original Test Center installation based on this research are expected in fiscal year 1974 and fiscal year 1975.

Power conditioning.—The on-board processing of power for the Linear Induction Motor (LIM) will be tested in fiscal year 1973. The Transportation Systems Center will continue research for lighter weight systems which will be tested in the TACRV or other test-bed vehicles at the Test Center.

LIM propulsion.—The first large LIM to propel a vehicle is being tested at the Test Center in a steel-wheeled vehicle. Other LIM designs—which require different track installations will be designed, fabricated and tested both in the present vehicle and a second similar test-bed vehicle. Additional track beyond the present 6.2 miles will have to be constructed for the new configurations.

These steel-wheeled vehicles will also be test beds for the high speed wheel rail dynamics experiments. Research studies on improved LIM's will continue through fiscal year 1975.

Obstacle detection.—Fiscal year 1973 and fiscal year 1974 funds will be used to install an obstacle detection system, which has been developed by FRA, on the TACRV and LIM test tracks for the purpose of operational suitability testing and providing needed safety for the high speed testing.

Guideways.—Design studies will be continued to lower the cost of elevated guideways for all types of HSGT systems.

Safety.—Studies will be conducted to develop design standards and operating procedures for all of the new non-railroad systems.

Communications.—Research will continue through fiscal year 1973 to fiscal year 1975 at the Transportation Systems Center on improved and less expensive ways to communicate with high speed ground vehicles. The best system will be installed and field tested on one or more of the experimental vehicles at the Test Center to evaluate performance and to be used by the test crews in communicating with the control center.

Network controls.—The control system under development can be used for many ground systems and has been combined with the Dual Mode Vehicle program jointly supported by FRA, UMTA and FHWA with the Transportation Systems Center doing the R. & D. A portion of fiscal year 1973 funds will be used for a controls test track at the Test Center. A portion of fiscal year 1974 and fiscal year 1975 funds will be used for test vehicles, testing, and continued installation of new test hardware and modifications.

Magnetic levitation.—Results of research in the HSGT program and in other countries have produced significant breakthroughs in the last year. An expedited program is needed to develop and test at the Test Center several configurations of magnetically levitated vehicles. The tests will be used to compare the costs of high speed rail and TACRV for possible implementation of such advanced systems in the 1980's.

Tunneling.—Results from research conducted during the last five years should be converted into hardware and field tested in quarries, mines, and tunnels.

Several techniques of rock fracture, new concepts in tunnel lines and materials handling offer promise of reducing the cost of tunnel construction to the point where subsurface units will be attractive as an effective alternative to surface right-of-ways.

DEMONSTRATIONS

New York-Washington

Funds will be used for reworking of the Metroliners to improve reliability and ride comfort and complete the demonstration with the improved cars.

Boston-New York

Funds will be used to complete the Turbotrain demonstration with the modified trains containing additional cars and modified equipment.

Data collection

Funds will be used to continue the collection of data to evaluate the results of the Metroliner and Turbotrain programs and to plan new programs.

DEPARTMENT OF TRANSPORTATION, FEDERAL RAILROAD ADMINISTRATION—HIGH SPEED GROUND TRANSPORTATION RESEARCH AND DEVELOPMENT

[Dollars in thousands]

Program summary	Budget authority—Fiscal year—			
	1972	1973	1974	1975
Research and development:				
Systems engineering.....	\$300	\$1,500	\$4,000	\$4,000
Test center:				
Support facilities.....	3,000	7,880	7,955	7,970
Wheel/rail dynamics laboratory.....	1,700	1,500	1,500	1,500
Railroad test tracks.....	1,000	1,500	1,500	1,500
Railroad track improvement:				
Test cars.....	(2)	3,600	1,600	1,600
Alternative track structures.....	550	1,200	2,000	1,000
Welded rail stability.....	100	400	400	400
Improved passenger trains.....		1,800	1,650	
Advanced systems:				
TACRV systems.....	2,950	19,200	24,700	4,400
Suspended vehicle systems.....		2,000	7,000	1,650
Tube vehicles.....	320	1,000	10,700	3,150
Advanced technology:				
Power collection.....	1,448	5,600	2,000	1,000
Power conditioning.....	100	600	1,500	800
LIM propulsion.....	700	6,800	7,170	4,990
Obstacle detection.....	50	700	550	200
Guideways.....		500		
Safety.....		400	400	400
Communications.....	135	400	1,400	500
Network controls.....	300	2,500	3,500	4,500
Magnetic levitation.....	200	3,000	3,100	5,100
Tunneling.....	577	4,000	4,000	4,000
Research and development total.....	13,430	66,080	86,625	48,660
Demonstrations:				
New York-Washington.....	5,400	16,700	500	
Boston-New York.....	3,600	1,000	500	
Data collection.....	1,000	1,000	1,000	1,000
Airport access and other demonstration studies.....		10,000	30,000	8,000
Improved passenger train.....			4,000	1,000
Air cushion vehicle.....				30,000
Tube vehicle.....				
Demonstrations, total.....	10,000	28,700	36,000	40,000
Administration, total.....	1,570	2,220	3,375	4,240
Total, high-speed ground transportation.....	25,000	97,000	126,000	92,200

¹ Estimates for these years are tentative and are subject to review and modification in the normal budgetary review process.

² Railroad research.

Mr. JARMAN. Mr. Adams.

Mr. ADAMS. Thank you, Mr. Chairman. Mr. Ingram, I see you are here this morning. Welcome to the Government, and I hope you enjoy it.

Mr. INGRAM. Thank you.

Mr. ADAMS. I have one question with regard to your tracked vehicle, or cushion vehicle, or magnetic vehicle programs. Wasn't a program discussed where a vehicle of this type would be used between Dulles and Washington, D.C., and that fell through, for reasons, I guess, which are not important here now, but it has also been discussed that it might be done in the Pacific Northwest. Is this Pacific Northwest corridor being considered? I know it is not on your list, but I know you are developing something at Pueblo on it. What is the status?

Mr. BEGGS. Yes, sir. If I may amplify a little on the answer, there were two speed regimes in the TACV, which are important. In our studies of the Northeast corridor, we concluded that vehicles in a speed range of 300 miles per hour was about the proper speed regime to be competitive with the alternate mode, which was aircraft, so we proceeded along the lines of designing a 300-mile-per-hour vehicle.

About 2 to 3 years ago, it became obvious to us that there was a further application for this technology, in a shorter-range kind of application, which would be usable for such things as access to the new regional airports which are beginning to appear around this Nation, and so we started to proceed with technology in the 150-mile-per-hour regime, and indeed this is comparable to what the Europeans have been doing.

Mr. ADAMS. The French vehicle, for example?

Mr. BEGGS. Yes, sir; that is in that range of speed.

Also, in short-stage lengths—lengths of up to perhaps 75 or even 100 miles—150 miles per hour is certainly adequate for any use that can be anticipated.

So, in addition to the research vehicle of 300 miles an hour, we have proceeded with two contracts for developmental vehicles in the 150-mile-per-hour class, that will be tested at Pueblo; and after that, it is our current planning, assuming that these vehicles turn out the way we anticipate they will turn out, to actually install one in an operating environment to test the vehicle and the vehicle system against public reaction.

Mr. ADAMS. I notice that in the version of the bill that came over from the Senate, there was a section that provides that the Secretary shall give highest priority to applications which will substantially increase employment in labor areas, and, for example, it mentions a figure of 90 percent, or 150 percent more than the total unemployment rate in the entire United States. Do you have any comment on that amendment?

Mr. BEGGS. Yes, sir. In general, we support that amendment, Mr. Adams. We would prefer to see the wording of it changed slightly in order to make it easier for us to comply with it. For example, in that Senate version, we would recommend that after the word "shall" on line 6, page 2, there be inserted the words "consistent with the purposes of this act and applicable procurement laws and regulations."

Mr. ADAMS. Would you repeat that?

Mr. BEGGS. "Applicable procurement laws and regulations."

We would prefer that the word "highest" be changed to "high" wherever it appears in that particular clause. The reason is that we want to be sure—and in most cases we, of course, are sure—that there are competent suppliers in the area that have high unemployment,

particularly at the present time; but over the long run, we want to be sure we can maintain high standards of technical competency and, of course, reasonable costs. Both factors, we think, are vital to the success of the program, and I am sure it is your intent as well as the Department's.

Mr. ADAMS. Thank you very much, Mr. Chairman.

Mr. JARMAN. Mr. Harvey.

Mr. HARVEY. Thank you, Mr. Chairman; and, Mr. Secretary, we welcome you here this morning.

Looking at your statement, it would appear that the committee has been headed in the opposite direction from what you would like it to go with regard to authorizations. We started out with a 3-year authorization; then went to a 2-year authorization—and last year it was only a 1-year authorization.

As I understand it, what you are telling us is that if we will give you permanent authorization, that you feel that you could bring in some additional private participation in the program.

Mr. BEGGS. Yes.

Mr. HARVEY. Could you elaborate a little on it? As the chairman has said, it will be most unusual if the subcommittee and the full committee will grant more than a 3-year authorization; but I, for one, would like to know whatever you can tell us about what sort of private participation will be likely in that event.

Mr. BEGGS. Yes, sir, I will be glad to. The kind of projects we are discussing here are, by their nature, long-term contracts. There is a long cycle from the time research is initiated to the time you get payout or get an operating system.

As a general rule, if you look at the history of these things, it takes a decade or more from the initiation of research to payoff. I think that is one of the reasons we have had relatively little industrial participation in the area—that is, the payoff is so far away and the industry could ill afford, in most cases, to sustain a program of the magnitude of these kinds of programs over that period of time.

Now, industry does have research funds to commit. However, as a general rule, they have tended to commit those research funds, as a prudent businessman always does, in areas where a payoff is reasonably assured. In these programs where we have a long-cycled program and where the technology needs to be demonstrated prior to payoff, we have had a reluctance on the part of the industry to do that.

As a matter of fact, they have pointed specifically to the short-term nature of the legislation and what they consider to be a lack of commitment on the part of the Federal Government to a continuation of this program over the long term.

As a consequence of that, they have been either unable or unwilling to invest company R. & D. funds in these kinds of programs.

We think that a longer term commitment on the part of the Federal Government—and that is the reason we recommended permanent legislation in this case—would encourage the industry to invest more money in these kinds of programs; and, in the long term, it is our view that private enterprise involvement at the operating end of high-speed programs is a very desirable thing. I might ask John Ingram if he would like to comment further on that.

Mr. KUYKENDALL. Will you yield for a moment?

Mr. HARVEY. Yes.

Mr. KUYKENDALL. Shades of the SST debacle, would you say? There is a slight shadow hanging over this thing as far as private industry's willingness to stick its neck out if the Government does not?

Mr. BEGGS. I think certainly in the back of a lot of businessmen's minds is a question of getting halfway through the program and having it canceled out from under them, yes, sir.

Mr. HARVEY. You are talking now essentially of the transportation industry here, the railroads?

Mr. BEGGS. We are talking about the equipment industry primarily in this context, Mr. Harvey, although certainly when you get toward the operating end, we would anticipate that railroad right-of-way would be an important asset in the development of such a system. Therefore, the railroads might indeed get heavily involved.

Of course, there is always the possibility of using such things as median strips on highways for high-speed transportation. And, also, as I mentioned in my statement, there is the possibility of tunneling in highly populated areas for systems such as this.

Mr. HARVEY. Would you have in mind that private industry would subsidize your activities or rather that private industry would step in and use the facilities that have been constructed?

Mr. BEGGS. We have in mind two parts of the program. First, private industry would step in on their own and use our facilities and test equipment.

Perhaps more important, I think, is our desire to get the industry to share, to some extent, the cost of research and development in this area. As I said, industry has funds which it commits to research and development, and, of course, they look to a fairly high return when they commit that money, and we would like to see the industry get interested—that is, the equipment industry—get interested in investing that kind of money in equipment of this type.

Mr. HARVEY. Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Podell.

Mr. PODELL. Thank you, Mr. Chairman. Mr. Secretary, it is good to see you here today. I would like to preface with the fact that the act we are considering appears to be mistitled. It is called the High-Speed Act. It should be called the No-Speed Act. The act was passed in 1965, since then, over \$150 million has been authorized and appropriated. In the next 3 years, an additional \$300 million is expected and anticipated.

You mentioned the SST earlier—I voted against further support of the SST. In the context in which we are speaking. My argument was simply this: While the SST would take us from Kennedy Airport to London in 2½ hours, the 15 miles from my home to Kennedy Airport takes me 2 hours to travel. First things should come first.

By 1973 you will have spent about a half billion dollars. Kennedy Airport will be no closer to me then, in terms of time, than it is today.

When I examine the record, your major accomplishments appear on exhibit A—one is a beaut: "Metroliner demonstration has shown that there is a demand for improved rail passenger service." "The Turbotrain demonstration has successfully demonstrated improved rail passenger technology."

Sir, my youngest is only eight and could probably tell us that there is a demand for improved rail passenger service at no cost at all.

Improved high-speed transportation is a priority, it is one of the most important things toward which we can direct our attention. Compare, for example, the 6 years of the High-Speed Ground Transportation Act to the space program, which was organized in 1953. In 6 years we had satellites up in the sky. Of course, the appropriation for space is far in excess of the program you are talking about today, and I am for giving you as much money as you need. But we have not accomplished very much for the money spent, outside of a water cannon and a few continued tests. I don't mean to be critical, I understand the problems that face us, but maybe someone from your office should come back to us every year and tell Congress what you accomplished before we continue to give you more funds. Would you care to comment on that?

Mr. BEGGS. Yes, sir. We would be quite willing to come back every year to tell you what we have accomplished. At the same time, we would very much like to see a commitment, long-term commitment, for this program. Now, a great deal has been accomplished in the 5 years that have ensued since the act.

Mr. PODELL. Six.

Mr. BEGGS. Well, 6 years, and I think you will find that things did not go very fast that first year. But we think a great deal has been accomplished. The Metroliner and turbotrain demonstrations—which, I might say, were quite difficult to get initiated—showed us, in the first instance, what it takes to get a demonstration in operation, and it took a great deal.

I think the existence of Amtrak will make easier the introduction of high-speed rail service in the future and high-speed demonstrations on the rails will become that much easier because we have an entity that is interested in supplying that type of service. But it was very difficult to initiate.

As I mentioned earlier in response to Mr. Harvey's questions, these are, by their nature, long-cycle systems. If you go back in history and look at the time it took to bring into operation any of the major transportation facilities in this country, you will find that a decade is a relatively short time when measured against this accomplishment. They take a long time to research and develop, and they take a long time to install.

My boss constantly asks me, because I spent some time in NASA, why we cannot move faster, and indeed I think it is a legitimate question, because, as it is so commonly put in this country, if we can go to the moon in less than a decade, why can't we construct a decent subway system in less than a decade?

But I would point out that in the case of the research and development work we were doing in NASA, we did not have the enormous problems that we have in modifying and moving through existing systems in our urban areas. This complicates this problem enormously. That is the reason for some of this tunneling research.

I think, if I can sum up, what I am saying in response to your question, it is simply this: The research and technology in the area of high-speed ground transportation has been moribund for 50 years. If you look at much of the equipment that exists today, it is designed and was developed around engineering principles which were well understood 50 years ago. Our objective is to bring some new technology into this

area, develop it to a point where it can produce a viable system, and proceed to put it into operation to determine whether, indeed, with this kind of service, you can generate a demand.

While it is true that almost every schoolchild—and indeed I have four that come home and tell me this—will tell you there is a demand for it, we are not so sure it has been completely demonstrated, and we think it should be demonstrated before we commit the billions of dollars which will be the kind of money we are talking about if we do commit ourselves to a major national system of this type.

Mr. PODELL. But, sir, are you telling the committee that you want \$500 million, including the moneys already spent, which does not include that which industry will obviously contribute, toward the high-speed transportation type of facility, and you are not sure there is a demand for it as yet?

Mr. BEGGS. We will be sure of high-speed rail, I think, very shortly. I think we are convinced—well, I am convinced at this point—that the Metroliner service, as I said in my statement, is sufficiently in demand to justify the installation of that kind of service throughout the transportation corridors in this country.

With respect to the TACV, which we will be demonstrating over the next year, and the magnetic levitation vehicles, which are just on the drawing board, we have not demonstrated there is a demand for that kind of service. We want to demonstrate that.

The amount of money we are talking about, as I mentioned earlier, is about \$100 million a year to find out the answers; and, for a transportation system with a net asset value, as nearly as we can calculate in the Department, of probably close to \$1 trillion in this country, an investment of \$500 million in pursuit of this new technology, I think, is a good investment. To date, through fiscal year 1972, we will have invested about \$130 million in high-speed technology. That is the total appropriation to date.

As I mentioned earlier, we are coming to the point where demonstrations of this technology are necessary if we are to find out and to prove what we have learned in our early research and test phases.

It is for that reason that we are here today—to ask that the Congress put their confidence in this mode. It has been very underfinanced for the past number of years—for the past 50 years. We simply have not pursued high-speed ground technology, and now we are running into a situation where we need it.

Mr. PODELL. Sir, it would strike me that before we build our tunnels and canyons, we make sure there is need for the kind of facilities you people intend to construct. This should certainly be the first order of business arrived at after the first year of operation.

There are many air-cushioned vehicles, one under water and one going on land. There are a number of individual companies that made a great deal of strikes in this area, so I don't think we can compare the days of yesteryear when we started building a locomotive.

I believe there is a great need for this kind of thing; I think it is a priority need. But I feel that the program should go much faster and have more effect. A projection has not even been submitted where I could be sure and say, "Well, in 1973 or in 1980 or 1990 we will have in this country the kind of facility DOT is talking about."

There has not been that kind of projection in your statement with which I can go back home and say to my people, "We are going to spend a couple of billion dollars, but this is what we will get you for your money." If someone back home asked me what you spent it for, I will have to say: "We are building a cannon and a Northeast corridor project." Do you think they will say, "Thank you very much"?

If you need more money, ask for it; I will be for it. Get the money in this thing and do the job. Up to now, I have not been overwhelmed by the results of this program.

Mr. BEGGS. Let me respond this way: I don't want to leave the impression we do not know and have not done some fairly comprehensive and detailed studies on the need and demand. The Northeast corridor report, which has been submitted to Congress and which was, in the total, including the backup and the several computer models that were built, an enormous study spanning about 7 or 8 years, contains a collection of enormous numbers of statistics pertaining to the Northeast corridor area which are specifically related to demand for this kind of service. I think that report demonstrates very well that, at least from the study point of view, there is a need and demand for the kind of service.¹

My previous remarks which were directed at that, we have not demonstrated except on the Metroliner. I think that needs to be done, that is a necessary step before you make a major commitment to an operating system.

In addition, we have submitted, as you know, to the Congress a report each year on the High-Speed Ground Transportation Act in accordance with that act, which includes data on a number of studies that we have done directed toward determining what the need is, and directed toward the question of how much speed you need, how much convenience, what frequency of service, and so forth, is required in order to make this a viable and publicly acceptable kind of service.

So there has been and there is a good basis for saying that we are at the point in the development of these systems where we ought to spend additional money to demonstrate them and to determine just exactly whether our projections are correct, and it is for that purpose we are asking for the extension.

Mr. POBELL. I thank you, Mr. Chairman.

Mr. JARMAN. Mr. Kuykendall.

Mr. KUYKENDALL. Mr. Beggs, welcome to the committee. Let me spend the next few moments, if I may, presenting what has been accomplished, and is being accomplished right now, in a different light and in a different way.

I think, if I were relatively new on this subcommittee and had read your report, I would have exactly the same concerns as the gentleman from New York. So let me, if I may, begin to separate and put into more layman terms these things.

Mr. Beggs, I get the impression sometimes people who live with a project every day get to where they know so much about it they assume other people know things they know, and a lot of times they don't. So may I first ask you if you can't generally separate your tasks into an immediate future and a more or less futuristic part of your tasks.

¹ Recommendations for Northeast Corridor Transportation—September 1971. U.S. Department of Transportation.

Is it not true that the Metroliner concept to use as a conventional vehicle on a conventional track, uses very little new technology and is more or less an answer for the next decade or two but no further; is this correct?

Mr. BEGGS. I would say yes, and I would say further, Mr. Kuykendall, that perhaps one can consider a mix of high-speed rail and some of the other higher speed modes even farther out than that.

Mr. KUYKENDALL. I will get into that in a moment, sir. In other words, we go around the world and see things like the Tokaido Express, with a train running on a conventional track. Have we not learned, for instance, in the Metroliner tests, with the positive things we learned, that we have also learned there is a definite limit as to speed and comfort you can get on a conventional track?

Mr. BEGGS. Yes, that is correct, with existing technology. There are some things that we think we can do with steel wheels on steel rails to improve the comfort of a vehicle of that type with advanced technology; but with current technology, that is correct.

Mr. KUYKENDALL. Is not one of the first steps you would have to take in achieving that comfort on a conventional track the removal of heavy freight loads from that track?

Mr. BEGGS. This is certainly one way that one would go about it, and indeed the Japanese have gone in that direction. There is a second way, however. You might be able to get a smooth ride from a train on a rough track that is subjected to heavy freight loads by careful design of the suspension of the train. The British are going in that direction.

Mr. KUYKENDALL. What do you think a ball-park figure is on the maximum speed you will be able to get on a conventional track with conventional propulsion?

Mr. BEGGS. We start to run into the very severe problems of wheel-rail dynamics at about 150 to 170 miles per hour, so that sets an upper limit, at least with what we know about the physical laws that govern speeds with steel wheels on steel rails. So I think you can set an absolute limit in that area.

Mr. KUYKENDALL. Is it not true when we start into this next step—the step that is going to be the only one that is really going to answer the problems for the 1990's and certainly the only one that will answer the problem of competing with the airliners—then we will start getting into investment probably similar to the space program that Mr. Podell spoke of?

Mr. BEGGS. Yes; the investments will certainly be very large. As I mentioned, the investment in the current transportation system is well up toward \$1 trillion when you throw in highways, waterways, airports, and rails; but I think we are talking well up into billions of dollars when you go toward operating systems, and it is our hope that at the time we demonstrate an economically viable system, at least the major portion of the cost of developing and building such a system could be privately financed.

Mr. KUYKENDALL. Let us talk a little about what has been accomplished. Is it not true that you have a vehicle going a certain speed right now, a vehicle that causes no pollution and, when it is run from an exterior power source, makes no noise and has practically no moving parts? I am speaking on the LIM vehicle, already bought and paid for and in demonstration; is this correct?

Mr. BEGGS. That is correct, sir.

Mr. KUYKENDALL. What is this vehicle capable of doing?

Mr. BEGGS. The linear induction motor is an electric motor that is just like a conventional electric motor except it stretches out in a straight line, and uses electrical power to run a vehicle down a track. That means, of course, one has to have some kind of reaction rail along the track to provide that power, just the same way as a subway has a third rail from which it takes wayside power to drive its motors.

In this case, the machine is propelled along the track by taking, again, wayside power, applying it to the part of the electric motor that is on the vehicle, and then it reacts with the reaction rail and provides propulsion force down the track. You could use this propulsion force to drive any kind of vehicle, whether rubber-tired, or steel-wheeled, or air-cushioned, or magnetically levitated. Almost any kind of vehicle will work with it.

So the propulsion device we are talking about here has broad applicability and is pollution-free to the extent there is no pollution along the right-of-way. You have to generate power at another location, but it is my opinion that the pollution connected with that is easier to control.

Mr. KUYKENDALL. Consider this: That the test vehicle at Pueblo is resting on steel wheels but it has nothing to do with its propulsion.

Mr. BEGGS. That is correct. Now, this particular propulsion system, theoretically, is capable of speeds—really the upper limit of this has not been tested, but it is really dependent on the kind of suspension put under the vehicle—of upwards to 400 to 500 miles per hour, assuming that the vehicle suspension could take it.

It is a very versatile, clean, quiet source of propulsion power, and it is widely applicable to almost any vehicle that we may conceive of for the future.

Mr. KUYKENDALL. This vehicle, the way it is now constructed at Pueblo, sitting on wheels, you find, I understand, that it is at relatively low speeds up to a figure—which I will ask you to have in your mind—up to a certain speed, it is probably more efficient to run it on wheels, but above that, is it not correct it would be probably better to go to tracks?

Mr. BEGGS. Yes.

Mr. KUYKENDALL. Where is the breakoff point—200 or 275?

Mr. BEGGS. As you know, we run racing cars that attain speeds of upward to 150 or 200 miles per hour. There have been some automobiles, experimental vehicles, constructed for operation on the salt flats that go up to almost 400 miles an hour, but, you run out of practical efficiency on rubber tires somewhere in the 200-mile-per-hour range.

It is unlikely we will construct very high speed vehicles of this type, and that drives you in the direction of either air or magnetic suspension.

Mr. KUYKENDALL. The gentleman from New York spoke of the fact there have been experiments in levitation with the air cushion now for, I suppose, 15 years; is that right, just about?

Mr. BEGGS. That is correct.

Mr. KUYKENDALL. I have ridden on the train at Orléans, and, of course, that train is propelled by turboprop, which is relatively noisy; is that correct?

Mr. BEGGS. That is correct. It is also true that the Europeans work, and the Japanese have also done work in this area—theirs has been in a speed range of 150 miles per hour. The reason is there are technical problems in a wayside power pickoff. There are technical problems in design and design of equipment by which you get the air suspension, and so forth, and it is in the solution of those technical problems that we decided to put together a program in the 300-mile-per-hour range.

We think those technical problems can be solved. We think that this Nation is much better capable of solving the problems because of our broad background in high speed research. In addition to that, of course, the linear induction motor and development of this kind of process, while it has been pursued in Europe, is not far advanced. We think in that area we are probably quite a way ahead of the Europeans.

Mr. KUYKENDALL. They don't agree.

Mr. BEGGS. No; that is true.

Mr. KUYKENDALL. So we reached the point we have an experiment going on with a linear induction motor which reaches the level of having a finished product ready to be demonstrated, and I saw it run a year ago; then we are not nearly that far along with our tracked air-cushioned; is that correct?

Mr. BEGGS. That is correct. We will have a machine from the Grumman Co., probably early next year. We think, with the 300-mile-per-hour vehicle, we are a little ahead of the Europeans and are about to gain in our lead. We think that in the important area of magnetic levitation, in which work has been done in Europe, we might be at least equal to them and we might easily gain the lead in this important area of technology with a little research work.

Mr. KUYKENDALL. You used a term, and I think there are two terms you might want to clarify, the power takeoff problem being one, the fact that the higher the speed, the drag of the electrical connection creating a problem at roughly what speed?

Mr. BEGGS. Right now, power pickoff, either from a third rail or pantograph, which is the overhead wire, has been demonstrated only to 160 or 170 miles per hour; and above that, it is very difficult. Of course, at the higher speeds, it is more difficult to follow, to get a follower along the rail or along the wire, and, as a consequence, you get a lot of arcing and a lot of failure in the parts.

To demonstrate it at higher speeds, which is essential if we are going to provide ourselves with a vehicle system that is low polluting and low noisemaking, requires a little research work, and we are doing it in the Grumman 300-mile-per-hour vehicle.

Mr. KUYKENDALL. One last technical point you may clarify for the record: You are speaking of two kinds of levitation: magnetic or air. Is it not true one of the problems with the track air-cushioned or levitation system is that it does consume a lot of energy to keep the vehicle levitated as compared to what you hope for magnetic?

Mr. BEGGS. It does, but I don't think that is the most significant part of the problem. The thing that is interesting and very important about magnetic levitation is that when you start talking about the types of vehicles that would move at high speed through tunnels, which is the type of technology I think we need for the high-population corridors, then air suspension is not a good application.

For that purpose, magnetic levitation looks ideal and looks like it will provide the method of suspension we want for a tube-type or tunnel-type vehicle at high speeds and do it efficiently.

Mr. KUYKENDALL. As soon as you get ready to go, you are going to be coming back to the American institutions, public and private, talking in terms of scores of billions of dollars for new right-of-ways, tunnels, completely new tracking systems, and this whole bit, instead of retooling the existing systems; is that correct?

Mr. BEGGS. Yes; the projections the northeast corridor study made were frightening to begin with, because they projected a doubling of demand for transportation services in corridor areas by 1985 or 1990. That means in order to provide the kind of service needed to meet that demand, a doubling of existing transportation capacity would be necessary in the northeastern corridor. However, it simply is not possible to double the amount of highways and track. There is not that much real estate available.

We envision we will have to come up with new and innovative modes of transportation in order to keep up with the demand. It is for that purpose we think this research is absolutely essential; and, moreover, if we don't do it, we will run out of the supply of transportation services some time during the next decade. We will have to crash a program if we don't do it on a logical basis and do it in such a way that the investment can be made in a rational way. While it involves a lot of money, I think if it is done over a period of time, it can be done in a way that pays for itself, and, as I say, at least a major part of the investment required can come from private financing.

Mr. KUYKENDALL. Let me suggest one thing in closing: that if you have an example of where you are running tandem tests which could be run parallel—even though we may turn you down—but please come and ask us, because I think you gathered the temper of this committee; we are in a hurry, and I know you have used discretion in asking for funds to put on a crash program. But I think we are suggesting here to you that maybe you should be asking us for a crash program.

Thank you, Mr. Chairman.

Mr. ADAMS (presiding). Mr. Metcalfe.

Mr. METCALFE. Thank you, Mr. Chairman. Let me join my distinguished colleagues in welcoming you to the committee. I would like to know whether or not you have any facts and figures available as to the number of deaths that occurred as a result of railroad accidents last year, and also how much money was spent as a result of accidents. You have to be accurate.

Mr. BEGGS. Mr. Metcalfe, speaking from memory, there were 1,500 fatalities at railroad grade crossings. On the railroads themselves, there were, I think, in the order of 1,000 or a little more than that. Is that correct? Let me ask Mr. Ingram.

Mr. INGRAM. I think that is right, but we will give you the exact figures for the record.

(The following information was received for the record:)

RAILROAD-CONNECTED ACCIDENTS AND CASUALTIES—1970¹

	Rail-highway grade-crossing			Other railroad connected		
	Number of accidents	Number killed	Number injured	Number of accidents	Number killed	Number injured
Employees on duty.....		8	98	147	15,645	
Employees not on duty.....		4	5	13	537	
Passengers on train.....				8	489	
Other nontrespassers.....	1,356		3,113	96	794	
Trespassers.....	74		135	519	511	
Total.....	3,571	1,442	3,351	25,755	783	17,976

¹ As reported to FRA under current rules and regulations.

Note: Grand total: Number of accidents, 29,326; number killed, 2,225; number injured, 21,327.

Mr. BEGGS. In terms of the money that has been put into this, of course, on the Federal highway system, where there has been an effort to eliminate grade crossings—of course, on the Interstate System, there are none—but on the rest of the Federal system, we have been attempting to invest money each year to eliminate grade crossings. There are still an enormous number, and it is still a problem.

On the other side of the problem—that is, the accidents on the railroad right-of-way itself—as you know, there was a new piece of legislation passed just last year on railroad safety, and we are gearing up to issue the standards for that on schedule. I think they are due by the end of this week. And we want to proceed forthwith in implementing those standards.

Mr. METCALFE. We have been talking a lot about billions of dollars, and I wondered how much was spent in terms of damages; I mean, in terms of equipment or loss of life, insurance, and all of that. Do you have any figures?

Mr. BEGGS. No, sir; I do not. I can supply them. Perhaps Mr. Ingram has them.

Mr. INGRAM. Not off the top of my head, but we can get them for you.

(The following information was received for the record:)

NUMBER OF TRAIN ACCIDENTS, BY GENERAL CAUSES AND PRINCIPAL SUBCAUSES, 1969-70

Causes	Number, 1970	Damage to equipment, track, and roadbed, 1970
Negligence of employees:		
Train orders.....	23	\$520, 662
Cab signals.....		
Automatic train control.....		
Fixed signals.....	45	3, 370, 096
Hand signals.....	86	445, 821
Train flagging.....	7	379, 340
Air brakes.....	37	732, 555
Hand brakes.....	385	1, 740, 618
Switches.....	519	3, 005, 764
Other causes.....	1, 089	8, 837, 528
Total.....	2, 191	19, 032, 384
Defects in or failures of equipment:		
Steam locomotives.....	77	1, 091, 859
Locomotives other than steam.....		
Trucks.....	296	6, 179, 649
Wheels and axles.....	767	21, 236, 666
Airbrakes and appurtenances.....	93	1, 731, 992
Handbrakes, brake rigging and appurtenances.....	110	980, 625
Couplers, draft gear and related parts.....	340	3, 578, 739
Car structure.....	150	2, 394, 695
Other parts of equipment.....	57	1, 160, 266
Total.....	1, 890	38, 354, 491
Defects in or improper maintenance of way and structures:		
Roadway structures.....	3	223, 507
Ties and tie plates.....	325	1, 958, 554
Rails and joints.....	945	22, 536, 234
Frogs and switches.....	455	2, 123, 822
Signal systems.....	3	99, 283
Other way and structure items.....	739	11, 877, 245
Total.....	2, 470	38, 818, 645
All other causes (including unknown).....	1, 544	25, 419, 758
Grand total.....	8, 095	121, 625, 278

Note: Total freight losses as a result of railroad accidents, 1970, prepared by the Freight Train Division, Association of American Railroads—Freight losses: \$36,782,768.

Source: Extract from Accident Bulletin No. 139, summary and analysis of accidents on railroads in the United States, calendar year 1970, prepared by the Bureau of Railroad Safety, Federal Railroad Administration.

Mr. METCALFE. Mr. Secretary, I get the feeling that you are of the opinion that speed is one of the necessary ingredients in order to really promote rail transportation, because we keep talking about 150 and 200 and 250 and up to 300 miles an hour, and am I correct in that?

Mr. BEGGS. Yes, Mr. Metcalfe. There are not very many mutable laws in transportation, I find. One thing seems to be clear in all studies we have made, and that is that a passenger will always take the shortest-timed trip he can get. That is demonstrated clearly with the path that is worn across the quadrangle in the town square. Rather than taking the sidewalk, the person will cut diagonally across.

It was also demonstrated when we started constructing high-speed highways around the city; we found that individuals would drive further on a high-speed highway to get to their destination in order to save minutes that would be lost on a shorter trip through the highly congested city. And it was further demonstrated by the wide acceptance of the jet aircraft and other aircraft transportation as it came into operation.

So it is our conclusion that in order to make ground transportation competitive with the other modes in terms of time, the two things that are necessary are these: One is higher line speed, and the other is better access or an easing of the interface problem so that the transfer points become more convenient and less time consuming.

Mr. METCALFE. Is not time measured from home to home rather than from station to station?

Mr. BEGGS. That is correct. That is what I meant by my last comment—one must make more convenient the points of interface or intermodal points so the individual can transfer easily, conveniently, and in a shorter time period. And that is very difficult now.

Mr. Podell, I think, made that point—that getting from a suburban location to a major airport is a very difficult thing. We acknowledge that, and we are encouraging the investment of public money in airport access. There is a good airport access system in Cleveland. New York is about to begin an airport access system on rails. Most other big cities which have this problem are likewise considering new systems. We are backing that.

Mr. METCALFE. I notice that during your entire presentation, the word "safety" was not mentioned, and with all of the research and with all of the expertise that has been put in, does this also include safety—the research that is done, as I understand it, in order to make certain that both the Metroliner and turbotrain and other vehicles operate efficiently, and you have a comfortable line, but I do not hear you saying anything about safety.

Mr. BEGGS. No, sir, I did not, and it was an oversight. If you will look in the various reports we have submitted to this committee on the High-Speed Ground Transportation Act, you will find there is a significant amount of material on the safety research which is a part of the program.

It has been a prime objective of all our programs to design safety into them and, as a matter of fact, the safety considerations go back right to the conceptual design. The tracked air-cushioned vehicle, for example, because it is on a track and because it is, by its concept, a fail-safe kind of system, is a very safe mode of transportation.

When we considered the various types of systems that we could invest in, in the high-speed ground area, right at the conceptual stage we considered the safety aspect, and I believe that those we have chosen are, by their nature, very safe; and in addition to that, the contracts that we have written with our industrial suppliers, as well as the research work we have done in the Department, has been directed toward making the systems as safe as is humanly possible, both from concept to execution.

Mr. METCALFE. I am concerned about the sabotage that we have on our railroads, or failure of some track, and has any research been entered into to be able to signal to the engineer sufficiently early enough that there is trouble ahead?

You see, we are investing millions of dollars in equipment, and not only that, but lives, and if we are thinking in terms of stimulating transportation, every accident and every loss of life, therefore, brings about some question on the part of the passengers as to whether or not they ought to use that mode of transportation.

Mr. BEGGS. Yes, sir, Mr. Metcalfe. That is a very important problem, and it is at once very complex. We have done a good deal of research work in such areas as obstacle detection, using various kinds of modern devices to detect obstacles on the track at considerable distance, as well as using those that are, in essence, married to the track and which give a signal to the engineer as he comes down the track.

A further problem is the one you mentioned—sabotage, or deliberate vandalism on the track. This is a more difficult problem, but we have in Gen. Ben Davis one of the best men in the country working on that problem, and he is doing research directed toward the development of techniques, devices, and methods by which these vandals can be frustrated.

It is an enormously difficult problem. We have 200,000 miles of railroad right-of-way in this country and 3.7 million miles of highways. So it is a problem of enormous magnitude providing security to airports, railroads, the main highways, and so forth. This is something that I do not think we can spend our way out of. We have to find some real basic kinds of techniques to get at the problem, because it looks like it is going to be with us for a long time.

The Secretary took cognizance of this late last year and, early this year, held a conference with the industry on the problem; and, as I said, General Davis is now actively at work and has gotten a research program—a very modest research program, to be sure—started now, and we intend to ask for more money in the coming fiscal year budget to beef up that program.

Mr. METCALFE. Are you knowledgeable as to what direction they are plowing? Are they going to have electronic beams to show there is a break in the system? What is the direction they are moving in?

Mr. BEGGS. We have used several techniques. One of the more promising is the use of the laser device, which, as you know, is a very accurate instrument and can detect very minor changes in alignment. We have also investigated various electrical devices for the detection of faults in tracks. There is no one good solution that we have found, but all of them together show considerable promise.

Mr. METCALFE. Thank you very much. I have no further questions.

Mr. ADAMS. Mr. Devine.

Mr. DEVINE. No questions, Mr. Chairman. Thank you.

Mr. ADAMS. Mr. Murphy.

Mr. MURPHY. Mr. Secretary, what is the average speed of a Metro-liner?

Mr. BEGGS. Right now, I regret to say, it is about 100 miles an hour. The vehicle itself is capable of speeds of up to about 160 miles per hour, but because of the conditions of the track, because of the maintenance problems that we have had on the vehicle itself, a speed limitation has been put on it and the average speed is about 100 miles an hour.

Mr. MURPHY. What is the average speed of its counterpart, running a regular passenger train?

Mr. BEGGS. Probably half of that or maybe two-thirds of that—60 to 70 miles per hour.

Mr. MURPHY. Maybe 30 or 40 miles an hour that involves us in this expense?

Mr. BEGGS. Yes; but it is an important 30 or 40 miles an hour. The other thing is, the vehicle itself, as I mentioned, is capable of speeds up to 160 miles an hour, and it is our intent, as we gain experience and can improve our ability to maintain the vehicle, to boost the speed up to 130 or perhaps 150 miles per hour.

We have track problems which we are working on. We have other problems. I might add here, one of the problems here is, we probably should have done more homework before we committed ourselves to the vehicles. We built the vehicles, as was mentioned earlier, with existing technology and we found, even though the vehicle we supposed to be within the existing state of the art as a system, when we put it together it did not operate very well.

We have had enormous maintenance problems. We have had operational problems with the vehicle. We are learning and have been learning for the last year and a half, and I think we are about at the point where we can start boosting the speed. But even assuming a 100-mile-an-hour speed, as compared to a 50-, 60-, 70-, or 80-mile-an-hour speed, is a very significant increment of speed and provides significant savings in time. We are finding that with the 3-hour or 3-hour-and-20-minute schedule that we have between Washington and New York, we are competitive, quite competitive in time with air transportation. I guess that reflects the fact that we do have an airport access problem.

Mr. MURPHY. With the existing trackage, can you get to 150 miles an hour?

Mr. BEGGS. We think we can by improving the suspension somewhat. I think we are going to have to improve the track, the right-of-way, somewhat. But I don't think we can ever expect to attain the kind of track maintenance that the Japanese have on their railroad, the Tokaido Express line, for these two reasons: It would be enormously expensive; and, secondly, our lines, as you know, are used both for freight and passengers; and the reservation of a line strictly for passenger use is quite unlikely. I think, although in certain areas it is conceivable, say in the Washington-New York area. But in most areas the line is simply not there, and to construct it would be very expensive.

So the route we are taking is to look at the suspension system of the train, to look at the way the train is built. We now know enough about dynamics, vehicle dynamics, to design a machine that will take a rough track with perfect safety and with perfect reliability, and give a reasonably smooth ride. We have just not done it. We are in the process of proceeding with a program of that type with the Metroliner in the coming year.

Mr. MURPHY. Can we realistically develop a system, within a decade, that would overcome the tremendously expensive problems of existing tracking and trestles?

Mr. BEGGS. I think we could have a tracked air-cushioned corridor in a decade, and I think we could have an advanced passenger train which would run perhaps at 150 to 170 miles per hour in less than a decade, perhaps 6 or 7 years. It would require a commitment quite early.

The northeast corridor report recommends such a train in the northeast corridor. The cost of that, I think, projects out at something in the order of \$480 million—to get an advanced passenger train running, but it requires a commitment if we are to get there by 1977.

Mr. MURPHY. This is what?

Mr. BEGGS. This is a train on a track, but it employs the most advanced concepts we know of in train construction and of train design. It would be an American equivalent, I think, of some of the work that the British have done in their advanced passenger train.

The big cost, of course, is the construction of the equipment and the improvement of the rights-of-way. Among the things you must do here if we are going to run trains of that speed is to eliminate all of the grade crossings between here and Boston. There still remain 47 grade crossings on that route. They are enormously expensive to eliminate, but they have to be eliminated. There are some bad curves in the track between here and Boston which also would have to be eliminated in order to achieve these speeds.

Beyond that, I think the standards of track maintenance have to be upgraded somewhat from what they are—not nearly to the standards that have been talked about in some quarters—for a high-speed train.

Mr. MURPHY. What about trestles?

Mr. BEGGS. I think you would have to go over the whole system—and we have done this somewhat but not completely—and determine whether the entire system is capable of sustaining the increased wear and tear it would get from these high-speed lines. But we have done this in some detail and, as I say, it runs out to about \$480 million to do the job.

Mr. MURPHY. That figure includes equipment as well as tracks?

Mr. BEGGS. As well as improvement of the track; yes, sir.

Mr. MURPHY. You can see us there, then, in 10 years?

Mr. BEGGS. A shorter time, assuming we get started; yes.

Mr. MURPHY. Well, with 100 miles an hour today, I just tried in my own mind to visualize the cost of getting that extra 50 miles an hour, which I think is critical to using it, and, of course, revenue return.

Mr. BEGGS. Yes, indeed. Of course, the Government got something of a bargain on those Metroliners. Our total investment in that project is about \$12 million, and I don't know how much the Penn Central put into it. I have never been able to find the line in the books, but they claim upward of \$50 million.

Mr. ADAMS. Neither has anyone else, Mr. Beggs.

Mr. BEGGS. Yes; I am aware of that, but the only Federal Government involvement in it consists of about \$12 million to subsidize the equipment and as a payment for certain experiments that we want to run on the operating side. That was a relatively modest investment for what we learned from it.

We learned an awful lot. We learned, I think, how to do it the next time a whole lot better, and we are learning a great deal about what service improvements will mean, and we are going to learn more before the experiment is over. So I think it was a genuine bargain for the Government, for a change.

Mr. MURPHY. What effect does cold weather, such as snow, have on the high-speed vehicles?

Mr. BEGGS. In the case of the Metroliner, it had a tremendous effect. This was part of the maintenance problem. Because of the design and the way that the machine was specified, and the fact that they had certain operating problems, they specified that none of the equipment could be put in the roof or the overhead part of the train. As a consequence, a lot of it was put underneath the train, and when the bad

weather came, the equipment was subjected to blowing snow and a lot of moisture. As you know, moisture is about the worst thing you can have with electrical equipment; and, as a consequence, we had a lot of failures.

It was a poor design. I think both the manufacturer and the operator will now acknowledge it was a poor design in the beginning. It was the first equipment we had built, the first passenger equipment we had built of any kind for any kind of speed range comparable to this since about 1950 or 1954.

Mr. MURPHY. The Japanese had the same problem.

Mr. BEGGS. The Japanese, of course, did. The Japanese adopted a little different philosophy than we did, although they tried to learn from the Tokaido experience. Unfortunately, all of the lessons were applicable to the northeast corridor and, in addition, we made mistakes of our own.

But I think in general we are quite satisfied now with the operation of the equipment. It has taken 2 years to bring it up to a reasonable level of maintainability and operation. But it is operating well now.

Mr. MURPHY. I was thinking we are at a vital decision point, and that is, to make an injection of dollar appropriations to do the trackage as well as the equipment and not to play a game of just going along with the equipment. The two go hand in hand in reaching the point at which people would get off of the airlines and get onto trains.

Mr. BEGGS. I don't disagree at all with your comment. I would suggest, though, that we examine all of the parameters of this problem, and particularly we want to be sure how much we can do with suspension. I think it would be a mistake to commit ourselves to track maintenance of the type the Japanese are doing on the Tokaido Express at this point in time, because I don't think it is necessary.

I think there is a great deal we can do in the design of the vehicle, but certainly some upgrading in track maintenance is going to be necessary. It is going to be essential that we get a better track maintenance program in existence in the Northeast Corridor. I don't know just how much we need at the present time. I think in a year or so we will be able to judge much better what standards we have to maintain.

Mr. MURPHY. I want to emphasize a comment of Congressman Metcalfe relating to safety. I have done some traveling by rail this year and I have not gotten into any car without a broken window. There is vandalism in our rapid-transit system in New York and Long Island, and that vandalism and the safety hazards to passengers is something that the local police have tremendous problems with. What the answer is, I don't know. But I am sure that you must have people working in that area.

Mr. BEGGS. Yes; I mentioned General Davis is spending almost full time working on that problem. Very significant measures already have been taken. For example, the Penn Central Railroad Co. is checking the line, at least as far down as into southern New Jersey, with a helicopter, trying to combat this vandalism. Also, that track is fenced for most of the way.

But still we are getting, as you say, broken windows from rocks, and we even have cases where rifle shots are taken at the train. I don't want to underplay the problem at all. It is an enormous prob-

lem. We have to get a handle on it and find some way to make the routes completely secure.

I am confident that we can indeed solve the problem. But it is going to take quite a lot of effort. It may take quite a bit of money before we are through. I don't think any problem in the Department is receiving more attention right now than this business of transportation security.

Mr. MURPHY. Thank you, Mr. Chairman.

Mr. ADAMS. Mr. Skubitz.

Mr. SKUBITZ. No questions.

Mr. ADAMS. Does anyone else have any questions?

(No response.)

Mr. ADAMS. I have one question. I understand a private corporation is now offering rail transportation where you put four passengers and a family car on a train from here to Florida. Have studies been made where there might be any other market for such service between other points?

Mr. BEGGS. Yes, sir. Mr. Chairman, we have run several studies on the autotrain concept. As a matter of fact, the concept originated in the Department, and it has now been picked up by a private corporation, as you said, and they are proposing to run a train to Florida. We are going to watch it with great interest. We wish them well. We hope it works out well for them.

I think we have some reservations respecting the system they propose, but it is an interesting approach, and I think that it has some chance of success. We have a report on the problem—and we can send it to the committee, although I think you have it—describing the concept and possible applications for it.

Mr. ADAMS. The committee would be interested.

Mr. BEGGS. Yes, sir.

(The report referred to may be found in the committee files.)

Mr. ADAMS. I have one more question. What is your experience with Lanham? We authorized the construction of a station there, but I understand only a few trains are stopping. Are you getting any suburban traffic?

Mr. BEGGS. We are getting some. To date, that experiment is not in full operation. It will be. That is, we will have more trains stopping. There is a major use of that station now. Mr. Loftus, who is following this program, says there is now a major use of the station and it is about 11 percent of that at Union Station.

In the experiment on the Metroliner, additional stops were programmed at the suburban stations to see how much passenger traffic we could attract. We have had high hopes, and I think we still have.

Mr. ADAMS. Thank you, Mr. Beggs. The committee appreciates your being here.

There being no further witnesses, the hearing is terminated.

(Whereupon, at 11:55 a.m., the subcommittee adjourned.)

