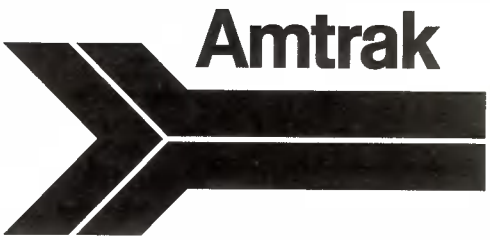
RAIL PASSENGER CORRIDORS

FINAL EVALUATION



by the

U.S. DEPARTMENT OF
TRANSPORTATION

FEDERAL RAILROAD ADMINISTRATION
and
NATIONAL RAILROAD PASSENGER CORPORATION

April 1981

THE SECRETARY OF TRANSPORTATION

WASHINGTON, D.C. 20590

APR 10 198

The Honorable George Bush
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

Amtrak President Alan Boyd and I are transmitting to you a report on a number of passenger transportation markets which we have reviewed for potential rail "corridor" service. This report was done in accordance with Section 1003 of the Rail Passenger Service Act, as amended. The evaluation contained in this report is restricted to only those factors specifically requested by Congress. These are rail ridership, energy conservation and cost effectiveness. Except where otherwise indicated, the report contains mainly uninterpreted factual data in order to develop an agreed upon, common base of statistical material from which further discussions can proceed. The report contains no policy or program recommendations because the perspective of the Department differs from that of Amtrak, leading to contrasting views of actions to be taken. In this letter I will summarize the Department's interpretation of the report.

The Department is opposed to expanding rail corridor services if they are in addition to existing Amtrak services. This position is based on three considerations:

- o few, if any, of the markets have any potential to support cost effective rail corridor service;
- o energy impacts of rail corridor development are at best insignificant and at worst wasteful; and,
- o in the light of overall transportation priorities, there is no justification in the report to support additional funding for corridors in addition to Amtrak's existing system.

Our study indicates that certain of the markets analyzed may have more potential for efficient operation than the worst of the services Amtrak now provides. In such cases, the Department would not oppose a decision by Amtrak to reprogram existing funds within the total $613 million we have requested to be appropriated in FY 1982.

Cost Effectiveness (See Tables III-5, IV-1, and IV-2 of the report)

With very few exceptions, the markets studied are not good opportunities for investment of public funds in rail corridor service. None of the markets could be served by rail corridor trains without an increase in public subsidy. Only nine corridors, at most, appear to have even marginal potential for helping Amtrak to meet the present Congressionally mandated goal of revenues covering 50 percent of costs by 1986, or the Administration's proposed goal for 1982.

Transportation can be provided in the corridors studied by means other than rail passenger service for a much lower public outlay. Amtrak's competitors--buses, autos and common carrier airlines--do not receive public subsidies approaching those necessary for additional corridor service in most of the markets studied. By comparison, rail corridor service would cost an average of 23 cents in public subsidy for each passenger-mile provided, or an average of $30.19 for each passenger ticket sold. The data indicate that only one of the 25 markets can be developed at a public cost of less than 10 cents for each passenger-mile, and only seven could be provided at a cost of less than 20 cents per passenger mile.

Energy Impacts (See Tables III-2, IV-1, and IV-2 of the report)

Based on several models developed under contract for the study, energy savings considerations alone could not support any further rail corridor development. Of the 25 markets (and submarkets) studied, rail service in 11 would actually consume more energy if the new or expanded rail service were implemented. In the other 14 markets, the average public expenditure for each gallon of gasoline saved would be $22.13. Even the corridor with the highest fuel savings potential, Los Angeles to San Diego, would require a net public outlay of $5.07 to save each gallon of fuel.

Even where energy on some corridors is saved rather than wasted, energy savings are small. The total conservation potential on these corridors amounts to less than .01 percent of the energy that would be consumed nationally by alternate modes.

National Priorities

Amtrak presently costs the taxpayer about $1 billion per year. With resources scarce, the Administation has concluded that we cannot, and should not, continue to subsidize all the services Amtrak now provides. As we have repeatedly testified, in the context of other national needs, the most we can justify for Amtrak in FY 1982 is $613 million--with lower Federal expenditures projected in subsequent years. This report provides no basis for increasing that figure.

I appreciate the opportunity for further discussion of the proper role for Amtrak in our national passenger transportation system. I look forward to working with you on this issue.

Sincerely,

Drew Lewis

National Railroad Passenger Corporation, 400 North Capitol Street, N.W., Washington, D.C. 20001 Telephone (202) 383-3000

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We have worked closely and cooperatively with the Department in preparing this report. We have mutually recognized from the outset, however, that we and the Department address this issue from different perspectives.

The Department, adhering to the evaluation method it proposed in its July 1981 report, has endeavored to evaluate the corridors solely on the basis of passenger miles and energy savings per dollar of public expenditure. These in themselves are reasonable measures, but they are not the only reasonable measures, nor are they the most communicative measures. They do not, for example, correspond with the Congressional criteria of short-term avoidable loss per passenger mile or passenger mile per train mile which are applied to trains currently in Amtrak's system. Nor do they correspond to the ratio of revenue to long-term avoidable cost which Amtrak regards as the most plausible single measure of a train's economic efficiency. While the Department's measures are useful in comparing the proposed corridors with each other, then, they do not serve to compare the proposed corridors with existing routes. Using more traditional measures, which are presented in the individual corridor profiles collected in Chapter V and summarized in Table IV-3, it is evident that many of the corridors assessed here would add significantly to the overall strength and efficiency of the Amtrak system.

Amtrak also believes that the public benefits of corridor service cannot be measured solely in terms of ridership and revenue. In an effort to assess other public benefits, Amtrak participated in approximately 30 community briefings in major cities along the proposed corridors. The public interest displayed at these meetings was extraordinary. The benefits

identified include urban revitalization, improved traveler safety, environmental compatibility, energy conservation, productive employment opportunities, and substantial savings of costs which will otherwise be incurred for alleviation of highway and airport congestion. The communities stressed above all the significant public benefit of having available a comfortable, convenient transportation alternative at a time when personal mobility will be increasingly constrained by deregulation of common carriers and increases in the price of fuel. In our view these are the kinds of benefits which ultimately justify public investment in transportation. They confirm our view that rail passenger service is increasingly in step with the requirements of the nation's urban areas. Summaries of these comments, specific to each corridor, are presented with each of the corridor profiles in Chapter V.

The expressed willingness on the part of states and communities to bear some of the financial burden needed to achieve these benefits is also noteworthy. Amtrak suggests that any legislative mechanism developed to implement an emerging corridors program should allow for and encourage extensive local participation.

Amtrak's role in preparing this report was principally to develop cost estimates for improvement of fixed facilities, provision of equipment, and operation of service. Our conclusions are presented in Chapter V's corridor profiles and are to some extent summarized in tables in other sections of the report. Amtrak also monitored the Department's preparation of demand forecasts and shares responsibility for those forecasts. We believe, however, for various reasons which we explain in the text, that the ridership projections may be considerably understated, and we would urge the reader to bear fully in mind the methodological caveats which attend any modelled effort to forecast five years in advance the performance of a qualitatively different kind of rail service from what is available today.

Amtrak takes particular exception to the Department's calculations of energy savings. These calculations depend heavily upon assumptions as to the back-up modes rail passengers would choose in the absence of rail service. Amtrak believes that the assumptions used by the Department are highly questionable. Our reservations, noted at length in the text, lead us to believe that actual energy savings would far exceed what the Department has calculated. This said, we would also note that although energy savings may be considerable, they are after all only an incidental benefit of corridor service. We do not quarrel with the Department's assertion that expenditures on corridor service cannot be justified by energy savings alone, and we have never attempted to justify an emerging corridors program exclusively on that basis.

A coherent transportation policy must begin with the recognition that transportation is in itself a public good, and that the kind of transportation available affects a host of social concerns, including not only energy conservation but also economic growth patterns, environmental quality, personal safety, and personal quality of life. We see a close fit between the kind of corridor service assessed in this report and the social needs this country will face over the next two decades. On this basis we consider public expenditure on selected rail corridors eminently justified.

Amtrak has for some time believed that densely populated corridors offer the most promising markets for the development of cost-effective passenger rail service in the United States. We have been encouraged in this belief by the successful experience other industrialized countries have had in operating this kind of service. The findings of this study now confirm our view. We are impressed by the favorable economic projections associated with many of these corridors, and we are prepared, with Congressional support, to move to a design and implementation phase.

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IDENTICAL LETTERS SENT TO:
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The Honorable Bob Packwood
The Honorable John D. Dingell

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EXECUTIVE SUMMARY

This report presents the results of an evaluation of improved Rail Passenger Service in 25 corridors and corridor segments, pursuant to Section 1003 of the Rail Passenger Service Act, as amended. Corridor service is evaluated in terms of ridership potential, energy savings and cost effectiveness, where cost effectiveness is measured by dollars of public expenditure per passenger-mile and per gallon of gasoline saved. Public expenditure is defined as the sum of annualized capital investment (amortization charges) and annual operating loss or subsidy (expressed as avoidable cost minus revenue).

Corridors are evaluated on the basis of both total service that would be provided (current service, if any, plus improvements and additional service) and incremental service, i.e., additional service and improvements. Unless stated otherwise, statistics presented in the report are for total service.

Forecasts of annual ridership expressed in passenger miles in Table 1 range from approximately 310 million for the New York-Buffalo Corridor and 180 million for the Philadelphia-Atlantic City Corridor, to less than 5 million in some corridors. Estimates of equipment utilization, expressed in passenger miles per train mile (PM/TM), range from 300 for the Philadelphia-Atlantic City Corridor and 180 for Los Angeles-San Diego, to less than 25. Twelve of the 25 corridors were estimated to generate less than 80 passenger miles per train mile.

Forecasts of incremental ridership (i.e., additional ridership attributable solely to the improved corridor service), excluding corridors without current service, range from approximately 160 million passenger miles for the New York-Buffalo Corridor to less than 12 million in some corridors. Estimates of incremental passenger miles per train mile for new, additional service (again excluding corridors without existing service) range from 167 for Los Angeles-San Diego and 154 for New York-Buffalo to less than 50.

The corridors vary greatly in terms of their annual public expenditure requirements for both the total and incremental requirements (see Table 1). In particular, corridors such as Los Angeles-San Diego, Chicago-Milwaukee, Washington-Richmond, and Philadelphia-Harrisburg have a relatively low requirement for incremental, i.e., additional, public expenditure because adequate capacity and track conditions already exist. At the other end of the scale are the

TABLE 1

SUMMARY OF CORRIDOR RIDERSHIP
REVENUE AND COSTS - 1985: TOTAL AND INCREMENTAL
(FY 80 Dollars in Millions)

Corridor	Revenues		Avoidable Cost		Avoidable Loss		Total Capital Costs (Fixed Facility & Equipment)		Annual Capital Cost (Equipment & Fixed Facilities)		Annual Public Expenditure	
	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental
Atlanta-Nashville	1.6	1.6	10.1	10.1	8.5	8.5	58.9	58.9	6.5	6.5	15.0	15.0
Atlanta-Savannah	0.5	0.5	9.9	9.9	9.4	9.4	46.5	46.5	5.3	5.3	14.7	14.7
Boston-Springfield-New Haven	5.9	5.9	9.0	9.0	3.1	3.1	84.5	84.5	9.2	9.2	12.3	12.3
Cleveland-Columbus-Cincinnati	2.7	2.7	10.7	10.7	8.0	8.0	91.6	91.6	9.8	9.8	17.8	17.8
Chicago-Cincinnati	10.1	10.1	13.6	13.6	3.5	3.5	99.1	99.1	10.9	10.9	14.4	14.4
Chicago-Cleveland	8.1	6.1	19.4	15.1	11.3	9.1	48.7	38.7	6.2	4.7	17.5	13.8
Chicago-Detroit	13.6	5.8	22.6	11.1	9.0	5.3	69.5	52.7	8.3	5.8	17.3	11.1
Chicago-St. Louis	9.0	4.0	19.1	8.5	10.0	4.5	68.0	51.3	7.9	5.4	17.9	9.9
Chicago-Twin Cities	12.0	12.0	19.6	19.6	7.7	7.7	164.8	164.8	17.5	17.5	25.2	25.2
° Chicago-Milwaukee	4.0	1.7	8.8	2.4	4.8	.8	23.3	6.5	3.0	.8	7.8	1.6
Los Angeles-Las Vegas	9.9	8.0	16.1	11.7	6.2	3.7	59.2	49.9	7.1	5.7	13.3	9.4
Los Angeles-San Diego	18.5	5.5	23.9	6.0	5.3	.5	36.5	9.3	5.0	.9	10.3	1.4
San Jose-Reno	5.5	5.5	15.2	15.2	9.7	9.7	27.6	27.6	3.4	3.4	13.1	13.1
° San Jose-Sacramento	1.7	1.7	7.4	7.4	5.7	5.7	19.3	19.3	2.5	2.5	8.2	8.2
Miami-Jacksonville	9.4	9.4	18.1	18.1	8.8	8.8	47.6	47.6	5.6	5.6	14.4	14.4
New York-Buffalo	31.1	16.5	51.4	23.7	20.4	7.2	135.0	47.3	18.3	5.1	38.7	12.3
° New York-Albany	8.7	3.8	22.7	7.6	14.0	3.8	70.2	30.9	9.4	3.5	23.4	7.3
Philadelphia-Atlantic City	18.1	18.1	30.3	30.3	12.2	12.2	66.0	66.0	8.7	8.7	20.9	20.9
Philadelphia-Harrisburg	6.2	2.0	13.0	2.8	6.8	.8	68.7	42.7	8.2	4.3	15.0	5.1
Seattle-Portland	5.9	2.6	15.9	7.6	10.0	5.0	74.1	60.7	8.5	6.5	18.5	11.5
Texas Triangle	12.5	12.5	45.0	45.0	32.5	32.5	284.6	284.6	30.4	30.4	62.9	62.9
° Dallas/Ft. Worth-Houston	5.1	5.1	18.4	18.4	13.2	13.2	115.4	115.4	12.2	12.2	25.4	25.4
° Dallas/Ft. Worth-San Antonio	4.6	4.6	20.0	20.0	15.3	15.3	160.2	160.2	16.7	16.7	32.0	32.0
° Houston-San Antonio	2.7	2.7	9.2	9.2	6.6	6.6	80.7	80.7	8.7	8.7	15.3	15.3
Washington-Richmond	3.9	2.9	8.4	5.0	4.5	2.1	26.9	19.1	3.5	2.3	8.0	4.4

Texas Triangle Corridors, and the Chicago-Twin Cities and the Philadelphia-Atlantic City Corridors. All have little or no service now and high projected incremental public expenditures reflect the amortization of large capital investments for equipment and fixed facilities as well as the operating subsidy for a significant amount of new service.

The Los Angeles-San Diego and New York-Buffalo Corridors have significantly better projected performance than any of the other corridors, when measured in terms of annual public expenditure cost per incremental rail passenger mile, 3¢/pm and 8¢/pm, respectively, as shown in Table 2. Conversely, 17 of the 25 corridors projected poor performance - more than 20¢/pm. These "incremental" measurements show how much it costs to serve new traffic. When measured in terms of total passenger miles per total dollar of public expenditure, including the subsidy, the same two corridors rank at or near the top of the list at 6¢/pm and 12¢/pm, respectively. The Philadelphia-Atlantic City Corridor, which has no service currently, is also near the top, at 12¢/pm.

There would be energy savings from some corridor improvements, but in 11 cases there would be energy losses. In 10 more corridors each additional gallon of gasoline saved would cost between $15 and $260. As Table 2 shows, even for corridors with the best energy savings in relation to cost, an expenditure of over $5 is required for every gallon of gasoline saved. Consequently, anticipated energy savings in and of themselves do not serve as a basis for justifying corridor improvements.

Other criteria for evaluating corridor service have been suggested by Amtrak and are included in the report. These include avoidable loss per passenger mile and ratio of revenue to avoidable cost. Many of the routes meet the current financial criteria in the Rail Passenger Service Act for retaining short distance routes in the Amtrak system (a route cannot have an avoidable loss/pm greater than 10 cents). These also are the routes with high revenue to avoidable cost ratios. With regard to these data, the Department notes that incremental capital costs are, in fact, avoidable but have not been included in these estimates of avoidable costs.

The Department and Amtrak wish to highlight differences over some of the results presented in this report. Amtrak believes that energy savings due to corridor service are understated because the forecasts, in Amtrak's opinion, overstate diversion from bus. Amtrak also believes that rail ridership is understated. To assess the likely consequences of these and other potential errors, a number of sensitivity analyses were undertaken. The sensitivity analyses suggest, in the Department's view, that the results of the evaluation are not significantly affected by even large changes in the key variables.

TABLE 2

ANNUAL PUBLIC EXPENDITURE
PER PASSENGER MILE AND PER GALLON OF GASOLINE SAVED

Corridor	Annual Public Expenditure Per Passenger Mile Total	Per Passenger Mile Incremental	Per Gallon Saved (lost)* Total	Per Gallon Saved (lost)* Incremental
Atlanta-Nashville	.97	.97	(55.56)	(55.56)
Atlanta-Savannah	3.00	3.00	(35.25)	(35.25)
Boston-Springfield-New Haven	.23	.23	(56.94)	(56.94)
Cleveland-Columbus-Cincinnati	.65	.65	(140.16)	(140.16)
Chicago-Cincinnati	.15	.15	(84.21)	(84.21)
Chicago-Cleveland	.21	.23	11.14	11.86
Chicago-Detroit	.13	.20	29.37	36.63
Chicago-St. Louis	.20	.29	86.47	89.19
Chicago-Twin Cities	.21	.21	35.44	35.44
o Chicago-Milwaukee	.22	.13	(36.28)	(21.62)
Los Angeles-Las Vegas	.14	.12	17.34	15.04
Los Angeles-San Diego	.06	.03	5.07	2.49
San Jose-Reno	.27	.27	(47.64)	(47.64)
o San Jose-Sacramento	.54	.54	(164)	(164)
Miami-Jacksonville	.17	.17	(134.58)	(134.58)
New York-Buffalo	.12	.08	10.95	6.89
o New York-Albany	.28	.21	316.22	260.71
Philadelphia-Atlantic City	.12	.12	7.42	7.42
Philadelphia-Harrisburg	.26	.52	(49.34)	(102.00)
Seattle-Portland	.35	.90	34.07	87.79
Texas Triangle	.49	.49	51.18	51.18
o Dallas/Ft. Worth-Houston	.47	.47	52.37	52.37
o Dallas/Ft. Worth-San Antonio	.67	.67	89.14	89.14
o San Antonio-Houston	.56	.56	39.74	39.74
Washington-Richmond	.22	.16	(30.77)	(22.00)

o Sub-segment of preceding corridor.

* Data in ( ) signifies negative savings

CHAPTER I

INTRODUCTION

PURPOSE

Section 1003 of the Rail Passenger Service Act, as amended, requires the Secretary and Amtrak to submit a report to both Houses of Congress by February 15, 1981, on the final evaluation of rail corridors, to include for each corridor: rail ridership projections, operating costs and revenue projections, and projected capital expenditures for improvements. This report is the Department of Transportation's and Amtrak's response to that mandate.

BACKGROUND

Over the past two years, as Americans have begun to adjust to long-term energy constraints, and as the nation has begun to deregulate various aspects of intercity passenger transportation, great interest has grown around the idea of developing and improving passenger rail service in various population corridors around the country. It has been suggested that frequent and reasonably fast train service over short to medium distances, carrying the passenger from city center to city center, might provide an attractive, energy-efficient alternative to airline and automobile service, capable of penetrating a substantial travel market.

Amtrak and the Department of Transportation have believed for some time that corridor service might offer the possibility of improving Amtrak's ratio of revenue to costs. Amtrak regards rail corridors as potentially attractive areas for capital investment, offering both near-term, as well as long-term promise. In addition, corridor rail stations could serve as multimodal transportation centers linking rail with intercity and local bus connections and local highway systems. In short, corridor rail service, as compared with long haul rail service, takes maximum advantage of the strengths of railroads as a means of intercity passenger transportation. In this context, over the past few years, Congress has directed that a series of corridor studies be undertaken by Amtrak and the Department. A list of published reports resulting from these studies is contained in Appendix A.

This report is the latest and most comprehensive in that series. It offers ridership, revenue, and capital and operating cost projections for each of the 25 corridors and corridor segments identified for

study. Based upon these projections, the report evaluates the corridors comparatively, employing a method developed by the Department in its July 1980 preliminary report, which assesses each corridor in terms of public expenditure per passenger mile and gallons of fuel saved.

In reviewing comments solicited from State and local representatives, Amtrak concluded that there may be additional dimensions by which potential rail corridors could be evaluated. One example, beyond the scope of this study, would be to conduct a cost-effectiveness comparison among competing modes. Many of the corridors examined in this report would require substantial capital expenditures to achieve the improved level of service envisioned. It may be that alternative improvements of freeway construction and maintenance may equal or exceed the cost of rail improvements and operations over time. As potential subsidizers of whatever mode is ultimately favored, the local communities and the States are in the best position to make such judgments.

EARLIER LEGISLATIVE MANDATES

The Passenger Railroad Rebuilding Act of 1980 (P.L. 96-254) amended the Rail Passenger Service Act (45 U.S.C. 501 et seq.) to add Section 1001 which required the Secretary of Transportation to produce, in consultation with Amtrak, a method for evaluating rail corridors that have the greatest potential for (a) attracting riders, (b) reducing energy consumption, and (c) providing cost-effective rail passenger service. The Secretary was to apply this method and rank the corridors. The Department responded to this requirement in its July 1980 Report, "Rail Passenger Corridors: Evaluation Method and Ranking," submitted to the Congress in early October 1980.

Section 1002 of the Rail Passenger Service Act, as amended, authorized Amtrak, upon completion of the preliminary ranking, to " . . . develop design and engineering plans to the extent necessary to provide accurate information on capital expenditures for improvements and equipment, operating cost projections, running times, and other information which the Corporation, in consultation with the Secretary, determines necessary to complete an accurate assessment of the anticipated costs and benefits of instituting new service in such corridors." In preparing such estimates, Amtrak was specifically required to consult with the Secretary and appropriate officials of each State which the corridors serve and to coordinate with rail carriers owning track in these areas.

COORDINATION OF STUDY

This study was conducted jointly by the Department and Amtrak. The Department had lead responsibility for demand forecasting while Amtrak had lead responsibility for the estimation of resource requirements and costs. In all cases, the Department and Amtrak have coordinated the analysis and study activities leading to the preparation of this report.

The Department and Amtrak representatives held briefings in Washington (December 12, 1980), San Francisco (December 15, 1980), and Chicago (December 17, 1980) to provide a status report on the current study, to discuss the study methods employed, and to solicit comments and information relating to this study. In addition, and at the invitation of local officials, Senators and Members of Congress, Amtrak provided a briefing on this study in at least one city on each of the corridors under consideration. At these community briefings Amtrak explained the purpose of the study and solicited comments and information from community leaders and officials.

The private railroads own right-of-way and related facilities in each of the prospective rail passenger corridors. In June 1980 the Department and Amtrak requested comments from each affected carrier on improvements for rail passenger service over its lines. Their comments have been incorporated into the development of required improvements and estimation of associated costs.

ORGANIZATION OF REPORT

This report is divided into five chapters and associated appendices. Chapter II contains a description of the general approach taken in this study. Because of the preliminary nature of the July 1980 Report and the updating of data in the current report, particular attention is given to revisions made to both the earlier evaluation method and the data base.

Chapter III describes the results of the analyses including rail passenger demand forecasts, energy savings, costs and revenues.

Chapter IV presents the cost effectiveness analysis; compares the corridors to the Northeast Corridor; discusses the sensitivity of the cost effectiveness results to key variables such as frequency of service, estimates of current origin-to-destination travel by auto, fare levels, energy costs, and the changes in population and income levels; and briefly summarizes the results of the evaluation.

Chapter V contains information on each of the corridors, including a description of the rail route itself, the equipment and engineering requirements to improve the route for the higher level of service

being evaluated, ridership projections, and operating statistics, and results of public hearings held by Amtrak in major cities of the corridors.

Appendix A contains a listing of the Emerging Corridors Reports previously submitted to Congress as well as earlier reports prepared for the Department.

Appendix B is a discussion of the methodology used for estimating base year auto travel.

Appendix C reflects the computations used in determining fuel savings as well as a discussion of how auto fuel efficiency was determined.

Appendix D contains, at the request of GAO, an analysis of fuel savings if the projected increase in rail demand were to be diverted to buses rather than trains.

Appendix E reflects information which, at the request of Senators Packwood and Cannon, has been prepared to provide a comparison of each corridor with the New York-Washington, D.C. segment of the Northeast Corridor. In addition to demographic and physical characteristic comparisons, information is presented to permit comparison of several financial measures.

CHAPTER II

APPROACH

The approach used in the study leading to this report is similar to the approach described in the July 1980 Report, although some modifications have been made to address concerns expressed by Amtrak, State and local officials, and the General Accounting Office. The modifications fall into two categories: (1) revisions in the evaluation method; and (2) changes in the estimation of measures used in the evaluation.

CHANGES IN EVALUATION METHOD

The evaluation method presented in the July 1980 Report was developed pursuant to Section 1001 of the Rail Passenger Service Act, as amended, which required the Secretary to develop a method for evaluating corridors to determine which corridors have the greatest potential to attract riders, reduce energy consumption, and provide cost-effective service. The evaluation method used in this report is the same as the method presented in the July 1980 Report, except that (1) the corridors are evaluated on an incremental as well as an absolute, i.e., total service, basis, and (2) the State commitment factor is not used.

The incremental analysis compares changes in ridership (passenger miles) and energy savings attributable to the improvement to the cost of the improvement, including the cost of improvements to fixed facilities, the cost of the additional equipment and the cost of the additional services operated (net of revenues). Thus, the incremental cost per new passenger mile for a particular corridor is calculated as follows:

$$IC = \frac{ic_f + ic_e + ic_o}{ip_m}$$

Where:

IC = incremental cost per new passenger mile

ic_f = annualized cost of improvements to fixed facilities

ic_e = annualized cost of additional rolling stock and locomotives

ic_o = annual cost of operating the additional service net of the additional revenue

ip_m = passenger miles associated with new passengers annually

The method of analysis for the relative impacts of improved corridor service is the same as that used for the July 1980 Report. Estimates of 1980 totals for ridership and energy saving are compared to the cost of delivering total corridor service, including the cost of improvements to fixed facilities, the total cost of all rolling stock and locomotives required for the service to be operated, and the total cost of operating the service (net of revenue). The total cost per passenger mile for a particular corridor is calculated below:

$$TC = \frac{ic_f + tc_e + c_o}{pm}$$

Where:

TC = total cost per passenger mile

ic_f = annualized cost of improvements to fixed facilities

tc_e = annualized total cost of all rolling stock and locomotives

c_o = annual cost of operating the total corridor service net of total revenue

pm = total passenger miles annually

CHANGES IN ESTIMATION OF EVALUATION FACTORS

The Act also states that the Secretary shall consider six specific factors in developing the evaluation method. The factors are defined as they were in the July 1980 Report. The principal changes are in the estimation procedures and the quality of available data. The changes to each of the factors are explained below:

Potential Ridership

The Department and Amtrak wished to obtain a second forecast of ridership and more accurate estimates of current auto travel between city pairs. This latter statistic is critical to more valid forecasting of rail ridership, since auto travel constitutes more than 80% of intercity trips on a national basis. Estimates of auto ridership were improved by the acquisition of traffic volume data from State highway department representatives. The method used to estimate intercity auto travel is described in Appendix B.

To forecast ridership for the corridors in this study, the Department used a method that has been applied in the Northeast Corridor.1/ The method involves two separate but related calculations. First, forecasts are made for total intercity ridership for each major city pair using a "total demand" model. Total ridership for each of the major city-pairs is then apportioned among each of the intercity modes (bus, rail, air and auto) using a "modal choice" model. Demand is forecast for both total corridor service as well as for the new additional service (incremental demand).

The total demand model uses a regression equation to forecast total city-pair ridership. Key variables are population and income, a composite of the time and cost of travel by all modes between the cities, and the relative attractiveness of other possible city destinations on the corridors.

The modal choice model is a disaggregate model which forecasts the modal decision of individual intercity travelers based on the purpose of the traveler's trip, the traveler's economic status and pertinent transportation factors. The transportation factors are: line haul travel time and cost between cities by each mode, the cost and time to travel to rail, air and bus stations at both origin and destination cities, and frequency of service by each common carrier mode.

For purposes of comparability and consistency in assessing corridor ridership, certain assumptions were made. For example, frequency was assumed to be three round trips per day in addition to the current level of service operated on a route. The one exception to this assumption is the Philadelphia-Atlantic City Corridor, where the anticipated continuation of rapid growth in visitors and commuters due to planned casino openings appeared to justify 12 frequencies a day as a more reasonable base case. In those corridors where current service exists but is either infrequent (e.g., one round trip per day or less) or the schedule of train arrivals and departures are at particularly inconvenient times of the day, current service is assumed to be nonexistent for purposes of analysis.

1/ A more detailed description of this forecasting method can be found in a document titled, Demand Forecasting Methodology for the Northeast Corridor, dated March 1979, produced by the Aerospace Corporation for the U.S. Department of Transportation.

The following key assumptions were also used: fares were set at approximately $.09 per mile, the current Amtrak system average; cost of energy was based on a per-gallon price of gasoline of $1.60 (in 1980 dollars); and population and income, which influence total intercity travel and modal choice were set at levels forecast by the National Planning Association.2/

The ridership model employed in making these projections is regarded by both Amtrak and the Department as the most methodologically defensible model available. In considering these projections, however, certain weaknesses common to all multimodal demand forecasting models that the Department or Amtrak have used, must be kept in mind. First, because the model calculates modal preference primarily on the basis of time and cost efficiency, it initially disregards the noneconomic determinants of modal choice, such as comfort, perceived safety, in-transit amenities, and the like. These noneconomic determinants of modal preference can be significant, and in order to account for them, the model uses a calibration factor based upon past displays of modal preference. However, because these data are based principally on 1977 experience and predate many of the environmental changes and service improvements that have markedly increased rail passenger traffic in the last few years, the calibration factor may not accurately define the modal preference that may exist for passenger rail travel in 1985.

Second, the calculation of the total corridor travel market is complicated because of the difficulty of accurately gauging total automobile traffic on the corridor in 1977. The consequences of variations in automobile demand are discussed in Appendix B.

Third, Amtrak believes that the model may underestimate the contribution to passenger rail demand that is made by increased frequencies. Amtrak is also of the belief that its experience demonstrates that an increase in frequencies significantly affects the perceptions of the traveling public by making the rail passenger alternative seem a sensible and realistic travel option, with an effect on demand disproportionate to the actual measurable increment in convenience. In view of the foregoing, as well as the length of the forecast period, the volatility of energy costs, and the forces that are at work in the market place which could have an impact on increased reliance on rail service (e.g., airlines have been deregulated and the potential for bus industry deregulation exists) render any forecast that depends on these factors highly judgmental.

2/ The Geography of Growth, 1976-1990, National Planning Association, December 1978.

The report addresses this problem through a series of sensitivity analyses which tested the impact on ridership forecasts of variations in key factors such as frequency of rail service, auto ridership levels, energy cost, rail fares, and population and income. Included in the sensitivity analysis is a test of the financial implications of base demand being understated by 25%. The analysis did not yield significant differences in the results when even large changes in key variables were tested.

Operating Costs and Revenues

No changes were made in the estimation of operating costs and revenues except to estimate incremental operating costs and revenues (i.e., the costs and revenues solely attributable to the additional service) as well as total operating costs and revenues. This report uses several terms to describe operating costs and revenues. Definitions of the following terms will be useful in understanding the costs and revenues associated with the corridors:

Passenger Miles (PM) -- The total annual number of miles traveled by passengers which are attributable to a given route. It includes not only travel on the route itself but where appropriate, travel on connecting routes which would not occur in the absence of the former route.

Train Miles (TM) -- All miles that trains annually travel over the route. For example, if one round-trip service is provided on a 100 mile route daily, the train miles traveled in a day are 200; the annual TM for this route would be 73,000.

Avoidable Cost -- The annual operating costs of train service for such items as fuel, crews, food supplies, maintenance of equipment, payments to the railroads, and station personnel. These costs are specific to the particular route and, as used in this study, includes a factor for distributing Amtrak overhead.

Revenues -- The annual ticket receipts, food and beverage revenues and amounts received for express package service provided over the route.

Avoidable Loss -- The difference between revenues and avoidable costs.

Facility Improvement Costs

The funds appropriated by the Congress to conduct this study were earmarked for marketing projections only, with nothing allocated for the engineering studies required by Section 1002 of the Rail Passenger Service Act, as amended. However, Amtrak conducted on-site evaluations with Amtrak staff and carrier representatives over most

of the proposed routes to determine the scope of work that would be required to make the corridor capable of handling three additional Amtrak round trips per day at a maximum speed of 79 mph. Although comments by the owning railroads were solicited and considered, no negotiations were undertaken to agree upon the scope of work or costs. Consequently, the engineering costs presented in this study are approximate. They are nonetheless based on actual knowledge of most of the proposed corridors and therefore represent a significant improvement over earlier estimates of corridor capital costs that Amtrak has provided. Amtrak cannot, at present, assign a precise cost to each route recognizing that the scope of the work to be performed must first be negotiated with the carriers and then followed by detailed engineering studies.

The following criteria were considered in evaluating each line segment:

- The condition of track
- The type of signal system
- The existing traffic volume
- The potential capacity of the line to handle increased traffic
- The extent of speed restrictions imposed by engineering conditions and terrain
- The impact of local speed ordinances
- The terminal facility requirements

A maximum speed of 79 mph was selected because it represents the top speed allowable on tracks meeting FRA Class 4 standards without the addition of a costly supplemental signal system such as Automatic Cab Signals (ACS) or Automatic Train Control (ATC) with no material benefit in reduced running times for freight trains. Upgrading track and signal systems to a quality that meets higher standards is considered too expensive to justify the slight reductions achieved in travel time. Freight operations have been considered in determining the capital requirements as well as the selection of routes.

Condition of Track. The quality of track is dependent upon the condition of its various components, i.e., rail, ties, ballast, surface and alignment. Failure of one or more of these components will affect the wear on the others and result in deterioration of the overall track quality.

When replacement of deteriorated track components is required, this report assumes replacement with the existing type of material. However, in some cases an improved ballast is required, and replacement rail programs contemplate continuous welded rail, which results in reduced maintenance costs. Some of the replaced rail would be suitable for welding and reused as replacement rail.

Signal System. Signal systems vary greatly from one line segment to another. Most routes are equipped with Automatic Block Signals and in some cases supplemented with a Traffic Control System (TCS). On some segments, no block signals are in use. The ability of a line segment to handle traffic is governed to a certain extent by the signal system in service and the flexibility it provides to handle increased volumes of traffic. Although Automatic Block Signals are satisfactory for corridor operations when the existing physical plant is capable of accommodating an increase in traffic, modification of that system to a TCS may be required to provide increased flexibility and capacity in order to expedite train movements. Modification of a block signal system to TCS is less costly than the alternative of constructing and signaling additional tracks.

Traffic Volume. Some routes have experienced substantial increases in traffic while others have experienced a decline. Large traffic increases have resulted from the movement of coal, export grain, petrochemicals, trailers and containers. Current freight data, including the number of trains operated and gross tonnage handled, were evaluated for various route segments. Consideration was also given to past and future traffic trends and present passenger traffic operated.

Potential Capacity. The potential capacity to handle freight and passenger traffic varies greatly from one line segment to another. To a great extent, it is dependent on the number of main tracks and availability of sidings and crossovers to accommodate meeting and passing trains. A further consideration on multiple main tracks is whether each track is signalled for handling trains in only one or in both directions. In addition, the terrain over which the line is constructed may impact on the ability of that line segment to accommodate traffic. The evaluation assessed each segment with regard not only to increased passenger train frequency, but also to the trend on each segment with respect to freight volume. The study addresses the modifications required, if any, to handle increased traffic.

Speed Restrictions. Expeditious schedules suffer a negative impact by engineering conditions with the result of reduced speeds and longer elapsed running times. Terrain of the area traversed dictates the degree of curvature and grades required. Examples of such speed restrictions are track curvature, diverging turnouts and condition of bridges. The scope of the improvements in this study do not contemplate the elimination of engineering constraints on the present routes, such as improvements in alignments or grade reductions; however, superelevation requirements on curves have been taken into consideration.

Local Speed Ordinances. Capital improvements should substantially increase the capacity of the selected line segments to accommodate passenger trains on reasonable schedules. The advantage of such improvements will be materially reduced and the ability to provide expeditious schedules will be seriously diminished by the frequency and severity of local speed restriction in certain cities and towns. California has taken legislative action to correct this situation by setting aside existing restrictions and by authorizing a government agency to regulate the future imposition of such restrictions. However, many other States allow local governments to impose severe speed restrictions on the movement of trains through their communities. The propriety of initiating efforts or expending capital to improve rail lines without substantial relief from local speed restrictions should be seriously questioned.

Terminal Facilities. This includes facilities both for the handling of passengers such as waiting rooms, ticketing, baggage handling, parking, and for the storage and turnaround servicing of cars and locomotives. The report includes capital costs for passenger handling facilities at terminal points and other key locations. The end points of most corridors require the construction of expansion trackage for the storage and servicing of equipment; of support facilities, for the cleaning, servicing, and maintaining of equipment, standby power and the provisioning of food supplies.

Equipment Costs

Amtrak has estimated in 1980 dollars the equipment costs that would be required by the implementation of corridor service over the various routes. The specific equipment costs for each corridor are provided in the profiles contained in Chapter V.

The capital costs for equipment are broken down into two categories: the value of the existing equipment currently used on the route, and the cost of the required incremental equipment. Where equipment other than Amfleet is currently in use, the Amfleet equivalent was used for purposes of calculating the current value of that equipment.

If no figure is given for the existing equipment category, either no Amtrak service is provided over that particular route, or the current service and equipment used are not equivalent to corridor requirements (e.g., the route is served by part of a long-haul train). For the purposes of determining the capital equipment costs required to start corridor service, the incremental dollar amount is the most important. This figure indicates how much would have to be spent on new rolling stock.

In addition to the cost figures, the type of equipment used on the particular corridor is indicated. For purposes of comparability and consistency, most routes are assumed to use an Amfleet train set--

one locomotive (F40), plus the appropriate number of coach cars (84 seats per car), and at least one Amcafe car (53 seats). However, because of terrain conditions, Los Angeles-San Diego requires two locomotives. Only the New York City-Albany segment of the Empire Corridor would use the Turboliner train set--two power coaches (40 seats), one at each end, plus the appropriate number of coach cars (72 seats), and one cafe car (52 seats). Because the Empire Route already uses Turboliners, this assumption would provide the most efficient use of existing equipment. The other exception is the Philadelphia-Harrisburg Corridor. Because the Philadelphia-Harrisburg Corridor is electrified, it would use the Jersey Arrow train set--the appropriate number of self-propelled double-car coaches (196 seats), with no food service car.

The size of the train sets for a specific corridor is based on the PM/TM figure derived from the Department's ridership projections. A 55 percent load factor has been used to determine the size of the required train sets. For example, if the PM/TM figure is 100 passengers, an Amfleet train would require two 84-seat coaches and one 53-seat Amcafe.

Capital costs for equipment and improvements to fixed facilities are annualized and added to annual operating costs to compute total annual costs. Annual public expenditure is defined as the sum of annualized capital costs and avoidable loss.

Evidence of State Commitment to Rail Passenger Service

The July 1980 Report relied on evidence of past State financial support of rail passenger service to assign States to one of three categories: minimal commitment, moderate commitment, and significant commitment. Weights were assigned to each category and the weight assigned a particular State was used as a multiplier against a corridor's cost effectiveness ranking score. The Department had reservations on this approach for, as several of the States and Amtrak contended, it served to penalize or reward States for past performance when the basic issue being addressed is what State and local authorities would do about future rail passenger service. Therefore, the foregoing approach has been omitted from this report. What an individual State intends to do in the future to support a potential rail corridor should provide the best evidence of State commitment.

Projections of Economic and Demographic Growth and the Cost of Energy

In response to concern expressed by representatives from States experiencing large population and economic growth, 1990 forecasts were made for selected corridors. The results were used to judge the sensitivity of rail ridership in these and other corridors to population and associated income changes.

Because of the rapid increases in the cost of oil, the price of gasoline was increased from the $1.40/gallon used in the July 1980 Report to $1.60/gallon, both expressed in 1980 dollars. In addition, sensitivity analyses were run to test the impact on rail ridership if the price of gasoline were to go to $2.15 and $2.70/gallon, also expressed in 1980 dollars. The potential impact of such changes on rail ridership in specific corridors is discussed in Chapter IV.

Modal Energy Efficiency

In computing measures of energy efficiency, changes were made in two general areas. The first concerns the source of statistics used in estimating diversion from competing modes to the improved rail service. The second change concerns fuel consumption data of individual modes.

Computation of Diversion Factors

A key in calculating the relative fuel savings, if any, of an improved rail corridor is to determine how many passengers would switch to the improved rail service from their normal choice of intercity travel mode, i.e., auto, bus, or air. The July 1980 Report used the results of a survey of intercity rail passengers conducted by Amtrak in October 1979. There were some reservations in using these results since the survey had not been designed to address specifically the question of modal preference. However, it was the best information available at the time.

This study used factors related to the competitiveness of the individual modes to estimate both incremental and total energy savings. Estimates of incremental savings were obtained by first forecasting total intercity passenger ridership for rail, air, auto, and bus, assuming an improved rail passenger system in 1985. Similar calculations were then made for 1985 assuming no improvements to existing rail. This latter situation, for example, assumed no rail service for the Texas Triangle, but in the case of the New York to Buffalo Empire Corridor current train frequencies and schedules were used. The incremental saving is the net difference of the two. The differences between the two forecasts show how demand would be redistributed over the modes under an improved rail situation. This method also has the advantages not only of producing redistribution of data on a corridor-specific basis, but also of automatically identifying the demand induced by the new rail service.3/

3/ "Induced demand" occurs when a significant improvement is made in a transportation mode; as a result, people who would not have made the trip ride the improved mode.

The method suffers, however, from the general problems with the demand model that have been noted in this chapter especially in its assumptions regarding modal preference. Amtrak believes that the demand model is biased toward past travel patterns, which in turn reflect inferior levels of rail service and may, therefore, understate the degree to which improved rail service would divert ridership from airplanes and automobiles, and overstate the degree to which improved rail service would divert ridership from buses. In Amtrak's view, therefore, the diversion factors shown in Appendix C, Part A, provide a conservative estimate of the energy savings in corridor service. While the Department recognizes that inaccuracies exist in demand models, the analysis would not be presented if there were any evidence of a bias in any particular direction.

It is Amtrak's clear, unequivocal belief that its experience demonstrates that as additional passenger rail service is offered, riders are diverted from the automobile and, in some cases, airplanes, but only very slightly from buses. Amtrak believes further that this experience is strongly supported by independent market surveys and the experience of other countries. Amtrak maintains that these surveys and experience also show that when rail service is reduced, people turn to the automobile, not the bus. Amtrak argues that this pattern was clearly followed in 1971 as rail routes were abandoned when Amtrak was created and that it was also the case when the British reduced rail service and actively sought to promote the bus as an alternative. (In this instance, the effort failed; people chose automobiles over the bus, and rail service was reintroduced.) Accordingly, Amtrak registers a major dissent from the assumptions in the Department's model that expanded corridor rail service would divert people who would otherwise have taken the bus. Since all energy conservation assumptions and the cost-effectiveness analysis are based on what Amtrak considers to be a fundamentally erroneous projection, Amtrak suggests that such conclusions must be treated with caution.

The Department understands Amtrak's concern that bus diversion may be overstated and has done a careful analysis of two Amtrak systemwide, on-board surveys during 1979. These surveys suggest that a significant portion of Amtrak riders will use bus. The survey results show that an average of 25% of Amtrak riders answered that bus would be their "fallback" mode, i.e., that they would use "bus" when responding to the question, "If there were no rail service between these two cities what mode of travel would you have selected as an alternative?"4/

Total energy savings are estimated as above except that the case of "no corridor rail service at all in 1985" is always compared with energy consumption under the improved rail scenario.

4/ Amtrak Passenger Assessment Surveys, February 1979 and October 1979.

Changes to Data for Calculating Modal Fuel Efficiency

This report contains data on fuel efficiency for air and auto that became available after publication of the July 1980 Report. A decision to use the same estimates of rail fuel efficiency as were used in the July 1980 Report was made only after more recent experiments validated the reliability of these estimates.

Rail Fuel Efficiency

This report employs the same procedures used in the July 1980 Report for estimating passenger miles per gallon (pm/g) for rail. The estimates of pm/g were generated by the simulation of a hypothetical train comparable in approximate size and weight to that which would be expected to operate in the corridor. The technique also simulates the route in terms of track geometry, trip time, slow orders and other operating conditions. At the time of initial use of these data, however, there were few actual data on which to validate the results of the computer simulations.

Since the July 1980 Report, fuel consumption data have been compiled utilizing test runs along the New Haven, Connecticut, to Boston, Massachusetts, Corridor.5/ Data collected included train make-up, weight, trip time, slow orders and total fuel consumption. Data from these runs were then compared with simulations of the corridor runs. Differences in fuel consumption and trip times between actual and computer simulated trains averaged only 1.04% and .03%, respectively.

Amtrak has some concern that the model used in making these estimates has been validated only between Boston and New Haven, a route that has unique curve and grade characteristics, and believes that the rail fuel efficiency figures presented here should be regarded as highly tentative. In addition, Amtrak notes that the calculation of rail fuel efficiency is predicated on the use of current locomotive technology which has been designed principally for freight service, and on static load factor assumptions. In Amtrak's view, future improvements in rail service will likely be accompanied by improved locomotive technology and improved load factors. Both developments would significantly improve the fuel efficiency of rail service that the Department has calculated for the purposes of this report.

The Department believes that the estimates of fuel consumption generated by the model are reasonably accurate. The rail fuel efficiency estimates are summarized for each corridor in Appendix C, Part B. The Department also does not foresee either load factor increasing significantly or rail fuel efficiency significantly improving in the 1985 time frame upon which the analyses are based.

5/ Amtrak Fuel Consumption Study, U.S. Department of Transportation Transportation Systems Center, Cambridge, Massachusetts, September 1980.

Auto Fuel Efficiency

The automobile fuel efficiency measure used in the July 1980 Report was 41 passenger miles per gallon (pm/gal) for 1985. This rate was based on an average auto occupancy of 1.5 persons for an intercity trip and a 27 mpg gasoline consumption rate for intercity driving. A September 1980 Environmental Protection Agency (EPA) report to the Congress gives considerable evidence to support such a switch to more efficient automobiles.6/ However, the report also acknowledges that the laboratory estimates overstate auto fuel efficiency because of the method of testing used by EPA. A more accurate estimate of actual fuel efficiency is obtained by factoring in what EPA terms "road slip." Road slip takes into account various factors determined by less than ideal environmental factors, driving habits and vehicle condition. Thus, even though the projection of 1985 auto fuel economy for intercity travel has increased from 27 mpg to 28.6 mpg the rate projected for 1985 has been lowered to an average of 21.5 mpg to compensate for road slip. Consequently, this report uses 21.5 mpg times a 1.5 persons average occupancy, or 32 pm/g, as the intercity modal efficiency for automobiles. A more detailed discussion of the EPA study on this point is contained in Appendix C, Part C.

Air Fuel Efficiency

Air passenger transportation is generally acknowledged to be energy inefficient in the short-haul market. The July 1980 Report reflected this view by using a fuel efficiency measure of 24 pm/g in 1985 based on an average load factor of 70%. Based on conversations with representatives of the Federal Aviation Administration (FAA), this estimate was lowered to 65%. (The 1979 average for all domestic flights was 61%.)7/ Narrow-bodied, twin engine jet or turbo prop aircraft that will compete with rail corridor travel operate at approximately 33 seat-miles per gallon in service under 500 miles. Thus, a fuel efficiency measure of 21 pm/g was used, 33 seat miles per gallon times 65% occupancy.

Bus Fuel Efficiency

In the July 1980 Report, the Department recognized new developments in the efficiency of bus diesel engines. Not only are new buses using the new power plants but older buses are being retrofitted with them. Therefore, the July 1980 Report used an estimate of bus fuel efficiency of 135 pm/g (6.3 mpg times 47% occupancy). A review of data made available through the Joint Industry-Government Voluntary Truck and Bus Fuel Economy Improvement Program of the National Highway Traffic Safety Administration (NHTSA) confirmed the trend of improved fuel efficiency of buses. As a result of this review the current report retains the bus efficiency measure of 135 pm/g.

6/ Passenger Car Fuel Economy: EPA and Road, United States Environmental Protection Agency, September 1980.

7/ Transportation Energy Conservation Data Book, Oak Ridge National Laboratory, February 1979.

Computation of Energy Savings From Rail Usage

Using the revised diversion factors and the revised modal fuel efficency rates discussed above, the fuel usage of diverted rail passengers was calculated for each corridor to arrive at incremental energy savings. This was done as follows:

- o Compute total energy consumed in 1985 in intercity passenger transportation by air, auto, bus and rail as such service existed in 1980;

- o Perform an identical computation as in the preceding step with improved service in 1985.

- o Subtract the total energy consumed in the 1985 second step from the energy consumed in the first step to arrive at net energy savings, or loss.

Total energy savings attributed to the entire rail service in 1985 are computed by subtracting energy consumed by corridor intercity transportation without any improved rail service from energy consumed by corridor intercity transportation with improved rail service.

THE EVALUATION METHOD

As discussed, the changes in the evaluation method from the July 1980 Report are the deletion of the State commitment factor, and the inclusion of an incremental analysis of demand, fuel savings, revenues and costs. The following evaluation method was used in this report:

1. For 1985, total annual public expenditure per passenger mile was calculated; similarly, the annual public expenditure for the improvement per incremental passenger mile was calculated.

2. For 1985, total gallons of gasoline saved are compared with total annual public expenditure, and the change in gasoline consumption attributable to the improvement is compared with annual public expenditure for the improvement.

This approach does not take into account a number of factors that Amtrak believes are significant in evaluating the cost effectiveness of corridor service, such as environmental benefits, improved traveler safety, urban development benefits, and productive employment opportunities. Nor does this approach take into account the cost effectiveness of rail service as compared with other transportation modes serving the same points.

While these factors can be important, the Department believes they are the types of generalized arguments which can and have been used to support unwise Federal intrusion into local or private sector decisions. Thus, the Department believes that these are matters which can best be evaluated in the context of State and local support decisions and which do not--at least with respect to rail passenger service--weigh heavily in the Federal funding decision.

CHAPTER III

RESULTS OF ANALYSIS

This chapter summarizes forecasts and estimates of the impacts of improved rail service in the corridors studied. The results are presented on both a total and incremental basis and include forecasts of rail ridership and of gallons of gasoline saved (as a measure of energy savings), estimates of capital cost for fixed facilities and equipment, and estimates of operating costs and revenues.

RAIL DEMAND

Table III-1 presents a summary of corridor demand forecasts for 1985 and shows passengers, passenger miles, train miles, and passenger miles per train mile (PM/TM) for the frequency of service selected for the improved rail service in the base case. Frequency is three round trips in a corridor with only marginal or no existing corridor service. Also shown is the increase attributable to the improvement in service, i.e., the incremental frequency of service, passengers, etc.

Ridership forecasts (expressed in passenger miles) range from 312 million for the New York-Buffalo Corridor, 181 million for Philadelphia-Atlantic City and 167 million for Los Angeles-San Diego, to less than 5 million passenger miles for one corridor. Forecasts of incremental ridership, i.e., ridership solely attributable to the improved service (excluding corridors without existing service), range from 158 million passenger miles for the New York-Buffalo Corridor, 79 million for Los Angeles-Las Vegas and 61 million for Chicago-Cleveland to less than 10 million.

Estimates of equipment utilization, expressed in passenger miles per train mile (PM/TM), range from a high of 304 for the Philadelphia-Atlantic City service to 24 and 8 for the Atlanta-Nashville and Atlanta-Savannah services, respectively. Other corridors projecting relatively high forecasts of total PM/TM are Los Angeles-San Diego, Boston-New Haven, Chicago-Cincinnati, Chicago-Twin Cities and New York City-Buffalo with 180 PM/TM, 151 PM/TM, 152 PM/TM, 132 PM/TM and 123 PM/TM, respectively.

Of the corridors with existing service, the Los Angeles-San Diego Corridor has the highest incremental increase, 167 PM/TM; however, this was lower than the 180 PM/TM for the total corridor service, indicating that fewer passengers are attracted for each successive new train. By contrast, the improved service in the New York-Buffalo Corridor shows a higher incremental PM/TM (156) than for the total service (123).

TABLE III - 1

CORRIDOR DEMAND FORECASTS (1985) - TOTAL AND INCREMENTAL

Corridor	Round Trip Frequency Trains/Day		Passengers (000's)		Passenger Miles (000's)		Train Miles (000's)		Passenger Miles/ Train Mile	
	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental
Atlanta-Nashville	3	3	89	89	15,500	15,500	648	648	24	24
Atlanta-Savannah	3	3	26	26	4,900	4,900	642	642	8	8
Boston-Springfield-New Haven	3	3	557	557	53,000	53,000	350	350	151	151
Cleveland-Columbus-Cincinnati	3	3	177	177	27,200	27,200	569	569	47	47
Chicago-Cincinnati	3	3	537	537	98,300	98,300	648	648	152	152
Chicago-Cleveland	4	3	390	295	82,000	60,700	996	747	82	81
Chicago-Detroit	6	3	848	320	134,300	56,700	1,226	613	110	92
Chicago-St. Louis	6	3	490	189	87,800	34,800	1,244	620	70	56
Chicago-Twin Cities	3	3	479	479	121,300	121,300	915	915	132	132
° Chicago-Milwaukee	8	3	453	172	35,900	12,500	496	185	72	68
Los Angeles-Las Vegas	4	3	323	263	96,800	78,600	949	710	102	111
Los Angeles-San Diego	10	3	1,804	531	167,100	46,300	927	278	180	167
San Jose-Reno	3	3	293	293	49,500	49,500	622	622	80	80
° San Jose-Sacramento	3	3	140	140	15,100	15,100	283	283	53	53
Miami-Jacksonville	3	3	399	399	86,900	86,900	900	900	97	97
New York-Buffalo	6/11	3/3	1,396	571	312,400	157,900	2,546	1,014	123	156
° New York-Albany	11	3	681	282	84,500	34,700	1,140	311	74	112
Philadelphia-Atlantic City	12	12	3,975	3,975	181,000	181,000	596	596	304	304
Philadelphia-Harrisburg	16	3	1,117	198	58,700	9,800	1,203	225	48	44
Seattle-Portland	6	3	352	80	53,300	12,800	815	406	65	32
Texas Triangle	3	3	590	590	129,200	129,200	1,873	1,873	69	69
° Dallas/Ft. Worth-Houston	3	3	218	218	54,200	54,200	681	681	80	80
° Dallas/Ft. Worth-San Antonio	3	3	262	262	47,700	47,700	707	707	67	67
° Houston-San Antonio	3	3	110	110	27,300	27,300	482	482	57	57
Washington-Richmond	5	3	180	98	36,100	27,800	398	239	90	116

Incremental is the difference between the improved corridor service and the base 1980 service.

ENERGY SAVINGS

Table III-2 presents forecasts of energy savings (or losses). Both total and incremental data are presented. In some corridors, the expanded rail service would actually have a negative impact on energy conservation. This would occur whenever a large portion of the users of the rail service would use the bus (a mode which generally has a higher modal fuel efficiency) in the absence of the improved rail service. The principal exception to the superior fuel efficiency of the bus occurs in the Philadelphia-Atlantic City Corridor where, because of the very high demand, longer consists and higher load factors, the estimated modal efficiency of rail is 229 PM/GAL, significantly higher than the 135 PM/GAL estimated for bus.

As previously noted, Amtrak believes that the ridership model employed by the Department to calculate diversion factors significantly overstates the diversion of passengers from bus to rail. Amtrak notes that the theoretical projections of the overlap in market and ridership pools between rail and bus is not supported by any known experience or by survey data. Accordingly, Table III-2 which purports to reflect energy savings or loss is, in the opinion of Amtrak, quite inaccurate.

The Department finds that the results of the Amtrak 1979 systemwide on-board surveys do, in fact, demonstrate overlap in ridership and market pools between rail and bus. The surveys show that about 25 percent of Amtrak passengers view bus as their "fall-back" mode, i.e., the travel mode they would use if the rail service did not exist.1/

Forecasts of total annual energy savings range from approximately 3,600,000 gallons of fuel saved for the New York City-Buffalo Corridor to losses of more than 400,000 gallons for the Atlanta-Savannah Corridor. Other corridors with forecasts of relatively high energy savings are Atlantic City-Philadelphia, Chicago-Cleveland and Los Angeles-San Diego with savings of approximately 2,800,000; 1,600,000; and 2,000,000 gallons respectively.

Forecasts of incremental annual fuel savings, presented in Table III-2, range from 1,784,000 gallons in New York-Buffalo; 625,000 gallons in Los Angeles-Las Vegas; and 563,000 in Los Angeles-San Diego to corridors with net losses. The estimation of incremental fuel savings also provides an opportunity to address further concerns that an overstatement of bus diversion to rail would significantly alter estimates of fuel savings. For each of the five corridors where bus diversion was projected to be greater than 25 percent (average of Amtrak riders in the 1979 Amtrak on-board surveys answering that bus was their "back-up" mode), fuel saved was

1/ Amtrak Passenger Assessment Surveys conducted in February 1979 and October 1979.

TABLE III - 2

ESTIMATED ENERGY SAVINGS

Corridor	Round Trip Frequency Trains/Day		Thousands of Gallons of Fuel Saved (Lost)*	
	Total	Incremental	Total	Incremental
Atlanta-Nashville	3	3	(270)	(270)
Atlanta-Savannah	3	3	(417)	(417)
Boston-Springfield-New Haven	3	3	(216)	(216)
Cleveland-Columbus-Cincinnati	3	3	(127)	(127)
Chicago-Cincinnati	3	3	(171)	(171)
Chicago-Cleveland	4	3	1571	1164
Chicago-Detroit	6	3	589	303
Chicago-St. Louis	6	3	207	111
Chicago-Twin Cities	3	3	711	711
° Chicago-Milwaukee	8	3	(215)	(74)
Los Angeles-Las Vegas	4	3	767	625
Los Angeles-San Diego	10	3	2028	563
San Jose-Reno	3	3	(275)	(275)
° San Jose-Sacramento	3	3	(50)	(50)
Miami-Jacksonville	3	3	(107)	(107)
New York-Buffalo	6/11	3/3	3535	1784
° New York-Albany	11	3	74	28
Philadelphia-Atlantic City	12	11	2816	2816
Philadelphia-Harrisburg	16	3	(304)	(50)
Seattle-Portland	6	3	543	131
Texas Triangle	3	3	1229	1229
° Dallas/Ft. Worth-Houston	3	3	485	485
° Dallas/Ft. Worth-San Antonio	3	3	359	359
° Houston-San Antonio	3	3	385	385
Washington-Richmond	5	3	(260)	(200)

*Data in ( ) signifies negative savings

estimated with bus diversion constrained to a maximum of 10 percent of total ridership (the smallest percentage in the Amtrak system for bus as back-up mode was about 12 percent).2/ The remaining diversion from bus was allocated equally to air and auto. Resulting changes in gasoline savings are presented below, and as the table shows, some are large. Nonetheless, as will be shown in Chapter IV, the changes would not alter significantly conclusions about the cost effectiveness of the corridors.

GASOLINE SAVED
(1000 GALLONS)

Corridor	Current Estimate	Maximum 10 Percent Bus Diversion
Boston-New Haven	(216)	445
Cleveland-Cincinnati	(127)	44
Chicago-Cleveland	1164	1426
Los Angeles-San Diego	563	1046
Miami-Jacksonville	(107)	690

COST AND REVENUE

The cost of rail passenger service in each corridor is the sum of annualized fixed facility and equipment costs and annual operating cost net of annual revenue, i.e., avoidable loss. Fixed facility costs are the capital cost of station and right-of-way improvements that are required in order to provide reliable, 79 mph passenger service. Table III-3 presents fixed facility capital costs broken down into three categories: (1) stations, (2) track and signals and (3) grade crossings. The majority of the costs are for track and signal improvements to provide sidings and signals to avoid delays to passenger and freight trains.

Table III-4 presents equipment costs for each corridor service. Both total and incremental equipment costs are presented. On the basis of incremental cost, the Philadelphia-Atlantic City Corridor would have the largest equipment cost ($41 million). Where corridor-type service exists today, the Chicago-Cleveland Corridor would experience the largest incremental equipment cost ($16.8 million) followed by Los Angeles-Las Vegas at $13.4 million.

Table III-5 summarizes revenues and costs for each corridor, including annual public expenditure which is the sum of annualized capital costs and avoidable loss. Excluding corridors without current service, annual public expenditures--the total cost to the public to operate improved rail service--range from a high of $38.7

2/ Ibid

TABLE III - 3

CAPITAL COSTS FOR FIXED FACILITIES*
(FY 80 dollars in millions)

Corridor	Distance (Miles)	Stations	Track & Signals (Low - High)	Grade Crossings	Total (Low - High)
Atlanta-Nashville	296.0	15.0	16.4 - 27.4	9.0	40.4 - 51.4
Atlanta-Savannah	293.0	5.0	17.1 - 22.8	8.6	30.7 - 36.4
Boston-Springfield-New Haven	160.0	2.0	59.3 - 74.1	-0-	61.3 - 76.1
Cleveland-Columbus-Cincinnati	261.7	16.1	38.3 - 76.6	5.1	59.5 - 97.8
Chicago-Cincinnati	296.0	11.1	43.9 - 67.5	11.8	66.8 - 90.4
Chicago-Cleveland	340.2	1.4	6.6 - 13.2	10.6	18.6 - 25.2
Chicago-Detroit	279.2	0.7	29.9 - 49.8	3.3	33.9 - 53.8
Chicago-St. Louis	283.9	0.8	24.5 - 49.0	8.2	33.5 - 58.0
Chicago-Twin Cities	418.0	1.0	114.5 - 152.7	9.7	125.2 - 163.4
° Chicago-Milwaukee	85.0	0.2	0.4 - 1.0	1.9	2.5 - 3.1
Los Angeles-Las Vegas	325.5	1.0	25.7 - 42.8	1.3	28.0 - 45.1
Los Angeles-San Diego	127.9	1.4	5.7 - 8.8	-0-	7.1 - 11.6
San Jose-Reno	282.0	6.0	5.4 - 9.7	0.7	12.1 - 16.4
° San Jose-Sacramento	126.0	5.0	2.6 - 4.7	0.3	7.9 - 10.0
Miami-Jacksonville	411.0	9.4	6.2 - 15.5	10.6	26.2 - 35.5
New York-Buffalo	463.0	10.4	20.8 - 34.7	1.4	32.6 - 46.5
° New York-Albany	142.0	-0-	18.6 - 26.5	0.4	19.0 - 26.9
Philadelphia-Atlantic City	68.3	2.1	16.7 - 21.2	4.0	22.8 - 27.3
Philadelphia-Harrisburg	104.0	1.0	31.2 - 52.0	0.1	32.3 - 53.1
Seattle-Portland	186.0	2.2	32.9 - 65.8	1.8	36.9 - 69.8
Texas Triangle	669.9	24.4	186.0 - 232.5	12.0	222.4 - 268.9
° Dallas/Ft. Worth-Houston	309.8	27.0	56.4 - 70.5	12.0	95.4 - 109.5
° Dallas/Ft. Worth-San Antonio	319.3	22.5	100.2 - 125.3	12.0	134.7 - 159.8
° Houston-San Antonio	219.9	14.5	36.6 - 45.7	12.1	63.2 - 72.3
Washington-Richmond	109.0	2.0	6.0 - 12.0	.3	8.3 - 14.3

*Required to achieve 79 mph speeds.

TABLE III - 4

CAPITAL COSTS OF EQUIPMENT REQUIRED TO OPERATE SERVICE
(FY 80 Dollars in Millions)

Corridor	Round Trip Frequency Trains/Day		Costs	
	Total	Incremental	Total	Incremental
Atlanta-Nashville	3	3	13.0	13.0
Atlanta-Savannah	3	3	13.0	13.0
Boston-Springfield-New Haven	3	3	15.8	15.8
Cleveland-Columbus-Cincinnati	3	3	13.0	13.0
Chicago-Cincinnati	3	3	20.5	20.5
Chicago-Cleveland	4	3	26.8	16.8
Chicago-Detroit	6	3	26.1	9.3
Chicago-St. Louis	6	3	22.3	5.6
Chicago-Twin Cities	3	3	20.5	20.5
o Chicago-Milwaukee	8	3	20.5	3.7
Los Angeles-Las Vegas	4	3	22.7	13.4
Los Angeles-San Diego	10	3	27.2	0.0*
San Jose-Reno	3	3	13.4	13.4
o San Jose-Sacramento	3	3	10.4	10.4
Miami-Jacksonville	3	3	16.8	16.8
New York-Buffalo	6/11	3/3	95.5	7.8
o New York-Albany	11	3	47.3	8.0
Philadelphia-Atlantic City	12	12	41.0	41.0
Philadelphia-Harrisburg	16	3	26.0	0.0*
Seattle-Portland	6	3	20.8	7.4
Texas Triangle	3	3	39.0	39.0
o Dallas/Ft. Worth-Houston	3	3	13.0	13.0
o Dallas/Ft. Worth-San Antonio	3	3	13.0	13.0
o Houston-San Antonio	3	3	13.0	13.0
Washington-Richmond	5	3	15.6	7.8

* There is zero incremental equipment cost for this corridor because the existing equipment is considered adequate to handle the additional frequencies.

TABLE III - 5

REVENUE AND COSTS
(FY 80 Dollars in Million)

Corridor	Revenues		Avoidable Cost		Avoidable Loss		Annual Capital Cost (Equipment & Fixed Facilities)		Annual Public Expenditure	
	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental	Total	Incremental
Atlanta-Nashville	1.6	1.6	10.1	10.1	8.5	8.5	6.5	6.5	15.0	15.0
Atlanta-Savannah	0.5	0.5	9.9	9.9	9.4	9.4	5.3	5.3	14.7	14.7
Boston-Springfield-New Haven	5.9	5.9	9.0	9.0	3.1	3.1	9.2	9.2	12.3	12.3
Cleveland-Columbus-Cincinnati	2.7	2.7	10.7	10.7	8.0	8.0	9.8	9.8	17.8	17.8
Chicago-Cincinnati	10.1	10.1	13.6	13.6	3.5	3.5	10.9	10.9	14.4	14.4
Chicago-Cleveland	8.1	6.1	19.4	15.1	11.3	9.1	6.2	4.7	17.5	13.8
Chicago-Detroit	13.6	5.8	22.6	11.1	9.0	5.3	8.3	5.8	17.3	11.1
Chicago-St. Louis	9.0	4.0	19.1	8.5	10.0	4.5	7.9	5.4	17.9	9.9
Chicago-Twin Cities	12.0	12.0	19.6	19.6	7.7	7.7	17.5	17.5	25.2	25.2
° Chicago-Milwaukee	4.0	1.7	8.8	2.4	4.8	.8	3.3	.8	8.1	1.6
Los Angeles-Las Vegas	9.9	8.0	16.1	11.7	6.2	3.7	7.1	5.7	13.3	9.4
Los Angeles-San Diego	18.5	5.5	23.9	6.0	5.3	.5	5.0	.9	10.3	1.4
San Jose-Reno	5.5	5.5	15.2	15.2	9.7	9.7	3.4	3.4	13.1	13.1
° San Jose-Sacramento	1.7	1.7	7.4	7.4	5.7	5.7	2.5	2.5	8.2	8.2
Miami-Jacksonville	9.4	9.4	18.1	18.1	8.8	8.8	5.6	5.6	14.4	14.4
New York-Buffalo	31.1	16.5	51.4	23.7	20.4	7.2	18.3	5.1	38.7	12.3
° New York-Albany	8.7	3.8	22.7	7.6	14.0	3.8	9.4	3.5	23.4	7.3
Philadelphia-Atlantic City	18.1	18.1	30.3	30.3	12.2	12.2	8.7	8.7	20.9	20.9
Philadelphia-Harrisburg	6.2	2.0	13.0	2.8	6.8	.8	8.2	4.3	15.0	5.1
Seattle-Portland	5.9	2.6	15.9	7.6	10.0	5.0	8.5	6.5	18.5	11.5
Texas Triangle	12.5	12.5	45.0	45.0	32.5	32.5	30.4	30.4	62.9	62.9
° Dallas/Ft. Worth-Houston	5.1	5.1	18.4	18.4	13.2	13.2	12.2	12.2	25.4	25.4
° Dallas/Ft. Worth-San Antonio	4.6	4.6	20.0	20.0	15.3	15.3	16.7	16.7	32.0	32.0
° Houston-San Antonio	2.7	2.7	9.2	9.2	6.6	6.6	8.7	8.7	15.3	15.3
Washington-Richmond	3.9	2.9	8.4	4.5	4.5	2.1	3.5	2.3	8.0	4.4

million in the Buffalo-New York Corridor (reflecting high capital and subsidy costs) to a low of $8.1 million in the Chicago-Milwaukee Corridor and $8.0 million for the Washington-Richmond Corridor. Some corridors require a relatively small increment over current costs to implement and operate improved service. Los Angeles-San Diego at $1.4 million and Chicago-Milwaukee at $1.6 million are noteworthy in this regard.

CHAPTER IV

SUMMARY

This chapter summarizes the cost effectiveness of the improved corridor rail passenger services using estimates of public expenditures per passenger mile and public expenditures per gallon of gasoline saved. These estimates are presented for both:

- o the improved rail passenger system based on total service and cost impacts; and

- o the improved rail passenger system based on incremental service and cost impacts. (Where no corridor type service presently exists, incremental service and costs equate to total service and costs.)

Amtrak's reservations with respect to the projected ridership figures and the projected energy savings used in this evaluation and with the Department's definition of cost effectiveness, have been noted in Chapter II. Amtrak believes these energy savings/loss projections to be highly questionable and that, coupled with quite conservative ridership forecasts and assumptions, which Amtrak believes are exaggerated, about the overlap in ridership between bus and rail, calls the cost-effectiveness analysis that follows into question. In the opinion of Amtrak, the approach employed leaves the false impression of statistical validity when, in fact, it results simply from compounding one questionable assumption with another. To address this issue, the Department did a sensitivity analysis exploring the ultimate consequences of errors of this type on the principal cost effectiveness measures discussed in this chapter. The results of this analysis indicate that relatively large differences in the key forecasting variables do not significantly affect the evaluation results.

The cost effectiveness section examines each corridor on the basis of dollars of public expenditure for each passenger mile produced and gallon of gasoline saved, and includes corridor estimates of avoidable loss per passenger mile, (the criterion used to judge Amtrak's existing routes) and revenue to avoidable cost ratio. A section of this chapter summarizes comparisons of the corridors with the New York-Washington segment of the Northeast Corridor. The final section of the chapter discusses the sensitivity of the cost effectiveness estimates to errors in demand forecasts. The chapter closes with a brief summary of key findings.

COST EFFECTIVENESS EVALUATION

Estimates of dollars of public expenditure per passenger mile ($/pm) and dollars of public expenditure per gallon of gasoline saved ($/gal) are used to describe the cost effectiveness of potential corridor services. As shown in Table IV-1, the Los Angeles-San Diego Corridor has the lowest estimate of dollars of public expenditure per passenger mile with .06 $/pm. New York-Buffalo and Philadelphia-Atlantic City are next with estimates of .12 $/pm.

Excluding corridors without current service and on the basis of additional passenger miles attributable to the service improvements, Los Angeles-San Diego, at .03 $/pm, has the lowest estimate of dollars of public expenditure per incremental passenger mile, followed by New York-Buffalo at .08 $/pm and Los Angeles-Las Vegas at .12 $/pm. By contrast, 17 of the corridors have estimates of public expenditures per passenger mile of 20 cents or more, ranging as high as 97 cents and 3 dollars.

With respect to the second criterion, dollars of cost per gallon of fuel saved ($/gal), Los Angeles-San Diego has the lowest estimate of total dollars of public expenditure per gallon saved--about $5.00. This is followed by Philadelphia-Atlantic City with a $7.14 cost for each gallon saved. Chicago-Cleveland and New York-Buffalo are next with about $11.00 per gallon saved. Addressing incremental savings (excluding corridors without current service), the Los Angeles-San Diego Corridor has the lowest estimate of dollars of public expenditure per gallon saved, about $2.50. The New York-Buffalo Corridor is next with $6.88 per gallon saved. For nine of the corridors, the cost of a gallon of fuel saved is estimated to range between $15 and $316. The new services are projected to result in net losses in fuel in 11 corridors.

For convenience of comparison with previous reports, Table IV-2 presents corridor rankings using passenger miles per dollar of public expenditure and gallons saved per dollar of public expenditure.

Other criteria could be used in evaluating the corridors. Two suggested by Amtrak are avoidable loss per passenger mile (a criterion specified by the Rail Passenger Service Act for evaluating Amtrak's existing routes) and ratio of revenue to cost. Table IV-3 presents corridor estimates of avoidable loss per passenger mile and revenue to avoidable cost ratios. The table presents estimates for both the 1985 base case as well as for the case if ridership is 25 percent above the base projection. It should be noted that incremental capital costs, i.e., capital costs for additional rolling stock and facility improvements, are, in fact, "avoidable," although they are not counted as such in these avoidable cost estimates.

It also should be noted that the term "avoidable loss" in Table IV-3 derives from a different definition of "avoidable cost" than is used

TABLE IV-1
CORRIDOR RANKINGS
DOLLARS OF PUBLIC EXPENDITURE PER PASSENGER MILE AND GALLON OF GASOLINE SAVED

Corridor	Dollars of Public Expenditure Per Passenger Mile	
	Total	Incremental
Los Angeles-San Diego	.06	.03
New York-Buffalo	.12	.08
Philadelphia-Atlantic City	.12	.12
Los Angeles-Las Vegas	.14	.12
° Chicago-Milwaukee	.23	.13
Chicago-Cincinnati	.15	.15
Washington-Richmond	.22	.16
Miami-Jacksonville	.17	.17
Chicago-Detroit	.13	.20
Chicago-Twin Cities	.21	.21
° New York-Albany	.28	.21
Chicago-Cleveland	.21	.23
Boston-Springfield-New Haven	.23	.23
San Jose-Reno	.27	.27
Chicago-St. Louis	.20	.29
° Dallas/Ft. Worth-Houston	.47	.47
Texas Triangle	.49	.49
Philadelphia-Harrisburg	.26	.52
° San Jose-Sacramento	.54	.54
° Houston-San Antonio	.56	.56
Cleveland-Columbus-Cincinnati	.65	.65
° Dallas/Ft. Worth-San Antonio	.67	.67
Seattle-Portland	.35	.35
Atlanta-Nashville	.97	.97
Atlanta-Savannah	3.00	3.00

Corridor	Dollars of Public Expenditure Per Gallon of Gasoline*	
	Total	Incremental
Los Angeles-San Diego	5.07	2.49
New York-Buffalo	10.95	6.89
Philadelphia-Atlantic City	7.42	7.43
Chicago-Cleveland	11.14	11.86
Los Angeles-Las Vegas	17.34	15.04
Chicago-Twin Cities	35.44	35.44
Chicago-Detroit	29.37	36.63
° San Antonio-Houston	39.74	39.74
Texas Triangle	51.18	51.18
° Dallas/Ft. Worth-Houston	52.37	52.37
° Dallas/Ft. Worth-San Antonio	89.14	89.14
Seattle-Portland	34.07	87.14
Chicago-St. Louis	86.47	89.19
° New York-Albany	316.22	260.71
° San Jose-Sacramento	(164.00)	(164.00)
Cleveland-Columbus-Cincinnati	(140.16)	(140.16)
Miami-Jacksonville	(134.58)	(134.58)
Philadelphia-Harrisburg	(49.34)	(102.00)
Chicago-Cincinnati	(84.21)	(84.21)
Boston-Springfeld-New Haven	(56.94)	(56.94)
Atlanta-Nashville	(55.56)	(55.56)
San Jose-Reno	(47.64)	(47.64)
Atlanta-Savannah	(35.25)	(35.25)
Washington-Richmond	(30.77)	(22.00)
° Chicago-Milwaukee	(37.67)	(21.62)

*Data in ( ) signify negative savings.

TABLE IV-2
CORRIDOR RANKINGS
PASSENGER MILES AND GALLONS OF GASOLINE SAVED PER DOLLAR OF PUBLIC EXPENDITURE

Corridor	Passenger Miles per Dollar of Public Expenditure Total	Incremental	Corridor	Gallons of Gasoline Per Dollar of Public Expenditure * Total	Incremental
Los Angeles-San Diego	16.2	33.0	Los Angeles-San Diego	.197	.402
New York-Buffalo	8.1	12.8	New York-Buffalo	.091	.145
Philadelphia-Atlantic City	8.7	8.7	Philadelphia-Atlantic City	.135	.135
Los Angeles-Las Vegas	7.3	8.4	Chicago-Cleveland	.089	.084
° Chicago-Milwaukee	4.4	7.8	Los Angeles-Las Vegas	.058	.067
Chicago-Cincinnati	6.8	6.8	Chicago-Twin Cities	.028	.028
Washington-Richmond	4.5	6.3	Chicago-Detroit	.034	.027
Miami-Jacksonville	6.0	6.0	° San Antonio-Houston	.025	.025
Chicago-Detroit	7.8	5.1	Texas Triangle	.020	.020
Chicago-Twin Cities	4.8	4.8	° Dallas/Ft. Worth-Houston	.019	.019
° New York-Albany	3.6	4.8	° Dallas/Ft. Worth-San Antonio	.011	.011
Chicago-Cleveland	4.7	4.4	Seattle-Portland	.029	.011
Boston-Springfield-New Haven	4.3	4.3	Chicago-St. Louis	.011	.011
San Jose-Reno	3.8	3.8	° New York-Albany	.003	.004
Chicago-St. Louis	4.9	3.5	° San Jose-Sacramento	(.006)	(.006)
Texas Triangle	2.1	2.1	Miami-Jacksonville	(.007)	(.007)
° Dallas/Ft. Worth-Houston	2.1	2.1	Cleveland-Columbus-Cincinnati	(.007)	(.007)
Philadelphia-Harrisburg	3.9	1.9	Philadelphia-Harrisburg	(.020)	(.010)
° Houston-San Antonio	1.8	1.8	Chicago-Cincinnati	(.012)	(.012)
° San Jose-Sacramento	1.8	1.8	Boston-Springfield-New Haven	(.018)	(.018)
Cleveland-Columbus-Cincinnati	1.5	1.5	Atlanta-Nashville	(.018)	(.018)
° Dallas/Ft. Worth-San Antonio	1.5	1.5	San Jose-Reno	(.021)	(.021)
Seattle-Portland	2.9	1.1	Atlanta-Savannah	(.028)	(.028)
Atlanta-Nashville	1.0	1.0	Washington-Richmond	(.033)	(.045)
Atlanta-Savannah	0.3	0.3	° Chicago-Milwaukee	(.027)	(.046)

*Data in ( ) signify negative savings.

TABLE IV-3

PROJECTIONS OF AVOIDABLE LOSS PER PASSENGER MILE
AND REVENUE/COST RATIO
(FY 80 Dollars in Cents)

Corridor	Base Projections for Route Totals		25% Above Base Projections for Route Totals	
	Avoidable Loss/PM	Revenue/Cost Ratio	Avoidable Loss/PM	Revenue/Cost Ratio
Atlanta-Nashville	43.5¢	16%	33.1¢	19%
Atlanta-Savannah	156.0	5	123.3	6
Boston-Springfield-New Haven	2.8	66	1.2	75
Cleveland-Columbus-Cincinnati	22.5	26	16.3	31
Chicago-Cincinnati	1.1	74	0.2	85
Chicago-Cleveland	9.6	42	6.0	51
Chicago-Detroit	3.7	60	2.1	68
Chicago-St. Louis	7.7	47	5.6	53
Chicago-Twin Cities	3.5	61	1.1	74
° Chicago-Milwaukee	9.1	46	7.6	49
Los Angeles-Las Vegas	3.5	62	1.2	74
Los Angeles-San Diego	0.7	78	(0.4)	86
San Jose-Reno	14.3	36	9.8	44
° San Jose-Sacramento	29.1	23	21.7	28
Miami-Jacksonville	6.4	52	3.4	63
New York-Buffalo	3.6	60	1.5	72
° New York-Albany	11.9	38	8.0	46
Philadelphia-Atlantic City	3.8	60	2.5	66
Philadelphia-Harrisburg	7.6	48	4.4	58
Seattle-Portland	13.5	37	10.7	42
Texas Triangle	19.1	28	14.1	33
° Dallas/Ft. Worth-Houston	18.4	28	13.2	35
° Dallas/Ft. Worth-San Antonio	24.8	23	19.4	28
°Houston-San Antonio	18.1	29	12.9	35
Washington-Richmond	8.4	46	5.1	56

in the revenue/avoidable cost ratio. For the revenue/avoidable cost ratio, the term "avoidable cost" conforms to the definition given in Chapter II, which includes certain common costs. In the case of "avoidable loss per passenger mile," those common costs are omitted. Fourteen of the corridors have losses less than 10 cents per passenger mile which is the maximum allowable for short distance routes under Section 404(d)(2) of the Rail Passenger Service Act.

CORRIDOR COMPARISONS WITH NEC SERVICE

The Chairman and Ranking Minority Member of the Senate Commerce Committee have requested comparisons of the proposed rail corridors with the Northeast Corridor (NEC), an ongoing rail improvement program for the Boston-New York City-Washington, D.C., Corridor. The comparison, presented in Appendix E, includes total service, revenues and costs, avoidable loss and annual public expenditures (i.e., annualized capital costs and annual avoidable loss) as well as a variety of other data. The New York-Washington segment was selected for comparison since it represents the segment of highest service.

Of the 25 corridors, only the Los Angeles-San Diego Corridor compares favorably with the NEC on an avoidable loss per passenger mile basis and on a public expenditure per passenger mile basis. The NEC is projected to cover its operating cost by 1987 and, consequently, would not have avoidable losses after 1986. The Los Angeles-San Diego Corridor, at 3 cents, has the lowest avoidable loss per passenger mile of the corridors studied. The same corridor, at slightly more than 6¢ of public expenditure per passenger mile (cost includes annualized capital costs) is lower than the 7¢ per passenger mile in the NEC.

The NEC has large capital costs which tend to raise its public cost per passenger, even though annual ridership is quite high. The large capital costs are the result of several factors, including the very poor initial condition of the track in the corridor due to the excessive deferred maintenance under the Penn Central ownership; the facilities required to handle intercity, commuter and freight trains; and the permanence with which track and facilities are being constructed. These factors do not have a significant consequence in other corridors.

SENSITIVITY ANALYSIS

Forecasts of passenger demand are a key determinant of the outcome of the corridor evaluations. Several steps have been taken to assure their accuracy, including discussions with local and transportation officials of cities and States on the corridors, use of the most recent travel and forecast data, and careful review of the forecasting model and model results. Nonetheless, the forecasts

are still subject to error. If there is a systematic error in the demand forecasts, it is likely to result from the assumptions used. While the assumptions used represent the Department's and Amtrak's best judgment of conditions likely to exist in 1985, sensitivity analyses have been conducted to assess the effect on the evaluations of different conditions than those assumed. Variables included in the sensitivity analyses are:

- o frequency of rail service
- o auto ridership
- o fare levels
- o energy costs
- o population and income
- o bus diversion

A range of values was used to assess the sensitivity of the results of each of these variables. The Los Angeles-San Diego and Chicago-Detroit Corridors were selected for the sensitivity analysis, as they appeared representative of the range of service and demographic conditions of the corridors being evaluated. Because of Congressional concern that future population growth had not been considered in the evaluation of the San Jose-Reno Corridor, this corridor was substituted for the Los Angeles-San Diego Corridor for sensitivity analysis of population and income. The findings associated with each of the variables tested are discussed below.

Frequency of Service

Frequency of service was analyzed to assess the sensitivity of demand and, ultimately, profitability to increases in service frequency. There are relatively few examples of frequency increases in recent Amtrak experience from which an analysis of the effect of past frequency changes can be made. This is due to the difficulty in separating the affect of changes in traffic levels, price and availability of gasoline, and other factors. As a case in point, consider data on frequency of service and ridership levels in the San Diego-Los Angeles Corridor as shown in Table IV-4. It is not possible to utilize these data to determine a factor that approximates the effect of change in frequency, since other factors affected demand: In 1976 and 1977 new Amfleet equipment was added to the route; in 1979 to 1980 a major escalation in the price of gasoline took place.

TABLE IV-4

TRENDS IN FREQUENCY-OF-SERVICE AND RIDERSHIP
LOS ANGELES-SAN DIEGO
FY 1975-1980

Fiscal Year	Average Daily Round Trips	Percent Increase	Passenger Miles (millions)	Percent Increase
1975	3.0	-	23.6	-
1976	3.0	0	37.1	57.2%
1977	4.4	47%	60.7	63.6%
1978	5.6	27%	66.2	9.1%
1979	6.0	7%	89.5	35.2%
1980	6.0	0%	97.2	8.6%

To test the impact of frequency increases, demand was forecast in this study for different levels of service. Where the existing service in a corridor is less than three trips a day, demand forecasts were based on levels of three daily round trips and six daily round trips. Where current service is three trips or more per day, higher levels of service were assumed. This affected only a few corridors, as shown below in Table IV-5. In the case of the Philadelphia-Atlantic City Corridor, twelve frequencies were assumed in anticipation of continuation of rapid growth in visitors and commuters due to planned casino openings. A city-pair shown in parentheses represents extensions of the preceding corridor; different frequencies were used in these extensions because of significant population density variations.

TABLE IV-5

CORRIDORS ANALYZED FOR OTHER THAN 3 AND 6 FREQUENCIES

Corridor	Frequencies
Los Angeles-San Diego	6-12
New York-Albany	6-12
(Albany-Buffalo)	(3-6)
Chicago-Milwaukee	6-12
(Milwaukee-Twin Cities)	(3-6)
Philadelphia-Atlantic City	6-12
Philadelphia-Harrisburg	12-18
New Haven-Springfield	6-12
(Springfield-Boston)	(3-6)

The effects of higher frequencies vary with each corridor due to different markets and travel options. On the average, the increase in traffic estimated when increasing service from three to six round trips per day is approximately 40 percent. For an increase from six

to twelve round trips, the increase due to frequency change tapers to less than 30 percent. In the case of the Philadelphia-Harrisburg market, where round trips were increased from thirteen to eighteen, there was only a 10 percent increase in the rail ridership estimate.

Auto Travel

Auto travel estimates for the base year (1977) were analyzed to assess the sensitivity of demand forecasts to errors in the estimates. Auto travel data were analyzed because auto constitutes the major mode for intercity travel and because the lack of recent auto data is most pronounced. This analysis compared forecasts of rail demand using nominal, i.e., 1977, data, and estimates of auto demand 50 percent less than the nominal estimate, and 100 percent greater than the nominal estimate. Table IV-6 presents the results of this analysis and shows that even gross errors in auto estimates would not significantly affect rail demand forecasts. Note that in both sensitivity cases there is a modal share increase (except in the nominal case) from 1977 to 1985 for auto in the Los Angeles-San Diego Corridor, and that all modes increase their share at the expense of air transport. This result is due to relatively high air fares assumed in 1985 which did not apply in 1977. The increase in air fares is due to the increase in fuel price.

TABLE IV-6

AUTO TRAVEL SENSITIVITY ANALYSIS
LOS ANGELES-SAN DIEGO
(annual person trips)

Scenario	Mode	1977 Modal Share	1985 Modal Share
Nominal Minus 50%	Rail	4.1%	10.8%
	Air	15.5	6.2
	Bus	3.4	5.4
	Auto	77.0	77.6
	Total	100.0	100.0
Nominal Auto Demand	Rail	1.2	5.9
	Air	4.7	2.9
	Bus	1.0	2.8
	Auto	93.1	88.4
	Total	100.0	100.0
Nominal Plus 100%	Rail	2.3	3.2
	Air	8.7	1.2
	Bus	1.9	1.7
	Auto	87.1	93.9
	Total	100.0	100.0

Fare Levels

Fare levels were examined to assess the sensitivity of revenues to fares charged. Against a base case rail fare, three alternate fare levels were analyzed: a 25 percent decrease in fare, a 25 percent increase in fare, and a 50 percent increase in fare. The results are summarized in Table IV-7. A 25 percent increase causes a 17 percent decrease in passenger miles, and a 50 percent increase causes a 31 percent decrease, or an elasticity of approximately -0.7. Thus, in these corridors where rail competes directly with air, auto, and bus, increases in fare are largely offset by losses in ridership.

TABLE IV-7

FARE SENSITIVITY ANALYSIS
PERCENT CHANGE FROM NOMINAL BASE CASE

	Demand		Revenue	
Rail Fares	Chicago-Detroit	Los Angeles-San Diego	Chicago-Detroit	Los Angeles-San Diego
-25%	+22.1	+21.5	-8.0	-7.8
Nominal	---	---	---	---
+25%	-16.8	-17.4	+1.1	+2.8
+50%	-31.6	-30.6	-1.1	+3.5

Fuel Prices

Fuel prices were analyzed to assess the effect of increases on rail demand. Three levels of energy prices were assumed for 1985. These included the following prices for gasoline as expressed in 1980 dollars: $1.60 per gallon as the "base case" assumption; $2.15 per gallon as an intermediate level; and a high price of $2.70 per gallon. Comparable adjustments were made to common carrier fares. The passenger mile and revenue results of the energy scenario tested are summarized in Table IV-8. Maximum revenues are attained in the case that assumes very high energy costs, suggesting that rail revenues will rise as the price of gasoline rises.

TABLE IV-8

FUEL PRICE SENSITIVITY ANALYSIS
PERCENT CHANGE FROM NOMINAL BASE CASE

Gasoline Cost Per Gallon	Demand		Revenue	
	Chicago-Detroit	Los Angeles-San Diego	Chicago-Detroit	Los Angeles-San Diego
$1.60 (Nominal)	-	-	-	-
$2.15	+13.7	+9.0	+12.5	+9.2
$2.70	+27.4	+20.1	+27.3	+17.0

Population and Income

Population and income were examined to assess the effect of future population and income growth on rail demand. Rail demand was forecast for 1990 in two corridors using population and income projections developed by the National Planning Association. Table IV-9 compares the effect of combined population and income changes on total intercity ridership and rail ridership and revenue for 1985 and 1990 in the Chicago-Detroit and San Jose-Reno Corridors. There is a moderate increase in travel by rail during the 1985-1990 period; but the rail share decreases. This implies that, other things remaining equal, if average per capita personal income increases, the use and ownership of automobiles tends to increase; at the same time, bus and rail use, as a proportion of total demand, tends to decrease. This analysis also suggests that population shifts by 1990 will have only a minor effect on rail demand. The conclusion is that rail demand beyond the 1985 time period should not be greatly impacted by population or economic growth. These findings and conclusions conform to conditions accompanying the long-term decline of rail and bus modal shares in the United States.

RAIL RIDERSHIP FORECASTS

To assess the effect on cost effectiveness of an underestimation of rail demand, 25 percent was added to the base demand. A 25 percent increase in the demand forecasts presented in Chapter III results in an average decrease in dollars of expenditure per passenger mile ($ cost/pm) of about 23 percent. The most significant change occurs in the Los Angeles-San Diego Corridor, where cost per passenger mile is 6 cents. (Table IV-1). When 125% of the demand figure is applied, it results in an estimate of 4 cents per passenger mile.

TABLE IV-9

POPULATION AND INCOME SENSITIVITY ANALYSIS

Unit of Measure	Time Frame	Chicago-Detroit	San Jose-Reno
Total Travel (000)	1985	13,250	13,924
	1990	14,962	15,581
	Change	+1,712	+1,657
	%Change	+12.9%	+11.9%
Rail Share	1985	3.8%	2.1%
	1990	3.8%	2.0%
	Change	-1.0%	-
	%Change	-2.6%	-4.8%
Rail Revenue (millions)	1985	$8.5	4.6
	1990	9.4	5.1
	Change	+0.9	+0.5
	%Change	+10.6	+10.9
Passenger Miles (millions)	1985	90.8	49.5
	1990	100.4	53.9
	Change	+9.6	+4.4
	%Change	+10.6%	+8.9%
Population Corridor (000)	1985	11,951	5,893
	1990	12,046	6,160
	Change	+95	+267
	%Change	+0.8%	+4.5%
Income Per Capita	1985	7,635	7,472
	1990	8,710	8,534
	Change	+1,075	1,062
	%Change	+14.1%	+14.2%
Total Personal Income	1985	91,249	44,034
	1990	104,918	52,570
	Change	+13,669	8,536
	%Change	+15.0%	+19.4%

BUS DIVERSION

As reported in Chapter III, the Department conducted an analysis of fuel savings which constrained bus diversion to a maximum of 10 percent (of total diversion from other modes to rail) in corridors where bus diversion was estimated to be greater than the 25 percent of the Amtrak riders who identified bus as their back-up mode in 1979 Amtrak systemwide, on-board surveys. While the results, shown in Table IV-10, indicate improvement, even this extreme "what-if" scenario yields only one corridor with the public cost of a gallon of gasoline at or near the present market price of about $1.40 per gallon.

TABLE IV-10

EFFECT OF BUS DIVERSION TO RAIL ON FUEL SAVINGS

	Current Estimate		Maximum 10% Bus Diversion	
Corridor	Saving (1000 gal)	$Cost/Gal	Saving (1000 gal)	$Cost/Gal
Boston-New Haven	(216)	N/A	445	27.64
Cleveland-Cincinnati	(127)	N/A	44	404.55
Chicago-Cleveland	1164	11.14	1426	9.68
Los Angeles-San Diego	563	2.49	1046	1.34
Miami-Jacksonville	(107)	N/A	690	20.87

Generally, the sensitivity analyses suggest that the results of the evaluation are not significantly sensitive to even large changes in key variables that drive the demand forecasts. Demand could shift more significantly if two or more of these variables were to change concurrently, or if there were a long-term interruption in the availability of gasoline.

SUMMARY

The evaluation of the corridors produced a wide range of cost-effectiveness estimates when measured against the two evaluation criteria: dollars of public expenditure per passenger mile and dollars of public expenditure per gallon of gasoline saved. Nonetheless, two findings emerge from the evaluations:

1. The Los Angeles-San Diego Corridor service is the best performer based on either of the two evaluation criteria; and

2. It is difficult at this time, to justify investment in corridor service based on fuel savings alone. Even where corridor service saves fuel, the annual public expenditure is greater than $5.00 per gallon saved.

CHAPTER V

Corridor Profiles

This chapter contains, for each corridor reviewed in this report:

- General requirements to bring the track up to corridor service standards, along with the estimated capital costs for track and signal work, grade crossings improvements, and operational facilities at stations.

- A section on ridership projections and revenue, which also includes summary information on current markets and other transportation modes serving the major destinations on the route.

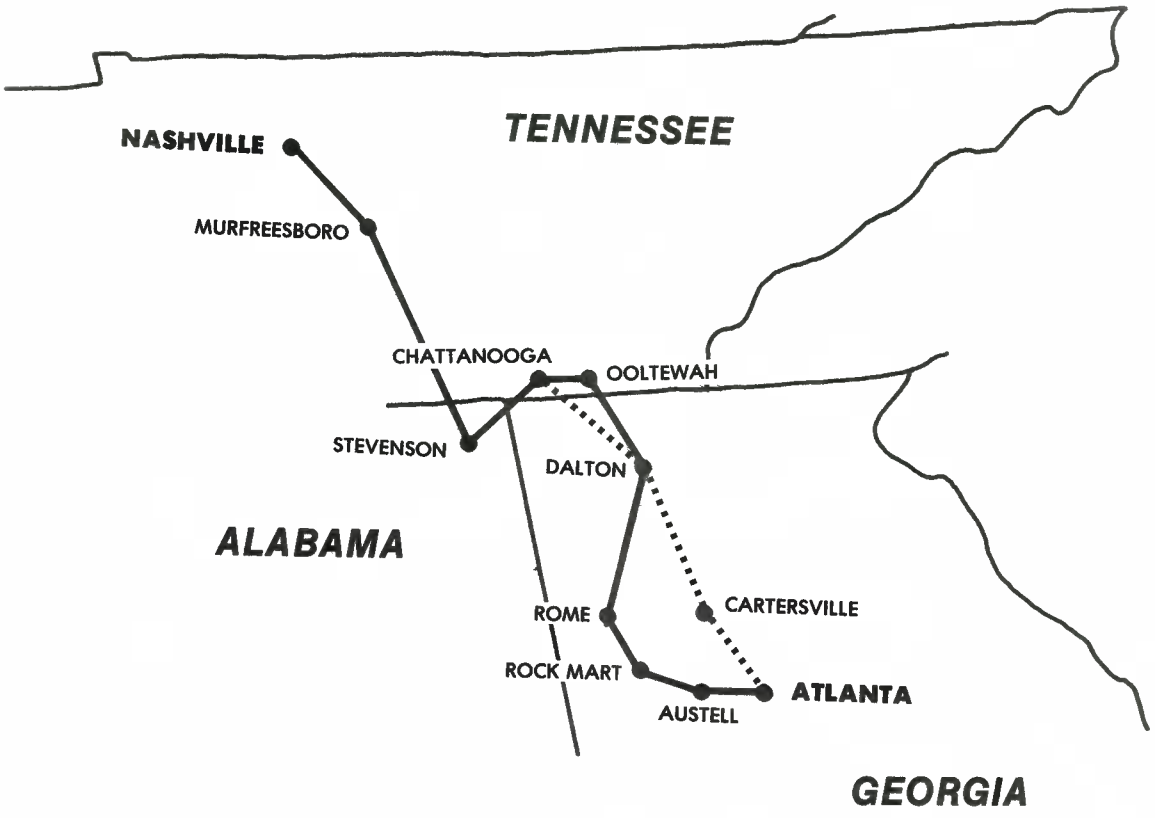
- Equipment requirements, given certain train frequencies and the projected market.

- Operating statistics broken out into three measures of projected performance -- passenger miles per train mile, short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost.

- Employment benefits -- the number of jobs that would be generated by the corridor service.

The final section of each profile contains a brief description of community views on potential corridor service. These reviews are the product of 30 corridor meetings held by Amtrak around the country along the routes of the 25 emerging corridors discussed in this report. The meetings, most of which were held at the invitation of Members of Congress, were intended to identify community characteristics which might have a bearing on ridership and revenue levels if passenger rail service were increased, to learn if states or communities might take actions to reduce the cost to the federal government of providing emerging corridor service, and to learn what additional, indirect public benefits might accrue to the affected communities beyond the provision of rail service itself. Inevitably, much information gathered at such meetings is impressionistic and is more difficult to quantify than other parts of a corridor analysis. Nonetheless, Amtrak considers such community views of the potential effects of corridor service to be an integral element of any assessment of the value of a potential emerging corridor. The Department did not participate in these hearings and played no role in developing this information. Therefore, the Department cannot attest to the accuracy or validity of these views.

Atlanta-Nashville Corridor



RECOMMENDED ROUTE
ALTERNATIVE ROUTE

Atlanta, one end of the corridor, is the business, financial, and transportation hub of the Southeast. Travel over all modes is very heavy. Nashville, at the other end, is a growing industrial area and the heart of Country and Western music. The recommended route also passes through Chattanooga, which bills itself as the "Energy Showcase of the Nation" because of the many model energy facilities in the area. At present there is no passenger service over the route, although freight traffic is among the heaviest in the country.

Engineering Requirements

The recommended route for the Atlanta-Nashville corridor (296 miles) would pass through Chattanooga. The segment from Atlanta to Chattanooga, about 152 miles, would be over Southern Railway track. It would connect in Chattanooga with a Louisville & Nashville (L&N) line that runs to Nashville, 144 miles. Other routes, which are shown on the map, are not recommended because of extremely heavy freight traffic. Freight traffic is heavy over the recommended route as well and would be a key problem if this corridor is developed. The Atlanta-Chattanooga Southern line is one of the heaviest density single track freight lines evaluated in the entire corridor study, and the volume of traffic is expected to continue growing.

The Southern line is mainly single track with Traffic Control System (TCS), with one short segment of double track just south of Chattanooga. Except in Chattanooga, the rail is continuous welded. It is maintained for a 60 mph maximum authorized speed, and slow orders are negligible. However, speeds are often restricted by the curvature and grades, some exceeding 1 percent. The line has excellent flexibility with the TCS and two to three mile sidings. Still, as noted, the route is close to saturation in terms of the volume of freight traffic, and a corridor service would require the addition of a second track in some areas, major improvements to existing sidings, and construction of new ones. Superelevations would also have to be restored in order to increase the operating speeds for passenger trains. Finally, grade crossings would have to be addressed.

The L&N line between Chattanooga and Nashville is single track except for one section of double track leading out of Chattanooga and other short segments. Traffic out of Chattanooga is very heavy and subject to restricted speeds, with resulting delays. Almost the entire route has TCS and continuous welded rail and is maintained in accordance with FRA Class 4 standards but operated at a maximum authorized speed of 50 mph. Because track conditions are generally marginal, the passenger comfort at speeds above 50 mph would be unsatisfactory. The same conditions have resulted in slow orders over about 20 percent of the track.

About 10 percent of the rail would need to be replaced to provide an adequate ride at speeds above 50 mph. A further difficulty is the rolling terrain, with numerous curves and steep grades. To accommodate a corridor train operation, existing sidings would have to be lengthened, and additional sidings would have to be constructed. Superelevation on curves would need to be restored and grade crossing protections upgraded.

Even with these capital improvements, it is likely that the heavy freight traffic would impede expeditious and reliable service. It appears that the only way to establish an adequate corridor operation would be to develop a dedicated right-of-way over selected segments of the route, a very expensive alternative. No estimate was prepared for this approach.

The terminals on the corridor also pose problems. In Atlanta, Amtrak currently uses the Peachtree Station in the northern section of the city. This station does not serve the downtown area and has inadequate capacity to accommodate a corridor service, particularly if the proposed Atlanta-Savannah corridor was also developed. The Peachtree facility cannot be expanded as no land is available nearby.

Five other sites have been proposed. Of these, the one with the greatest potential is adjacent to the Southern Railway line where it passes near OMNI in downtown Atlanta. The approach trackage is in excellent condition and is signaled for operating flexibility. On the other hand, the site would require a major capital investment to develop it. These and other alternatives for new terminals in Atlanta need to be studied further.

There is no suitable station at Chattanooga, either. There does not appear to be a potential site in the central business district, but sites would probably be available adjacent to the L&N line. Wherever the site, a new station will have to be built.

The former Amtrak station in Nashville is judged to be wholly unsuitable for a corridor service. A large part of the station was purchased by the federal government and is being used for offices. If a corridor service is to be developed, it would be appropriate to consider building a new terminal.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $16 and $27 million; of improving signal protection or eliminating grade crossings, $9 million; and of upgrading the station facilities, $15 million. These figures do not include engineering and design costs.

Ridership Projections

The SMSAs included in this corridor are Nashville, Chattanooga, and Atlanta, with a total population of 3,371,000, or 11,708 persons per route mile. On this route there are four military installations with a population of 2,027, as well as 30,991 federal civilian employees.

There is currently no passenger train traffic within this corridor. However, connections can be made in Atlanta with Amtrak's Crescent between New York and New Orleans. There is frequent non-stop air trunk line service between Atlanta and both Chattanooga and Nashville, with flying times of less than one hour to each. Limited commuter air service is available between Chattanooga and Nashville. Through-express bus service is available between all points, with Atlanta-Nashville trip times of under six hours on some runs. For the auto traveler, Interstates 24 and 75 closely follow this route.

The following table shows common carrier service and fares as of February 1981 between Atlanta and Nashville:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail		NO RAIL SERVICE	
Air	26	0:45	$66.00
Bus*	6	5:35	29.80

*December 1980 data.

Following the implementation of corridor service, it is projected that the rail schedule would be six hours.

With a projected ridership of 15.5 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $1.56 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 19.38 million passenger miles per year, for an estimated annual revenue of $1.95 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
3 Round Trips	$13.0	Amfleet	4
3 RTs (+25% Demand)	13.0	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections — passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	24	43.5¢	16%
+25% Demand	3	30	33.1	19

Employment Benefits

Operation of the service described here would provide ongoing employment for 179 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,425 person-years of labor.

Community Views

In January 1981, Amtrak held a briefing in Atlanta, Ga., on both the proposed Atlanta-Savannah corridor and the proposed Atlanta-Nashville corridor. About 100 people attended, including representatives of the mayors of Atlanta and Savannah, representatives of members of the U.S. Congress, and numerous people representing county boards of commissioners, Chambers of Commerce, universities, the Georgia Municipal Association, the National Association of Railroad Passengers, state and local transportation agencies, and tourism organizations. The attendees were knowledgeable about the issues involved in rail passenger service and the corridor concept, in part because of the interest generated a year earlier by discussions concerning Georgia's potential participation in Amtrak's 403(b) program. In addition, Georgia is served by four key long-haul Amtrak passenger routes. Frequent reference was made to the large

amount of business and tourist travel to Atlanta, the business, financial, and transportation hub of the Southeast. It was noted that Atlanta is the third largest convention destination in the country. The event generated a substantial number of editorials and letters to the editor, most of which were supportive of a corridor service.

Further comments and information were submitted subsequent to the briefing. Several members of the Tennessee State House of Representatives endorsed the idea of an Atlanta-Chattanooga-Nashville corridor, pointing to the industrial growth in the region and the need for reliable transportation alternatives. The mayor of Nashville and the Metropolitan Government of Nashville and Davidson County noted that their region had a long history of support for rail service over the corridor and that there was continuing interest on the part of such organizations as the Chamber of Commerce and the Tennessee Department of Tourism. Nashville is planning to build a convention center near the recently remodeled train station; that project would be enhanced by the reinstitution of rail service. Correspondents noted the need for the railroad as an alternative to intrastate air service, which has been decreasing in frequency and increasing in price. Further evidence of a demand for a rail alternative is the decline in revenues from state gas taxes, indicative of a shift away from automobile travel. Finally, mention was made of the many tourists who are attracted to the home of the Grand Ol' Opry.

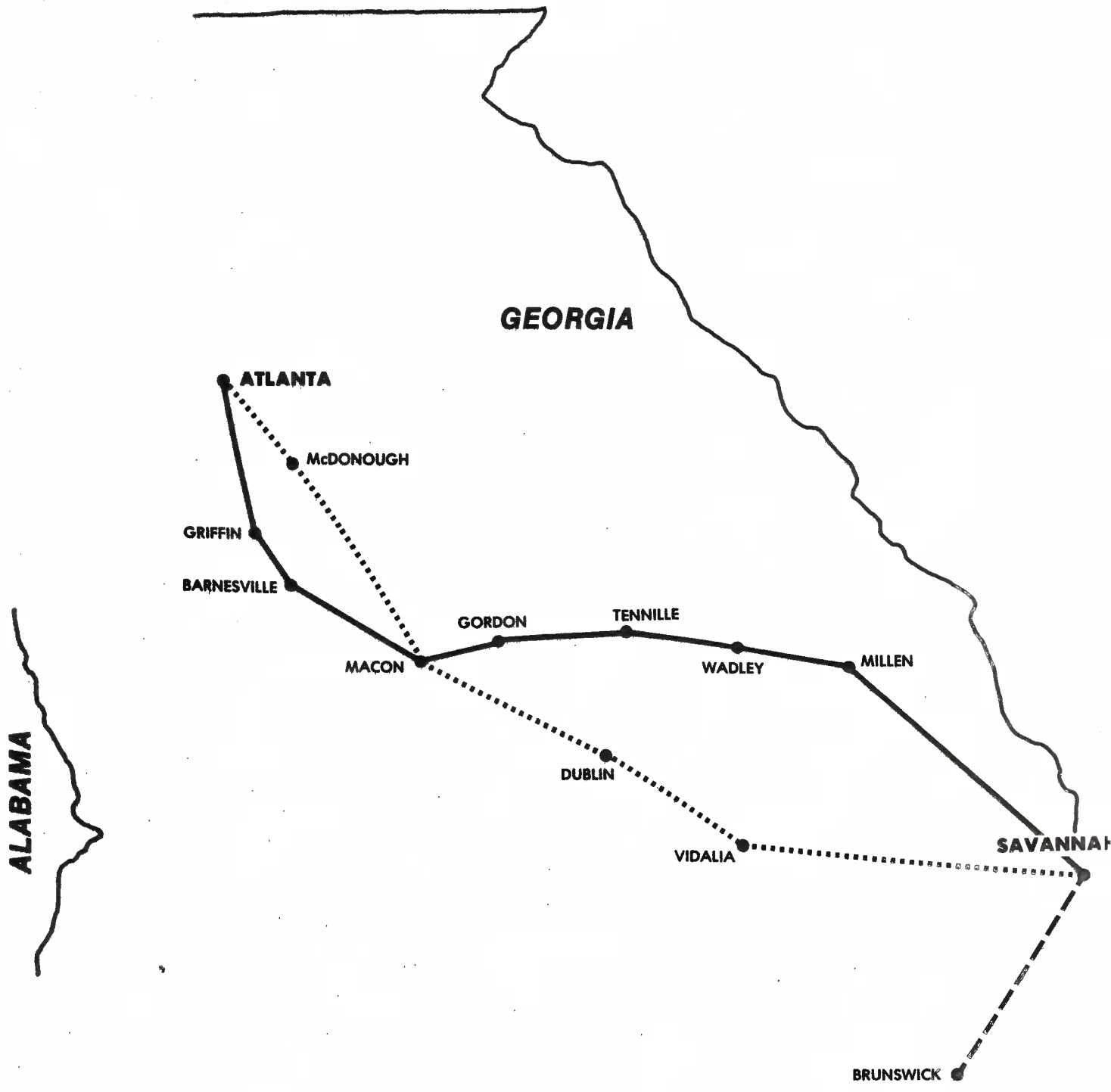
Chattanooga officials also wrote in support of the corridor service. They commented on the business and tourist travel generated by the many model energy facilities in the area -- the city bills itself as the "Energy Showcase of the Nation." Another major attraction that spokesmen said would benefit rail travel is the Tennessee Valley Railroad Museum. They noted that in addition to tourists, many of the 20,000 students and 31,000 federal employees in the area could be expected to use the railroad. They noted that the downtown redevelopment efforts in Chattanooga would be enhanced by rail service and that, as part of that effort, the train station was being rehabilitated. Two alternative sites for a station in the central business district near the Chattanooga Choo Choo Complex were also said to be available.

It was noted that Chattanooga has been involved in a major railroad relocation program since the early 1960s, a project that has received state support. As a result of this program, all grade crossings at major routes have been eliminated, and the remaining ones are being improved. This program was cited as evidence of the city's long-standing interest in rail service.

Support was also expressed by a number of local communities along the corridor, such as Smyrna, where a major Nissan automobile plant is being constructed. One of the regional planning and development associations, representing 62 local governments in southeast Tennessee and northeast Georgia, expressed strong support for the corridor service. It noted the rapid rate of industrial growth in the area and the need for rail service, particularly in light of the decrease in frequency in intrastate air service.

The Georgia Department of Transportation has noted that it would prefer to see the Atlanta-Nashville emerging corridor considered in conjunction with the Atlanta- Savannah emerging corridor, on grounds that the overall performance would be improved by joining them.

Atlanta-Savannah Corridor



Atlanta is already a major transportation hub for all modes of travel, the result of its position as the financial and business center of the Southeast. It is said to be the third largest convention destination in the nation, and it offers numerous tourist attractions. Savannah, a city rich in history and famous for the restoration of its downtown, is the largest port in the Southeast, a gateway to coastal resorts, and the connecting point for trains to Florida. Rail passenger service is expected to benefit a great many people -- tourists, businessmen, students, commuters to Atlanta, and the elderly -- who travel along this corridor.

Engineering Requirements

The recommended route for the Atlanta-Savannah corridor runs 293 miles over Central of Georgia (C of G) track, passing through Macon. The Southern Railway route between Atlanta and Macon has extremely heavy freight traffic.

The segment running between Atlanta and Macon, which is 103 miles long, is single track with a Centralized Traffic Control system. Freight traffic is minimal. However, in general the condition of the rail and ties is poor, and there are numerous slow orders, including one 10 mph segment. The railroad is considering a 25 mph speed restriction because of the track conditions. With upgrading of the rail and ties, a track suitable for a corridor operation could be restored. Crossing protection circuits would also have to be lengthened to accommodate the higher speeds. A new deck would be required on the trestle leading into Macon, which is currently out of service.

The segment from Macon to Savannah is 190 miles of single track with continuous welded rail in excellent condition. However, only about 20 miles have Traffic Control System (TCS). The rest of the line has no block signal system. The absence of a block signal system would reduce the maximum speed to 59 mph. The capital improvements required to make this segment of the route suitable for a corridor operation are principally TCS and some sidings. In general, communities in Georgia have imposed many local speed restrictions. The resulting delays would appear to impede establishment of a reasonable and expeditious corridor service.

Amtrak currently uses the Peachtree Station in Atlanta. However, this terminal is in the northern section of the city, which would not be convenient for trains from Savannah. Further, the station does not have adequate capacity to accommodate a corridor operation, and additional land is not available for expansion. The problem would be particularly acute if the Atlanta-Nashville corridor were also developed.

Five other sites have been proposed. The site adjacent to the Southern Railway line near OMNI in downtown Atlanta has the greatest potential. One factor favoring this site is its access to both the Savannah and Nashville corridors. The trackage to the site is in excellent condition and is signaled for operating flexibility. On the other hand, the site would require a major capital investment to develop it. Further study is needed to examine these and other options for an Atlanta terminal.

Restoration of the existing Macon station for passenger service is not economically feasible, and a new facility would probably have to be constructed there as well. Property adjacent to the former station might be available.

In Savannah, Amtrak is using a station owned by the Port Authority on SCL trackage. The station has adequate capacity to handle a corridor operation, however some capital improvements would be needed to provide for servicing.

The State of Georgia has requested that service between Atlanta and Brunswick be evaluated. Service running Brunswick is only feasible through Savannah. No estimate of capital costs was prepared for this route.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $17 and $23 million; for improving signal protection or eliminating grade crossings, $9 million; and for upgrading the operational capacity of the station facilities, $5 million. These figures do not include engineering and design costs.

Ridership Projections

The SMSAs included in this corridor are Atlanta, Macon, and Savannah, with a total population of 2,510,300, or 8,570 persons per route mile.

There is no passenger train traffic currently within this corridor. However, connections can be made at Atlanta with Amtrak's Crescent (New York-New Orleans) and at Savannah with Amtrak's various trains between Atlanta and both Macon and Savannah, with flying times of less than one hour to each. Through bus service is available between Atlanta, Macon, and Savannah, with schedules of about seven hours. For the auto traveler, Interstates 75 and 16 closely parallel this route.

The following table shows common carrier service and fares as of February 1981 between Atlanta and Savannah:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail		NO RAIL SERVICE	
Air	24	0:47	$70.00
Bus*	12	5:40	20.75

*December 1980 data.

Following the implementation of corridor service, it is projected that the rail schedule would be 5 hours, 30 minutes.

With a projected ridership of 4.9 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $486,000. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 6.1 million passenger miles per year, for an estimated annual revenue of $607,000.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Cost of Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
3 Round Trips	$13.0	Amfleet	4
3 RTs (+25% Demand)	$13.0	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	8	$1.56	5%
+25% Demand	3	10	1.23	6

Employment Benefits

Operation of the service described here would provide ongoing employment for 151 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 1,869 person-years of labor.

Community Views

In January 1981, Amtrak held a briefing in Atlanta, Ga., on the Atlanta-Savannah corridor. About 100 people attended, including representatives of the mayors of Atlanta, Savannah, and other Georgia municipalities along the proposed route, representatives of members of the U.S. Congress and numerous people representing county boards of commissioners, Chambers of Commerce, universities, the Georgia Municipal Association, the National Association of Railroad Passengers, state and local transportation agencies, and tourism organizations. The attendees were knowledgeable about the issues involved in rail passenger service and the corridor concept, in part because of the interest generated a year earlier by discussions concerning Georgia's potential participation in Amtrak's 403(b) program. In addition, Georgia is served by four key long-haul Amtrak passenger lines. Frequent reference was made to the large amount of business and tourist travel to Atlanta, the business, financial, and transportation hub of the Southeast. Atlanta was said, for example, to be the third largest convention destination in the country. Commuters were mentioned as another key market; many people travel to work from as far away as Macon, a major city that would be served by a corridor operation.

Savannah, the major port of the Southeast and a historic city, is a major tourist attraction, particularly since the restoration of the downtown. It is also the connecting point for trains to Florida and a gateway to Georgia and South Carolina coastal resorts. The large retirement community in Savannah was mentioned as a substantial and likely market for rail service, as the elderly live on fixed incomes that do not keep pace with the price of gas. Finally, note was made of the 40,000-plus military and federal civilian personnel along the corridor. Use of rail service would be enhanced, it was said, by the decline in intrastate air service, the frequency of which has been dropping as short hops become less and less economical.

Further comments and information were submitted subsequent to the briefing. Again, Atlanta's position as a regional center was emphasized, with every expectation that the rate of growth would continue. One spokesman submitted statistics showing the heavy volume of travel in the area: traffic over the Interstate system is the third highest in the nation, air travel through

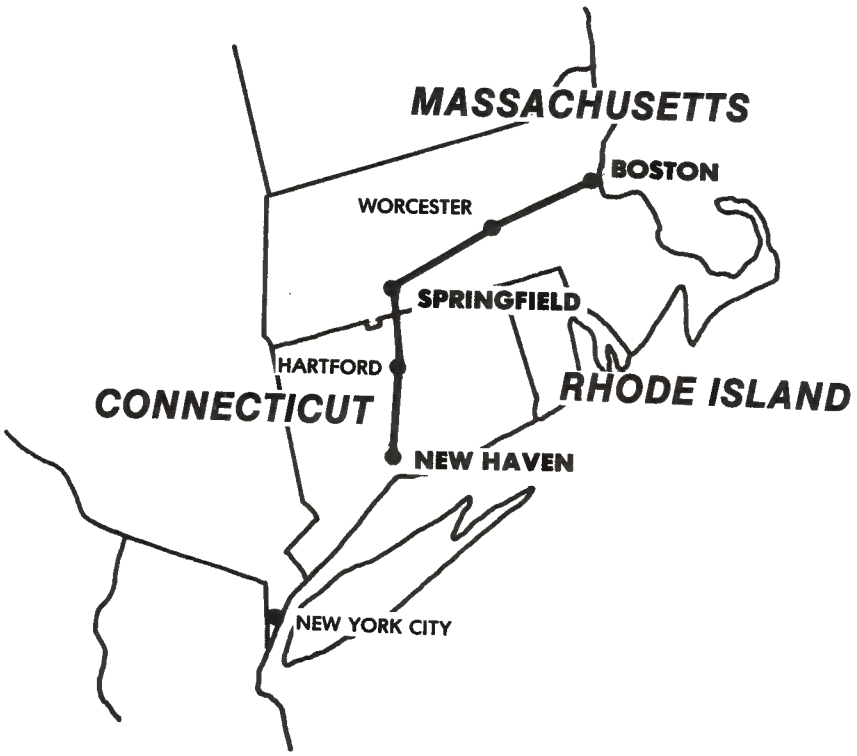
Atlanta is the second highest in the world, and bus travel is substantial. Spokesmen for Savannah reiterated the popularity of their city as a tourism destination and the volume of business travel between Atlanta and Savannah.

Many local communities and organizations such as the Coastal Area Planning and Development Commission submitted resolutions supporting the corridor concept. Many communities expressed their willingness to support the corridor through the provision of services such as parking.

The State of Georgia has already expended substantial monies to improve grade crossings and has funded a feasibility study for rail passenger services between Atlanta and Macon. Interest in Amtrak's 403(b) program has been high.

The Georgia Department of Transportation has noted that it would prefer to see the Atlanta-Nashville emerging corridor considered in conjunction with the Atlanta- Savannah emerging corridor, on grounds that the overall performance of both would be improved by joining them.

Boston-Springfield-New Haven ["Inland"] Corridor



RECOMMENDED ROUTE

The Inland emerging corridor is so named to distinguish it from the Shore route that also connects Boston and New York City. The Inland corridor would provide service to the major Massachusetts cities of Worcester and Springfield and the major Connecticut cities of Hartford and New Haven.

Engineering Requirements

The Inland Route extends from Boston to Springfield, Mass., to New Haven, Conn., for a total length of 160 miles. The line from Boston to Springfield, generally referred to as the Boston & Albany, is Conrail's main line between Boston and the West. Amtrak operates the Lake Shore Limited over this line. Amtrak owns the line from Springfield to New Haven. Upgrading the route for corridor service would require considerable work on track and an improved signal system for major segments.

The entire route consists of double track, much of which is in poor condition and in need of major upgrading, primarily because of rail condition. The segment from Boston to Springfield would require renewal of rail for more than 100 track miles and new ties and surfacing for about 130 track miles.

The track from Springfield to New Haven consists of old rail that has carried heavy tonnage for many years. Much of the rail dates from the 1930s and the 1940s and is worn out. Almost all of the rail on this 62-mile double-track segment would have to be replaced. A tie program is being instituted as part of a multiyear Amtrak renovation effort.

Another important requirement for corridor operations would be the installation of a Traffic Control System (TCS) in two segments: from a point just east of Worcester, Mass., to Springfield, and from Springfield to New Haven.

Amtrak estimates that the capital costs of upgrading track and signals for this corridor could range from approximately $59 million to $74 million. Amtrak estimates the cost of improving signal protection or eliminating grade crossings to be neglible. Station and yard facilities will require upgrading which is estimated to cost $2 million. Engineering and design costs would be in addition to these estimates.

Ridership Projections

The SMSAs included in this corridor are Springfield, Worcester, Boston, Hartford, and New Haven, with a total population of 5,958,800, or 37,200 per route mile. The route has a federal employee population of 38,527.

Passenger train traffic currently consists of 14 per day each way Springfield-New Haven, including two through trains (the Bankers and the Montrealer). In addition, the Lake Shore Limited serves Springfield and Boston daily. The Springfield-New Haven schedule is 1 hour, 35 minutes; Springfield-Boston is 2 hours, 35 minutes. There is also MBTA commuter rail service between Framingham and Boston. Scheduled airlines operate between Hartford/Springfield and New York (38 minutes flying time), Boston (28 minutes flying time), and Philadelphia (52 minutes flying time). There is extensive bus service from Springfield to New York with a 3 hour, 30 minute schedule, and from Springfield to Boston with a 1 hour, 35 minute schedule. For the auto traveler, Interstates 90 and 91 parallel the rail route.

The following table shows common carrier service and fares as of February 1981 within this corridor:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail		NO RAIL SERVICE	
Air	10	0:28	$29-50.00
Bus*	43	1:35	19.50

*December 1980 data.

Following the implementation of corridor service, it is projected that the Boston-New Haven rail schedule would be 3 hours, 17 minutes.

With a projected ridership of 53 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $5.94 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 66.25 million passenger miles per year, for an estimated annual revenue of $7.43 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, and the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
3 Round Trips	$15.8	Amfleet	3
3 RTs (+25% Demand)	18.7	Amfleet	3

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	151	2.8¢	66%
+25% Demand	3	189	1.2	75

Employment Benefits

Operation of the service described here would provide ongoing employment for 81 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 3,719 person-years of labor.

Community Views

Local official and public views on the Inland corridor were the subject of an Amtrak briefing held in City Hall in Springfield, Mass., on January 28, 1981. Eighteen people attended, representing the state transportation departments of Connecticut and Massachusetts, municipal planning departments, state and municipal economic development agencies, civic groups, rail labor, and members of the U.S. Congress. The briefing was held at the invitation of the Mayor of Springfield, Theodore DiMauro.

The Massachusetts Executive Office of Transportation and Construction submitted a memorandum on the corridor. It noted that Delta Air Lines, which was the only major airline serving Worcester, discontinued all service there effective April 1980. As of January 1981, there is no through air service between Worcester and any Northeast Corridor points south of New York. The memorandum noted that because of marginal profitability and ease of entry, the

commuter airline route structure in the Commonwealth of Massachusetts has a history of instability. The commuter airline routes in the Inland corridor have been operated by the current carriers for under two years, and it is difficult to predict the long range future of this service. The memorandum also noted that the greatest potential need for service that would be provided by the Inland Route is for travel between Worcester and New York City or points south. During the past decade, major revitalization of the Worcester Central Business District has taken place.

The Lower Pioneer Valley Regional Planning Commission submitted a statement noting several distinct characteristics of the corridor that might significantly affect the ridership projections. The commission pointed out, for example, that the route would have an unusually dense concentration of education institutions (50 in Boston, 10 in Worcester, 20 in Springfield, 10 in Hartford, and 5 in New Haven). The commission said that New Haven, Hartford, Springfield, Worcester (under construction), and Boston all operate civic centers or areas seating in excess of 8,000 people each. Further, the five major cities along the Inland Route exhibit extensive economic ties. All of these ties combine to create a significant market for business-related train travel among those cities. An additional distinctive characteristic of the Inland Route is the strong cultural, recreational, economic, and tourism ties that the five cities and New England in general hold with New York City. The largest city within the commission's planning jurisdiction is Springfield, which the commission said currently is undergoing a major revitalization of its center city. The program affords improved access to the downtown area, additional parking facilities, and construction and renovation of more than 1,000 housing units downtown within the past few years. More work is underway or is planned. It was felt that improved rail service could contribute to this development.

Subsequent to the January briefing, the Connecticut Department of Transportation (ConnDOT) responded to a number of questions posed by Amtrak. ConnDOT noted that Connecticut has a demonstrated commitment to investment in its rail system; an example is its investment in the New Haven Line commuter service. The response listed major tourist attractions in New Haven, Hamden, Meriden, Middletown, New Britain, Hartford, and other locales. The response also listed 15 major colleges and universities, adding that athletic events such as the Harvard-Yale football game would add riders to the corridor trains. Development plans to improve rail access also were discussed in the ConnDOT response. The Springfield Line Capital Improvement Program is a cooperative program undertaken by ConnDOT and Amtrak. ConnDOT has purchased 12 new self-propelled railcars and undertaken reconstruction and expansion of station parking facilities; Amtrak has improved station facilities and increased service by five round trips on its Connecticut Valley service. This program was conceived with the

objective of making the railroad both cheaper for Amtrak to operate and more attractive to potential passengers; it is an indication of the state's attitude toward participating in financing corridor operations, ConnDOT said. ConnDOT also noted that the Hartford Intermodal Transportation Terminal is a multimillion dollar program to combine rail, intercity bus, local bus, airport-oriented bus, and taxi service into one terminal facility. Commercial development of the remainder of the building and substantial parking are integral parts of the the project.

ConnDOT noted two projects involving other modes of travel which could affect corridor rail use. Improvement of Interstate 95 from Hartford to the Massachusetts line could divert some riders — during the lengthy construction period -- from cars and express buses to rail service. The long-term effect of the improved I-95 is expected to lie in further economic growth in the region. The increasing cost of highway travel, ConnDOT noted, should encourage the use of alternate modes for longer trips. The other project is the reconstruction of Bradley International Airport. Assuming that the plan is implemented, the effect on Inland route service is not clear because ConnDOT's rail and air planners believe that in this corridor Amtrak and the airlines are not generally competing for the same trips.

ConnDOT also made these points:

- Connecticut has maintained a strong attraction to new and relocated corporate offices and light industries. The availability of convenient, relatively inexpensive rail transportation should further enchance the attractiveness of the state's cities.

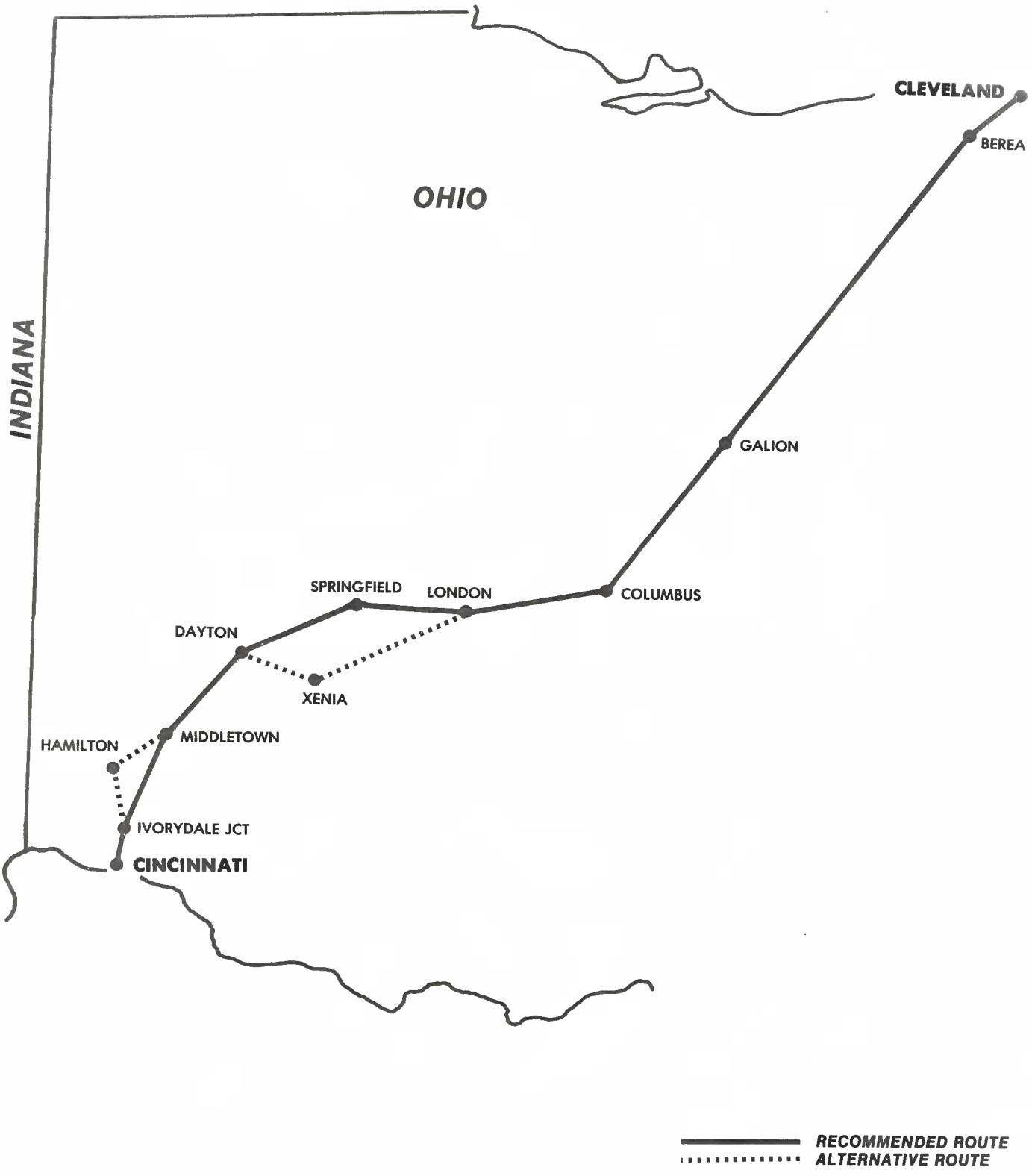
- Many major employers in the Hartford area have expressed to ConnDOT an interest in rail service.

- ConnDOT's bureau of highways has been participating in the improvement of railroad crossings at grade on the Springfield line.

- State and local participation in station upgrading exists; an example is the project to upgrade the Springfield Line station.

Finally, ConnDOT stated that the availability of a convenient, reliable, and relatively inexpensive alternative mode of transportation is a definite asset to the attractiveness of any urban area. As gasoline prices increase, highway travel is becoming less attractive, the agency said. Air travel has shown a significant decrease over the past year. There appears to be a growing gap in the travel market that emerging corridor service, particularly when intergrated with regional motor bus service as feeders and relievers, is "ideally suited to fill."

Cleveland-Cincinnati Corridor



This corridor connects Cleveland and Cincinnati via three other major metropolitan areas -- Columbus, Springfield, and Dayton. Thus it would run through densely populated areas, as well as sparsely populated countryside and farming communities. At present, there is not a great deal of traffic between the two end terminals, although both are major pro sports centers. Dayton, Springfield and Columbus, all industrial areas, generate business travel, and Columbus, as the state capital, draws visitors from throughout the state. No passenger rail service is currently operated within the corridor.

Engineering Requirements

The recommended Cleveland-Cincinnati corridor, which passes through Columbus, Springfield, and Dayton, is approximately 262 miles long. Except in the Cincinnati terminal, the route uses Conrail trackage. Other alternatives were studied, but are not recommended.

There is capacity for an additional three passenger trains each way per day, even though the corridor is a key freight line in Ohio.

Almost the entire corridor would have to be upgraded to FRA Class 4 standards. In some areas ties would have to be replaced and resurfacing performed. While there are about 167 miles of double track, in general, one of the two tracks is in marginal condition, and the other is authorized for maximum speeds of 40 to 60 mph. The remainder of the route is single track that would require upgrading and the construction of new sidings. Speeds are restricted to less than the authorized maximums because of the rail condition. A small amount of Traffic Control System needs to be installed. Crossing protection circuits must be lengthened to accommodate higher speeds. Some additional specific problems are:

- On the Berea to Galion segment, six grade crossings with other rail lines seriously impede reliable high-speed corridor service.

- The London to Dayton segment has numerous slow orders, including one through Springfield, where the track runs through town, at one point passing down the middle of a main street. Grade crossings are numerous.

- From Ivorydale Junction into Cincinnati, freight traffic is very heavy and operating speeds very slow.

With respect to terminals, Amtrak has a new facility in Cleveland, but it would have to be expanded to provide adequate servicing and storage capability. Land is available for that purpose. Cleveland is a terminal for two potential corridors (Cleveland-Cincinnati and Chicago-Cleveland), and it could be developed to serve both.

Springfield has no station, and one would have to be constructed. The Conrail station at Dayton could be upgraded with relatively little cost.

The Amtrak terminal in Cincinnati is on the Conrail line that goes to Indianapolis. The terminal would have to be substantially upgraded to serve even one corridor, in terms of both servicing and standby capacity and passenger needs. The nearby B&O Storrs Yard should be available for purchase or lease in 1981 and would afford adequate space for development of a terminal facility with room for future expansion. It may be necessary to add a new track around the B&O freight yard to improve access and provide improved operating speeds to the Cincinnati station.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $38 and $77 million; for improving signal protection at or eliminating grade crossings, $5 million; and for upgrading terminal and station facilities, $16 million. These figures do not include engineering costs.

Ridership Projections

The SMSAs included in this corridor are Cincinnati, Dayton, Columbus, and Cleveland, with a total population of 5,557,800, or 20,992 persons per route mile.

There is currently no passenger train traffic within this corridor except for Amtrak's Lake Shore Limited, which runs for 12 miles between Cleveland and Berea. However, connecting Amtrak service is available at Cincinnati (Cardinal to Chicago, and the Cardinal and Shenandoah to Washington, D.C.); Crestline (Broadway Limited to Chicago and New York/Washington); and Cleveland (Lake Shore Limited to Chicago and New York/Boston).

Air service is available between all combinations of Cincinnati, Dayton, Columbus, and Cleveland. Frequencies, however, are rather limited between some combinations and are largely provided by commuter air carriers. Non-stop flying time between Cleveland and Cincinnati is 45 minutes. Express bus service is available between all points, with a Cincinnati—Cleveland running time of 5 hours, 30 minutes to 6 hours.

For the auto traveler, Interstate 71 provides a direct link among Cincinnati, Columbus, and Cleveland, while Interstates 75 and 70 connect Dayton and Springfield to Interstate 71.

The following tables show common carrier service and fares as of February 1981 between Cleveland-Columbus-Cincinnati:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
		Cleveland-Cincinnati	
Rail		NO RAIL SERVICE	
Air	6	0:45	$71-75.00
Bus*	16	5:10	19.80
		Cleveland-Columbus	
Rail		NO RAIL SERVICE	
Air	5	0:33	$52.00
Bus*	20	2:45	11.70

*December 1980 data.

Following the implementation of corridor service, it is projected that the rail schedule would be 5 hours between Cleveland and Cincinnati.

With a projected ridership of 27.2 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $2.74 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 34 million passenger miles per year, for an estimated annual revenue of $3.42 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs	
		Type	Proposed Train Sets
3 Round Trips	$13.0	Amfleet	4
3 RTs (+25% Demand)	13.0	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	47	22.5¢	26%
+25% Demand	3	60	16.3	31

Employment Benefits

Operation of the service described here would provide ongoing employment for 161 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 4,358 person-years of labor.

Community Views

The Northeast Ohio Areawide Coordinating Agency, an organization of city and local governments, hosted a briefing on the Cleveland-Cincinnati and Chicago-Cleveland corridors in January 1981. Representatives of the Ohio Rail Transportation Authority (ORTA), local businesses and Chambers of Commerce, county governments and local communities, railroads, unions, and Congressional offices attended.

Speakers showed general interest in a corridor service. Some caution was expressed because of the lack of heavy business and tourist travel. On the other hand, it was noted that both Cleveland and Cincinnati are major destinations for pro sports events, and in 1980 the Ohio State Buckeyes attracted about 615,000 fans to their games in Columbus, which would be served by the recommended route. Dayton, Springfield, and Columbus are all industrial centers and attract significant business travel. The lack of adequate air service among the major cities in Ohio and the problems of winter weather suggest the need for a reliable, all-weather transportation system. Two large, potentially important markets are the approximate 190,000 students at institutions of higher education along the route and the 39,000 military and civilian personnel at Wright-Patterson Air Force Base near Dayton. ORTA indicated it would support the corridor service as an interim step toward its ultimate goal of high-speed rail passenger service throughout the state.

Additional information was submitted subsequent to the meeting. Spokesmen for Cincinnati wrote in support of a corridor linking their city with Cleveland. They noted that the Union Terminal revitalization project in Cincinnati has attracted restaurants and shops back to the station area. More parking has been added, access to Interstate 75 has been made more convenient, and signage to the terminal has been upgraded. Bus service to the facility is excellent. The inadequacy of intrastate air service was mentioned as a factor favoring rail service, as was the need for reliable public transportation during the winter. The mayor of Cincinnati expressed his belief that renewed rail passenger service would increase tourism (which centers around sporting events and two nearby theme amusement parks), would encourage the growth of business and reinvestment in the downtown, and would provide obvious energy savings. He also commented on the large student population of about 50,000 around Cincinnati. ORTA subsequently informed Amtrak that it supported use of Union Terminal in Cincinnati because the station was well developed and would contribute to train usage.

The Tower City Development Corporation of Cleveland, which is redeveloping the Terminal Tower that houses the former railroad station, expressed strong support for the proposed corridor service. It noted the Tower's easy access to Cleveland's new rapid transit system and the general revitalization of the area. It hoped that rail service to the terminal could be restored. ORTA subsequently informed Amtrak of its support of the use of Terminal Tower station because of good rapid transit connections to airports.

Columbus, likewise, expressed its support of the corridor service. The city recently completed a new downtown convention center near the former railroad station and is promoting the redevelopment of the area, now called Ohio Center. There is already a major and successful shopping mall, and a Hyatt Regency hotel across from the station. The area is accessible to local buses and the interstate highway system. The city hopes eventually to make Ohio Center the terminus of a People Mover. Mention was also made of the inadequate air service and the need for a reliable, rapid, all-weather alternative.

Dayton is also revitalizing its downtown and has constructed a new convention center. Although the former Union Station has been out of service since 1979, the city believes it could be restored easily and has adequate capacity to serve a corridor operation. It is accessible to other transportation modes and is surrounded by extensive commercial development. Reopening the station would provide further impetus to rejuvenation of the downtown.

Two other cities which wrote in support of the corridor concept were Toledo and Springfield. They, too, saw it as a boost to their downtown redevelopment efforts.

The Ohio State Constitution prohibits the state from entering into joint ventures with for-profit corporations such as Amtrak, which is a possible constraint on the support the state might be able to provide. However, it was noted that local communities and cities have been cooperating with Amtrak, and ORTA has spend substantial funds on feasibility studies, research, and marketing studies relating to a high-speed intercity rail passenger service statewide.

Chicago-Cincinnati Corridor

RECOMMENDED ROUTE

This corridor connects Cincinnati and Chicago via Indianapolis. Chicago has long been the major hub of rail passenger service in the United States, linking all parts of the country. The city of Indianapolis is also a regional business center. Reliable and cost-effective transportation alternatives are considered a key in the future of the city. In Amtrak's opinion, the popularity of the recently initiated Hoosier State service between Indianapolis and Chicago indicates a substantial demand for rail passenger service by businessmen as well as pleasure travelers. Cincinnati, the major sports, cultural, and commercial hub of the Ohio Valley, provides a strong southeast anchor for this corridor.

Engineering Requirements

The Chicago-Cincinnati corridor, which is 303 miles long, passes through Indianapolis. The corridor is best reviewed in two segments -- Cincinnati-Indianapolis, and Indianapolis- Chicago.

The 108-mile Cincinnati-Indianapolis segment is a part of the former direct passenger route between Cincinnati and Chicago, which is currently owned by Conrail. This line is presently maintained for only 10 mph maximum speed, except for 18 miles that are out of service. It would require substantial rehabilitation of one main track and installation of a Traffic Control System (TCS) over the full 108 miles before any passenger trains could be placed in service. Remaining portions of the second main track would be retired.

There is no suitable alternative route between Cincinnati and Indianapolis. The B&O route is slow and circuitous and would not be considered suitable even with upgrading.

The route between Indianapolis and Chicago, 188 miles of predominately single track, was substantially upgraded in 1979-80 for Amtrak's Hoosier State service, which operates one train each way per day. Much of the track is suitable for 79 mph operations. Continuous welded rail should be installed over a portion of the track that is presently jointed rail to provide reduced future maintenance costs. In addition, the capacity of the line would have to be increased to accommodate six additional trains each day. Principally, this increase in capacity would involve the addition of controlled sidings and a Traffic Control System.

A potential problem that could impede a corridor service is the imposition of local ordinances that restrict speed. Two were imposed after the initiation of the Hoosier State service, adding unnecessary delays.

Chicago's terminal facilities have the capacity to accommodate one or two additional corridor operations. A total of six

proposed corridors would use Chicago as a terminal, however, and the need for capital improvements would depend on the number of corridors implemented.

The former train terminal in Cincinnati is no longer accessible and is not recommended for rehabilitation. Instead, Cincinnati is served by a new Amtrak facility which would need to be expanded to handle a corridor operation, as its servicing, standby, and passenger handling facilities are inadequate. Further capital improvements might be needed if the second proposed corridor -- Cincinnati-Cleveland -- is also developed. The B&O Storrs Yard nearby should be available for purchase or lease in 1981 and would afford adequate space for development as a terminal facility with room for future growth.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $44 and $68 million; of improving signal protection or eliminating grade crossings, $12 million; and of upgrading the terminal and station facilities, $11 million. These figures do no include engineering costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Lafayette, Indianapolis, and Cincinnati, with a total population of 9,654,000, or 32,962 persons per route mile.

Within this corridor, Amtrak's Cardinal currently operates between Chicago and Cincinnati (continuing on to Washington, D.C.); however, the service is over a different route that runs through Peru, Muncie, and Richmond, Ind. Air taxis operate between Chicago and Lafayette (40 minutes flying time). Trunk airlines out of Chicago serve Indianapolis (45 minutes flying time) and Cincinnati (55 minutes flying time). There is also air taxi service between Cincinnati and Indianapolis, with 30 minutes flying time. Express bus service runs between all points within this corridor, with schedules between Chicago and Indianapolis of 3 hours, 45 minutes and between Chicago and Cincinnati, 6 hours, 25 minutes. For auto travelers, Interstates 65 and 74 parallel this route the entire distance.

The following table shows common carrier service and fares as of February 1981 between Chicago and Cincinnati:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	2	6:50	$32.50
Air	18	0:55	77.00
Bus*	15	6:05	33.35

* December 1980 data.

Given the increased speed of corridor trains over the new route, it is projected that the rail schedule would be improved to 5 hours, 30 minutes.

With a projected ridership of 98.3 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $10.1 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 122.86 million passenger miles per year, for an estimated annual revenue of $12.62 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

		Equipment Needs	
	Capital Costs for Required Equipment (in Millions)	Type	Proposed Train Set
3 Round Trips	$20.5	Amfleet	4
3 RTs (+25% Demand)	24.3	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	152	1.1¢	74%
+25% Demand	3	190	0.2	85

It should be noted that although rail connections are available between Cincinnati and Chicago, this service (long-distance trains over another line) was not considered equivalent to that of corridors for calculation purposes.

Employment Benefits

Operation of the service described here would provide ongoing employment for 180 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 4,413 person-years of labor.

Community Views

In January 1981, at the invitation of the Mayor of Indianapolis Amtrak held a briefing in Indianapolis on the proposed Chicago-Cincinnati corridor. In addition to the mayors of Indianapolis and several other communities along the route, about 150 people attended the meeting, including representatives of the Governor and Lieutenant Governor of Indiana, representatives of several U.S. Congressmen and Indiana's two Senators, and representatives of Chambers of Commerce, town councils, and transportation and planning agencies. Spokesmen for various interests in Ohio also attended.

Indianans were strongly supportive of a corridor service. The popularity of Amtrak's recently initiated daily Hoosier State service between Indianapolis and Chicago was considered evidence of the desirability of more frequent service. Reference was made to the volume of business travel between the two cities, as well as travel for shopping and entertainment. Two very large potential markets along the route were noted -- the student population, well over 100,000, and a combined military and federal civilian employee population of 80,000. At present, travel to Chicago for these groups is inconvenient, in part because air service has decreased substantially since deregulation, as air carriers are finding short hops uneconomical. Many companies have acquired or are thinking of purchasing their own airplanes, an expensive solution to the transportation problems. More frequent rail service is thus seen as a very favorable alternative. Further, it is not subject to the inevitable delays in the region resulting from winter weather.

Spokesmen representing Indianapolis stressed the growth of their city as a regional center. Both the private and public sector have been active and work closely together in promoting that growth. With assistance from the city, the private sector underwrote the cost of the new convention center near the renovated Union Station. The station itself is undergoing further development that will turn it into a transportation center; access to local and interstate buses and to the airport are being planned. Additional redevelopment is going on in the surrounding neighborhood, and private interests are planning to construct a domed stadium next to the station. The stadium should be a major attraction. A general comment from most spokesmen for Indianapolis was that transportation is a key ingredient in the future of the city.

Representatives of a number of communities around Indianapolis expressed similar enthusiasm. Many are on rail lines that have been abandoned. Aside from the benefits of improved access to Indianapolis and Chicago for business and pleasure, they see passenger service as leading to improved freight service and providing an impetus to their efforts to promote their towns. Typical of the breadth of interest in rail service was the large group that came to the briefing from Shelbyville, which is midway between Indianapolis and Cincinnati. Its contingent included numerous businessmen, civic organizations, the town council, and interested residents.

A representative of Senators Lugar and Quayle gave a joint statement that noted the energy efficiency of rail travel and the possibly favorable economics of operating an Indianapolis-Chicago corridor service.

Subsequent to the meeting, many organizations submitted additional comments, and letters of support were received from 27 communities along the route. Lafayette, for example, a town to the northwest of Indianapolis, emphasized the market represented by its residents, Purdue University, and the business community. There is a high volume of traffic between Lafayette, Indianapolis, and Chicago by employees at the large Eli Lilly facility. Many residents who now commute to work by car have expressed interest in an all-weather, reliable rail service as an alternative to driving. Other local communities restated the problems they have with the limited air service and the need for all-weather public transportation operating between the downtown areas of major cities. One person suggested that business places a high value on a reliable link to Chicago.

Several persons also commented on the renewed interest of the State of Indiana in supporting rail passenger service. To date, such support has been limited, as state policy has been not to become involved with public transportation. Recently, however, the state allocated funds for urban public transportation and for the overhaul of equipment for South Shore Line's South Bend-Chicago rail passenger service. In addition, legislation was passed permitting operating assistance for this route. Thus the climate is favorable for some type of state participation in a corridor service.

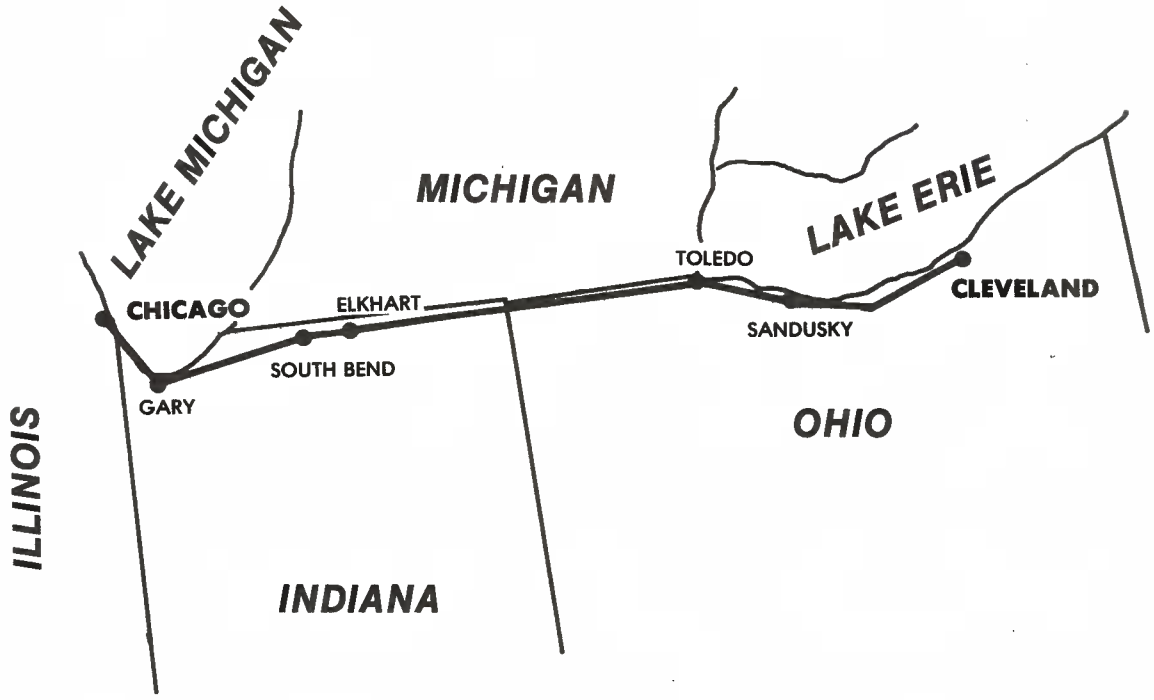
Spokesmen for Cincinnati wrote of their support for a corridor linking their city with Indianapolis and Chicago. They noted that the Union Terminal revitalization project in Cincinnati has attracted restaurants and shops back to the station area. More parking has been added, access to Interstate 75 has been made more convenient, and signage to the terminal has been upgraded. There is frequent bus service to the facility, and the city has begun talks with Amtrak about moving its trains there. It was noted that air service within Ohio has decreased and is unreliable in

the winter and that rail service is an attractive alternative. The mayor of Cincinnati expressed his belief that renewed rail passenger operations would increase tourism, now centered around sporting events and the nearby theme parks, encourage the growth of business and reinvestment in the downtown, and provide obvious energy savings. He, too, noted the large student population around Cincinnati, numbering about 50,000.

The Ohio Rail Transportation Authority, a state agency that has been developing a statewide rail plan, expressed support for the corridor as an intermediate step toward its ultimate goal of bullet train operations throughout the state. ORTA also noted the growing and active interest of businesses in Ohio in rail service.

It was pointed out that the Ohio State Constitution prohibits the state from entering into joint ventures with profit making corporations such as Amtrak, a possible constraint on the support the state might provide. However, local communities and cities have already been supporting rail service and cooperating with Amtrak, and ORTA has spent substantial funds on feasibility studies, research, and marketing studies relating to high-speed intercity rail passenger service statewide.

Chicago-Cleveland Corridor



RECOMMENDED ROUTE

This corridor would serve the two major cities of Cleveland and Chicago, and the metropolitan areas of Gary, South Bend, and Toledo, which are en route.

Engineering Requirements

The Chicago-Cleveland corridor extends 341 miles over Conrail track. This line is Conrail's principal freight route between New York State and the Chicago Gateway; its major freight classification yard is located on this line at Elkhart, Indiana. The line is double track, with some Traffic Control System and some Automatic Block Signal territory. Conrail has carried out considerable rehabilitation in recent years and maintains the track in accordance with FRA Class 4 standards. Conrail presently imposes a 70 mph maximum speed limit for passenger trains. Amtrak is considering action to increase the maximum speed to 79 mph.

Corridor service could be accommodated on this line with no major problems, although capital improvements would be needed. A portion of the line would have to be equipped with a Traffic Control System, and some remote-controlled crossovers would have to be installed. Work would be needed to improve protection at grade crossings. Amtrak has a new terminal in Cleveland, but it would need to be expanded to provide adequate servicing and standby capability; land is available for that purpose. The extent of the expansion would depend on development of the Cleveland-Cincinnati corridor as a second corridor out of Cleveland.

Chicago is the proposed terminus not only for this corridor, but also for five other corridors. The Chicago terminal has the capacity to handle one or two corridor operations, but expenditures would be required to handle more than that.

Amtrak estimates that the capital costs of upgrading the track and signals on this route would be between $7 and $13 million; for improving signal protection or eliminating grade crossings, $11 million; and for upgrading the terminal and station facilities, $1.4 million. These figures do not include engineering and design costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Gary, South Bend, Toledo, and Cleveland, with a total population of 10,705,000, or 32,099 person per route mile. There are six military installations along the route, with about 6,000 military personnel; the federal civilian employee population numbers about 60,000.

Within this corridor, Chicago, South Shore, and South Bend operate a parallel commuter service between Chicago and South Bend (89 miles). Scheduled airlines operate between Chicago and Cleveland (1 hour, 10 minutes flying time), and Chicago and Toledo (57 minutes flying time). Air taxis serve South Bend (35 minutes flying time). There is also air taxi service between Cleveland and South Bend (48 minutes flying time), and Cleveland and Toledo (34 minutes flying time). Express bus service runs between all points, with schedules for Chicago-Cleveland as fast as 7 hours, 5 minutes. For auto travelers, Interstates 80 and 90 parallel this route throughout.

The following table shows common carrier service and fares as of February 1981 between Chicago and Cleveland:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	2	7:00	$40.00
Air	26	1:00	69-87.00
Bus*	27	7:05	37.60

* December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 5 hours, 40 minutes.

With a projected ridership of 82 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $8.14 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 102.5 million passenger miles per year, for an estimated annual revenue of $10.16 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
4 Round Trips	$10.1	$16.8	Amfleet	2	6
4 RTs (+25% Demand)	10.1	16.8	Amfleet	2	6

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	4	82	9.6¢	42%
Current	1	86	6.8	49
Incremental	3	81	10.6	40
+25% Demand	4	103	6.0¢	51%
Current	1	86	6.8	49
Incremental	3	109	5.8	52

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 219 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 1,537 person-years of labor.

Community Views

In January, 1981, the Northeast Ohio Areawide Coordinating Agency, an organization of city and local governments, hosted a briefing on the Chicago-Cleveland and Cleveland-Cincinnati corridors. Representatives of the Ohio Rail Transportation Agency, and persons representing local businesses and Chambers of Commerce, county governments and local communities, railroads, unions, and Congressional offices also attended.

Speakers showed general interest in a Chicago-Cleveland service. It was noted that Cleveland is a major destination for pro sports events. Other factors that were raised are the lack of adequate air service among the major cities in Ohio and the problems of winter weather which present a need for a reliable, all-weather transportation system. The Ohio Rail Transportation Authority (ORTA), the state agency charged with planning Ohio's rail system, indicated that it would support the corridor service as an interim step toward its ultimate goal of high-speed rail passenger service throughout the state.

The Tower City Development Corporation of Cleveland, which is redeveloping the Terminal Tower that houses the former railroad station, expressed strong support for a corridor service. It noted the Tower's easy access to Cleveland's new rapid transit system and the general revitalization of the area surrounding the Tower. It expressed its hope that rail service to the terminal could be restored.

It was pointed out that the Ohio State Constitution prohibits the state from entering into joint ventures with for-profit corporations such as Amtrak, which represents a constraint on the support the state might be able to provide. However, it was noted that local communities and cities have been cooperating with Amtrak, and ORTA has spent substantial funds on feasibility studies, research, and marketing studies relating to a high-speed intercity rail passenger service statewide.

Chicago-Detroit Corridor

RECOMMENDED ROUTE

The Chicago-Detroit corridor route links not only the two major end-point cities, but also several well populated en route communities -- Gary, Kalamazoo, Battle Creek, Jackson, Ann Arbor, and Dearborn. Numerous colleges and universities dot the corridor, with a total student population of approximately 290,000. According to a survey conducted in late 1980, 20.1 percent of the passengers on this line are students -- a figure higher than for most Amtrak routes.

Strong local interest has been shown in providing a rail link between the Detroit Amtrak station and Windsor, Canada. Because Via Rail Canada provides rail service between Windsor-Toronto-Ottawa-Montreal-Quebec City similar to the Northeast Corridor, this connection would create through train service between Chicago and Quebec City, with direct connections in Toronto for through train service to Niagara Falls, Buffalo, Albany, and New York City. In Amtrak's view, such service could result in substantial increases in ridership along the Chicago-Detroit route as well as many other corridors.

Engineering Requirements

The 279.2-mile Chicago-Detroit corridor uses a double track route owned by Conrail, with the exception of a 94-mile single track segment (Porter-Kalamazoo) that is owned by Amtrak. This route currently has three daily passenger trains operating each way. However, passenger trains destined for other cities use portions of the line, especially the 40-mile Chicago-Porter segment. In addition, a Chicago-Port Huron daily passenger service runs over the 160-mile Chicago-Battle Creek section. Commuter service use of this route is minimal, consisting of one peak-time Monday-Friday train each way between Jackson and Detroit. Between Chicago and Porter, heavy use is made by freight trains of the Conrail lines (20 to 30 trains daily), but freight traffic is moderate between Kalamazoo and Detroit, and only light freight traffic is operated on Amtrak's Porter-Kalamazoo segment.

This route requires a considerable amount of capital improvements to accommodate an increase in corridor-type service. Significant portions of the track require upgrading, especially the 145 miles of jointed rail between Kalamazoo and Detroit. In addition, this section, as well as the 12-mile Porter-Michigan City segment, requires track rehabilitation, including new ties, ballast, and surfacing. Such improvements should allow the speed limit on Conrail segments to be increased from 70 mph to 79 mph and the Porter-Michigan City segment from 50 mph to 79 mph.

Siding upgrading and additions are another major improvement factor for the Amtrak single track segment between Porter and

Kalamazoo. Although current sidings are located an average 10 to 12 miles apart, new controlled sidings should be added to eliminate sections that are as far as 17 miles between sidings.

Another feature requiring capital improvements is the signal systems. Currently, the Chicago-Detroit route has a combination of Traffic Control Systems (TCS) and Automated Block Systems (ABS). To facilitate freight and passenger train traffic, some portions of the ABS sections should be modified to a Traffic Control System.

Interlockings and crossovers are other physical features that require upgrading consideration. The connection at the Porter interlocking between the Conrail double track and Amtrak's single track line should be reconstructed. By relocating the connection and crossovers to reduce the curvature, the permissible speed would be increased from 15 mph to 45 mph. Modifications should also be considered for the West Detroit interlocking to permit greater operational flexibility. In connection with the TCS upgrading, new crossovers are also required in some portions of the double track segments.

Other requirements include the conversion of numerous grade crossings to automatic crossing protection systems, especially in the Kalamazoo-Detroit segment. Although some grade separations may be warranted for safety and speed considerations, flashing lights and gates would be adequate for most crossings.

With regard to major structural features, three moveable bridges in the Chicago-Porter segment need to be modernized. Such upgrading should eliminate the current problem of bridges being out of service and disrupting corridor service.

Terminal improvements are required at Detroit. New station and storage track, as well as standby and servicing facilities, would be required to implement corridor service. In addition, some power operated switches should be installed, and various platforms should be modernized to provide passenger protection from the elements.

Chicago's Union Station, which is situated just north of Amtrak's maintenance yard for the region, already has the capacity to accommodate one or two additional corridor operations. A total of six proposed corridors would use Chicago as a terminal, however, and the need for capital improvements would depend on the number of corridors implemented.

A final consideration of corridor service is the congestion of rail traffic over the Chicago-Porter segment. If corridor service between Chicago and Detroit and Cleveland is initiated,

both routes would use this segment. In addition, the proposed Cincinnati corridor joins this segment at Colehour Junction. The impact of such an increase in traffic must be studied carefully.

Amtrak estimates that the track and signal work required for corridor service would necessitate expenditures in the range of $30 to $50 million. Improving signal protection or eliminating grade crossings would require a further $3 million, and improvements to stations for corridor operations would run approximately $1 million. It should be noted that these figures do not include the necessary engineering costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Gary, Kalamazoo, Battle Creek, Jackson, Ann Arbor, and Detroit, with a total population of 12,908,200, or 48,515 persons per route mile. Along this route, there are seven military installations with a population of 6,372, and a federal civilian employee population of 98,658.

Passenger train traffic currently consists of three each way daily between Chicago and Detroit, with one additional train each way between Chicago and Battle Creek (en route to Port Huron) and between Jackson and Detroit (weekdays only). Scheduled airlines operate between Chicago and Kalamazoo (40 minutes flying time) and Chicago and Detroit (50 minutes fly time). Air taxis from Chicago serve Battle Creek (40 minutes flying time), Jackson (1 hour, 15 minutes flying time), Detroit (50 minutes flying time). There also is air service between Detroit and Jackson (21 minutes flying time), Detroit and Battle Creek (30 minutes flying time), and Detroit and Kalamazoo (34 minutes flying time), as well as between Jackson and Kalamazoo (21 minute flying time). Express bus service is available between all points within this corridor, with Chicago-Detroit schedules of six hours. For auto travelers, Interstate 94 parallels this route throughout.

The following table shows common carrier service and fares as of February 1981 between Chicago and Detroit:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	6	5:40	$30.50
Air	43	0:45	59.00-78.00
Bus*	17	6:00	30.70

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 4 hours, 59 minutes.

With a projected ridership of 134.3 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $13.56 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 167.9 million passenger miles per year, for an estimated annual revenue of $16.93 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
6 Round Trips	$16.8	$ 9.3	Amfleet	4	6
6 RTs (+25% Demand)	16.8	15.3	Amfleet	4	6

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	6	110	3.7¢	60%
Current	3	127	2.2	67
Incremental	3	92	5.9	52
+25% Demand	6	137	2.1¢	68%
Current	3	127	2.2	67
Incremental	3	147	2.0	69

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 174 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,696 person-years of labor.

Community Views

On January 9, 1981, Amtrak conducted a briefing on the Chicago-Detroit corridor to obtain the views of the area's business and community leaders. The meeting was held in Dearborn, some 10 miles from downtown Detroit, at the invitation of Michigan Congressmen John D. Dingell, William D. Ford, and Carl D. Pursell. The briefing was well attended by state representatives, mayors, council members, representatives from the Michigan Department of Transportation (MDOT), railroad associations, Chambers of Commerce, transportation planning groups, and labor unions, as well as the interested public. Press coverage of the meeting was extensive, including both local and national reports.

Enthusiastic support was the overwhelming attitude of the briefing attendees. It was stressed that among the emerging corridors, the Chicago-Detroit route has an on-line population second only to that of Los Angeles-San Diego. With regard to ridership potential, the MDOT has sent subsequent information indicating that in 1979 the route already had exceeded the 1985

projections presented in this report by nearly 3.5 million passenger miles.

One topic that received great attention at the meeting was the possible extension of the corridor to Windsor, Canada, just across the Detroit River. Currently, Via Rail Canada offers a Windsor-Toronto-Ottawa-Montreal-Quebec City service that serves as the Northeast Corridor of Canada. To use this line, U.S. travelers now have to drive to Windsor. A Detroit connection could significantly increase the passenger traffic of both corridors in return for low capital costs.

Both those who attended the briefing and those who sent written responses recognized the developmental benefits associated with the proposed corridor. Many communities along the route (Ypsilanti, Ann Arbor, Jackson, Battle Creek, Kalamazoo) are currently redeveloping their downtown areas near Amtrak stations and view increased train service as a revitalizing factor. With regard to specific development of train facilities, new stations are planned for 1981 in Ann Arbor and Battle Creek, and a new station was recently opened in Dearborn. In addition, stations have been restored or renovated in Jackson and Kalamazoo; restoration is planned for the Niles (South Bend) facility; and the Michigan Central Station in Detroit has benefited from cleaning and painting programs.

Various travel-related benefits were also noted. For Detroit residents, the downtown-to-downtown service of Amtrak passenger trains was recognized as a major advantage, considering the distance of the airport from the city center. In addition, airline deregulation has resulted in some en route communities suffering a complete loss or sharp reduction of air service -- a transportation gap that could be filled by increased train frequencies. Corridor service could also help to reduce congestion on Michigan highways, especially considering the fact that no new highway construction in competition with the route is anticipated by the state.

With regard to development costs of the corridor, the state has a history of strong support for passenger rail service. Michigan was one of the first states to participate in the Amtrak 403(b) program. Since the inauguration of the Blue Water Limited (Chicago-Port Huron) in 1973, the state has invested over $18 million toward the capital and operating expenses of passenger train service. Examples of state support for capital improvements include the following:

- Together with the rail owners along the corridor route (Amtrak and Conrail), the state has already invested heavily in major track upgrading and plans to continue this endeavor. As part of the proposed state-supported

403(b) service from Chicago to Grand Rapids, the state will contribute to the required track upgrading along the Kalamazoo-Jackson segment of the corridor route.

- Bills have been introduced in the Michigan legislature to remove passenger train speed restrictions from local jurisdictions, and the state also has an aggressive program to improve or eliminate grade crossings.

- The state has provided a major portion of the funding for the previously mentioned station construction, renovation, or restoration projects at stops along the corridor.

With regard to operating costs, the state participates in several 403(b) services -- the previously mentioned Chicago-Port Huron and Chicago-Grand Rapids route, as well as the Jackson-Detroit Michigan Executive service. In addition, the state provides an innovative Passenger Service Aide Program, which provides a team of young adults to serve on board all intercity trains to answer passenger questions, to give directions, and to offer a source of transportation and tourism information. The MDOT also administers an aggressive program of passenger rail promotion and advertising and conducts detailed market and operational feasibility studies to help plan for future service development.

Strong support for passenger train service is not limited to the state or other governmental bodies in Michigan. The people in the towns served by Amtrak trains are actively interested in trains and have participated in maintaining associated facilities. For example, in August 1980, a family day celebration was held at the Detroit station, and over 30,000 people came to examine a display of train equipment and to help clean and refurbish the station. In addition, residents have assisted in the program of station restorations and renovations at all stops along the route, including planting and caring for flowers, trees, and shrubs around stations, and painting and reroofing the Chelsea station.

In summary, the Chicago-Detroit proposed corridor service is highly valued by Michigan State and its residents. As stated by the MDOT: "There can be no question that the State of Michigan has demonstrated its commitment to rail passenger service in the past and will continue to live up to its reputation of having one of the most aggressive rail service development programs in the nation."

Chicago-St. Louis Corridor

RECOMMENDED ROUTE

The Chicago-St. Louis corridor route lies along several well populated communities in Illinois -- Joliet, Pontiac, Bloomington/Normal, Lincoln, Springfield (the state capital), Carlinville, and Alton -- and is anchored at either end by a major urban center. A sizable student population is associated with colleges and universities located along the route.

Engineering Requirements

The 282.1-mile Chicago-St. Louis corridor uses a predominantly single track route owned by Illinois Central Gulf Railroad (ICG). Double track extends from Chicago to Joliet. In addition, a paired track arrangement between the ICG and the Santa Fe provides two tracks between Joliet and Pequot. A similar arrangement with Conrail provides two tracks between Wann and Granite City. Amtrak currently operates three passenger trains each way daily between Chicago and St. Louis. In addition, one daily pair of trains for the Chicago-Peoria route uses this line to Chenoa, a distance of 102 miles. Commuter service is light -- two weekday trains between Chicago and Joliet. Freight traffic is light north of Springfield and moderate between Springfield and St. Louis.

Before corridor service can be offered over this route, substantial capital improvements are required. The most significant item of concern is the rail, which averages 35 years old. The jointed rail is badly worn, provides a poor ride, and has resulted in numerous slow orders. To alleviate these problems, a major program to install continuous welded rail over approximately 189 miles of the route is required. In addition, significant track work is needed. Although some tie and surfacing programs have been completed during the past two years, the poor rail conditions have hampered the quality of the rehabilitation and the retention of the improvements. In particular, the Mazonia-Wann segment requires major tie and surfacing attention.

Another critical factor requiring major upgrading is the sidings along the single track route. In order to accommodate a substantial increase in traffic, several new controlled sidings are needed, especially in the Mazonia-Wann segment. In addition, the controlled sidings along the single-track portions of this route that are unsignaled need modification.

The Chicago-St. Louis ICG route currently uses a Traffic Control System (TCS), with the exception of the double track segments, which use an Automated Block System (ABS). The Joliet-Mazonia segment should have a traffic control system to provide greater flexibility. In addition, the interlocking equipment at the Illinois Terminal rail crossing at Wood River was damaged by a derailment and requires correction to eliminate the associated

delays. Although substantial grade crossing protection improvements have been accomplished, a program to upgrade remaining crossings without automatic protection should be planned.

Another major issue for this corridor route is poor access to both the Chicago and the St. Louis terminals. With regard to the Chicago approach, route flexibility needs to be increased by the construction of new crossovers at the 21st Street interlocking and the interlocking of the railroad crossings at Brighton Park. Currently, the latter section's lack of an interlocking requires all trains to stop before proceeding.

With regard to the St. Louis access, two alternative routes are available, although neither is currently in an acceptable condition for corridor service. The presently used approach via Merchants Bridge along the west side of the Mississippi River is slow (a maximum speed of 20 mph), has numerous grade crossings, and is in poor condition. The route on the east side of the river that crosses the Municipal Bridge is generally tangent and virtually free of grade crossings, has minimal rail congestion, but is in terrible condition with an average speed of 15 mph. Despite the need for significant upgrading work, the preferred route should follow the east-side approach because of its minimal rail traffic. In addition to improving this track (which is currently maintained to FRA Class 2 standards between Granite City and Bridge Junction), the Municipal Bridge requires some repair work. The present St. Louis terminal is unsuitable for additional corridor traffic.

Chicago's terminal facilities have the capacity to accommodate one or two additional corridor operations. A total of six proposed corridors would use Chicago as a terminal, however, and the need for capital improvements would depend on the number or corridors implemented.

Amtrak estimates that the track and signal work required for corridor operations ranges between $25 and $49 million. Improving signal protection or eliminating grade crossings would require a further expenditure of $8 million, and station improvements for corridor operations would run approximately $1 million. It should be noted that these figures do not include the necessary engineering costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Bloomington, Springfield, and St. Louis, with a total population of 9,729,500, or 34,567 persons per route mile. Along this route, there are nine military installations with a population of 11,913, and a federal civilian employee population of 76,462.

Within this corridor, Amtrak currently operates three passenger trains daily each way on a 5 hour, 20 minute schedule. Two weekday commuter trains operate over this route between Chicago and Joliet (37 miles). Scheduled airlines operate between Chicago and Bloomington (50 minutes flying time), Chicago and Springfield (45 minutes flying time), and Chicago and St. Louis (1 hour flying time). There is also air service between St. Louis and Bloomington (1 hour, 10 minutes flying time), and St. Louis and Springfield (27 minutes flying time). Express bus service is available between all points within the corridor, with Chicago-St. Louis schedules of slightly over six hours. For auto travelers, Interstate 55 parallels the entire route.

The following table shows common carrier service and fares as of February 1981 between Chicago and St. Louis:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	6	5:20	$29.00
Air	46	0:53	55-76.00
Bus*	29	5:50	26.60

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to five hours.

With a projected ridership of 87.8 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $9.01 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on the corridor would be 109.8 million passenger miles per year, for an estimated annual revenue of $11.2 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
6 Round Trips	$16.8	$5.6	Amfleet	4	6
6 RTs (+25% Demand)	16.8	9.3	Amfleet	4	6

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	6	70	7.7¢	47%
Current	3	85	6.9	47
Incremental	3	56	8.7	47
+25% Demand	6	88	5.6¢	53%
Current	3	85	6.9	47
Incremental	3	92	4.4	59

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 180 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,696 person-years of labor.

Community Views

On January 13, 1981, Amtrak conducted a briefing on the Chicago-St. Louis emerging corridor in Normal, Ill., approximately the midway point in the route. Congressman Edward Madigan sponsored the meeting, which was attended by nearly 100 representatives of city, county, and state governments, Congressional offices, transportation unions, tourism groups, operating railroads, Chambers of Commerce, universities, and colleges, as well as interested residents. Virtually every community along the route sent representatives.

A majority of the concerns raised at the meeting were local in nature. The City of Normal, for example, identified a need for Amtrak trains to stop in its community to provide service for the local residents and the 20,000-strong student body of Illinois State University (ISU).

Another local issue was the safety of the numerous grade crossings in the rural areas of the line. Meeting participants urged a thorough study of the problem to ensure the safety of the route. Participants noted that the state and local communities have already invested over $11 million during the past five years to improve grade crossing protections along the corridor route.

Spokesmen at the briefing expressed an expectation of significant ridership increases along the corridor. Some 170,000 university students are enrolled in colleges served by the corridor. Springfield, the state capital, is the source of a great deal of government travel, while all communities along the route expect that increased business travel would follow more reliable and more rapid train service.

Communities along the corridor emphasized the benefit of improved rail service to their urban development plans. Representatives from Chicago noted that Union Station has been commercially developed, and that they expect further development benefits following the initiation of corridor service. In order to facilitate a more efficient movement of all rail traffic through the St. Louis metropolitan area, the St. Louis Terminal Restructuring Project has been established to eliminate a severe rail bottleneck in the area. Numerous freight classification yards would be relocated away from the downtown riverfront area of East St. Louis, allowing passenger trains to move through the area much more easily and quickly.

With regard to the costs of rail service, Illinois' current level of commitment places it among the leaders in the rail passenger system. Illinois currently subsidizes more 403(b) trains than any other state -- six in total. One 403(b) train, the State House, is on the Chicago-St. Louis corridor route. Another, the Prairie Marksman, feeds into the corridor. In addition, the state currently has commenced two studies concerning the operations and engineering and travel potential of the Chicago-St. Louis corridor route, and both the state and local governments are participating in an aggressive grade crossing program. According to the state department of transportation: "Improved rail passenger service has many benefits for Illinois. We stand ready to begin the improvements, particularly in the Chicago-St. Louis corridor."

Chicago-Twin Cities Corridor

RECOMMENDED ROUTE

The Chicago-Minneapolis/St. Paul route covers a large portion of the Upper Midwest region, crossing Wisconsin to Minnesota. The Twin Cities region is the largest metropolitan area between Chicago and the Pacific Northwest.

Engineering Requirements

The Chicago-Twin Cities corridor uses a double track route owned by the Milwaukee Road. Amtrak currently provides one daily overnight train and one tri-weekly daytime service each way between Chicago and the Twin Cities with four additional trains each way between Chicago and Milwaukee. Freight traffic over the route between Chicago and Milwaukee is approximately 10 trains daily each way, and is moderate with 4 through freights and 3 short TOFC trains each way daily plus coal trains over the balance of the route.

The 85-mile Chicago-Milwaukee segment is currently in a suitable condition for increased passenger train traffic, requiring only minimal capital improvements. This double track line's recently completed Traffic Control System should be modified to provide increased flexibility. The existing jointed rail has been rehabilitated, including some continuous welded rail, and minimal track work is anticipated.

In contrast to this segment, the 333-mile Milwaukee-Twin Cities section requires significant capital improvements. The major problem area is the track, which is in an unsuitable condition. Although the line has an approved maximum speed of 70 mph, large sections are currently under slow orders -- approximately 70 miles westward and over 100 miles eastward. To remove the slow orders and to permit a comfortable ride at the current 70 mph speed limit, major roadbed rehabilitation, including new ties and ballast after undercutting and surfacing, is needed. However, to provide a 79 mph corridor service with reliability and an appropriate ride quality, the major part of this segment's jointed rail should be replaced.

The Milwaukee-Twin Cities portion also requires some upgrading of the signaling system. Although the Automatic Block Signal system in use between Milwaukee and St. Paul (Division Street) is sufficient for current traffic levels, some portions should be modified with a Traffic Control System to relieve congestion that may result from increased frequencies.

A few other physical features of this segment require minimal improvement expenditures. For example, some grade crossings should be equipped with automatic crossing protection. Although the Midway Station serving Minneapolis-St. Paul is suitable for expanded passenger service, its storage track and servicing facilities may have to be increased to accommodate additional trains, depending on the frequencies.

Chicago's terminal frequencies have the capacity to accommodate one or two additional corridor operations. A total of six proposed corridors would use Chicago as a terminal, however, and the need for capital improvements would depend on the number of corridors implemented.

Amtrak estimates that the track and signal work needed for corridor service would require expenditures in the range of $115 to $153 million. Upgrading signal protections or eliminating grade crossings would require a further $10 million, and improvements to stations for corridor operations would run approximately $1 million. It should be noted that these figures do not include the necessary engineering costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Racine, Milwaukee, Madison, Lacrosse, and Minneapolis/St. Paul, with a total population of 11,141,200, or 27,884 persons per route mile. Along this route, there are seven military installations with a population of 6,121, and a federal civilian employee population of 91,663.

Passenger train traffic currently consists of one daily overnight train (North Star) and one long-haul (Empire Builder, Chicago-Seattle) three times weekly on a daylight schedule. Both trains are scheduled for 8 hours, 45 minutes. There are additionally four trains each way daily between Chicago and Milwaukee. Other rail transportation service includes commuter service over the portion of this route between Chicago and Rondout (32 miles). Scheduled airlines operate between Chicago and Milwaukee (30 minutes flying time), Chicago and Madison (35 minutes flying time), Chicago and LaCrosse (1 hours, 10 minutes flying time), and Chicago and Twin Cities (1 hour, 5 minutes flying). There is also scheduled airline service between Madison and LaCrosse with 30 minutes flying time. Express bus service is offered between all points, with Chicago-St. Paul schedules of slightly over nine hours. For the auto traveler, Interstates 90 and 94 parallel this route throughout.

The following table shows common carrier service and fares as of February 1981 between Chicago and Twin Cities:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	4	8:45	$47.50
Air	68	1:03	98-104.00
Bus*	15	8:45	32.00

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 6 hours, 45 minutes.

With a projected ridership of 121.3 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $11.96 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 151.6 million passenger miles per year, for an estimated annual revenue of $14.93 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs	
		Type	Proposed Train Sets
3 Round Trips	$20.5	Amfleet	4
3 RTs (+25% Demand)	20.5	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	132	3.5¢	61%
+25% Demand	3	166	1.1	74

It should be noted that although Amtrak currently provides the Chicago-Twin Cities corridor with train service, it was determined that the service (part of long hauls and one daily overnight) was not equivalent to corridor operations for calculation purposes. Therefore no "current" or "incremental" figures are provided.

Employment Benefits

Operation of the service described here would provide ongoing employment for 256 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 7,435 person-years of labor.

Community Views

To obtain the views of area business and community leaders, Amtrak conducted a briefing on December 18, 1980, at the State Office Building in St. Paul. Held at the invitation of Commissioner Richard Braun of the Minnesota Department of Transportation (MDOT), the briefing was attended by mayors of corridor communities; members of the Minnesota State Legislature; representatives of local colleges, universities, labor unions, transportation planning groups, and industrial development organizations; members of city councils and Chambers of Commerce; and interested area residents.

The briefing participants expressed strong support for the corridor concept. It was noted that the combined Twin Cities region is the largest metropolitan area between Chicago and the Pacific Northwest, with both a concentration of corporate headquarters and numerous universities and colleges along the route. Participants voiced expectations of a significant business and student travel market.

With regard to schedules, it was noted that the long running times (8 hours, 45 minutes) and the long distance (418 miles) of the current Amtrak service to Chicago removes it from competition with airline service. In addition, the excessive schedules have also reduced the competitiveness of rail travel with the automobile. As the MDOT noted, both trains and cars require approximately nine hours to travel between the two cities. If corridor service can increase the speed of train trips from the current average of 52 mph to 60 mph (the average for a 79 mph corridor) over the Twin Cities-Milwaukee segment, the schedule could be reduced to 6½ to 7

hours. Such time differences would provide a powerful incentive for people to ride the train rather than to drive a car to Chicago.

Another need identified by briefing participants was a train service aimed specifically at the Twin Cities and the en route communities. Currently, Amtrak only offers an overnight service on a daily schedule. The resultant departure times are awkward for many potential passengers on this route. For example, the North Star departs Midway Station, St. Paul, at 10:15 p.m. Down-line passengers are therefore burdened with very early morning boarding times (e.g., Winona, 12:48 a.m.; LaCrosse, 1:31 a.m.). The only daytime service is the Empire Builder, a tri-weekly, long-haul service between Chicago and Seattle. This train offers a daily service only during peak travel periods (summer and the winter holiday season). Because this train is often booked with long-distance travelers, potential passengers from the Twin Cities and en route stops are shut out of reliable rail service. Briefing attendees noted that a corridor-type service would eliminate these problems by providing several daily daytime trains that are focused on the Twin Cities region as a terminal point.

Strong support of the corridor service was expressed by mayors of the en route communities. They expressed a strong need for better schedules and for more forms of public transportation. Recently, many smaller communities such as Winona and LaCrosse have experienced cutbacks or discontinuance of air service to their localities. Mayors of such communities are eager for increased passenger rail service to fill the gaps left by retreating airlines. In addition, the mayor of Winona emphasized that this community could serve as a more efficient travel link to the Mayo Clinic in Rochester, and thereby attract a greater ridership, if train frequencies through Winona were increased.

Other benefits were recognized for the corridor area. Relief for the congested highway system was one, because the state has no plans to build new highways along the route at this time. In addition, during the severe weather conditions that are often experienced by the region, the Twin Cities airport is at times shut; passengers are then transported to Midway Station to make use of the all-weather rail service.

Subsequent written responses to the briefing listed other benefits. The City of St. Paul noted the development benefits available to the station area. Midway Station is located in the Midway Industrial Park, which has grown by 44 acres and 1,000 employees since the station was built in 1978. A further development (Energy Park) is also proposed for the vicinity of the station. It is expected that both Amtrak service and the city would benefit from such development of the location.

In addition to the general support for the corridor concept, the State of Minnesota, the City of St. Paul, and many corridor communities have expressed a willingness to contribute to the development requirements of the emerging corridor. With regard to operating costs, the state currently funds rail passenger service between the Twin Cities and Duluth under the 403(b) program. This service acts as an excellent feeder line to the corridor. The state has also already invested heavily in the improvement of grade crossings along the route and would consider further investment if circumstances warrant such upgrading. In addition, the MDOT is willing to serve as a catalyst for encouraging local and private development projects that could enhance the viability of the corridor.

The City of St. Paul is also actively involved in the support of rail service. It supported the state funding of the extension of the North Star service to Duluth and financed the construction of Midway Station in St. Paul. In addition, the city has contributed to the improvement of directional signs and both road and rail access to the station. Finally, the city has encouraged the development of a multimodal transportaton center in conjunction with the Amtrak station, linking trains, various transit companies, and the airport limousine services.

Smaller communities along the corridor route have also expressed their willingness to support the corridor project. For example, Winona and Red Wing have already participated in the upgrading of grade crossings in their jurisdictions, and other en route communities are willing to work with Amtrak to lift speed restrictions. In addition, Winona is considering a multimodal approach of combining rail and bus services under a "union station" concept, thereby eliminating the need for duplicate facilities.

At another briefing session held on December 15, 1980 in Milwaukee on the Milwaukee-Chicago segment (itself a proposed corridor), enthusiastic support was voiced. The City of Milwaukee has recognized the developmental benefit of corridor service to their current downtown revitalization projects, the travel benefit of a mode of transportation to Chicago that is competitive with the car; and the environmental benefit of replacing the need for a new highway connection. Both the State of Wisconsin and the City of Milwaukee have expressed willingness to participate in the program by improving grade crossings as needed, by placing directional signs to Amtrak stations, by providing ample parking at station facilities, and by participating in some form should future investments be required on the Milwaukee Road line.

In summary, the Twin Cities and the en route communities are very supportive of the corridor service concept. As stated by the Mayor of St. Paul: "In a period where air and bus services are being lost to higher fuel costs and deregulation, it is most important to us that rail service be maintained and expanded to meet future demands."

Chicago-Milwaukee Corridor

RECOMMENDED ROUTE
ALTERNATIVE ROUTE

The Chicago-Milwaukee corridor follows a route a few miles inland from Lake Michigan that passes through heavily populated urban areas, providing an exceptionally dense concentration of potential travelers along the route.

Engineering Requirements

The 85-mile Chicago-Milwaukee corridor uses a double track route owned by the Milwaukee Road. The current traffic pattern over this route includes five daily Amtrak trains each way, one tri-weekly train, and freight movements of approximately 10 trains each way, as well as extensive commuter service between Chicago and Rondout.

The physical condition of this proposed corridor is currently suitable to handle additional passenger train frequencies without significant capital improvements. The line's recently completed Traffic Control System requires only modest upgrading and modifications to increase flexibility. The existing jointed rail has been rehabilitated, including laying some continuous welded rail, and minimal track work is anticipated. In addition, the station at Milwaukee is adequate for corridor service, requiring only minimal additions to the servicing facilities.

Because of the track's overall condition, corridor service could be improved by raising the current speed limit in some sections. Although the line is maintained in accordance with FRA Class 4 standards and is virtually free of slow orders, the carrier currently imposes a 70 mph limit over the entire route. Raising the limit to 79 mph in significant portions could result in improved running schedules, which now require 92 minutes terminal to terminal.

Chicago's terminal facilities have the capacity to accommodate one or two additional corridor operations. A total of six proposed corridors would use Chicago as a terminal, however, and the need for capital improvements would depend on the number of corridors implemented.

An alternate route between Milwaukee and Chicago is available over a line owned by the Chicago and North Western (C&NW) Railroad. Currently, the RTA commuter service operates on the C&NW route between Kenosha and Chicago at 60 mph with numerous slow orders; RTA proposes to upgrade the C&NW track to 79 mph. However, north of Kenosha, the track has 40-year-old jointed rail that requires significant rehabilitation before passenger trains could travel over this segment. At the present time, only freight trains use this track. In addition, a new

connection would have to be constructed in Chicago between the C&NW track and Chicago Union Station to provide access to this line. In summary, considerable capital expenditures would be required to operate over this alternate route.

Amtrak estimates that the capital costs for upgrading the track and signals on the recommended Milwaukee Road line is in the range of $400,000 to $1 million. Improving signal protection or eliminating grade crossings would require a further $2 million, and improvements to stations for corridor service would run approximately $200,000. It should be noted that these figures do not include the necessary engineering costs.

Ridership Projections

The SMSAs included in this corridor are Chicago, Kenosha, Racine, and Milwaukee, with a total population of 8,650,000, or 101,800 persons per route mile. Along this route there are six military installations with a population of 6,095, and a federal civilian employee population of about 68,000.

Passenger train traffic currently consists of five trains each way daily between the two cities. Other rail transportation service includes commuter service between Chicago and Rondout (32 miles). Scheduled airlines operate between Chicago and Milwaukee with 30 minutes flying time. Express bus service is offered between all points, and Interstate 94 parallels this route throughout.

The following table shows common carrier service and fares as of February 1981 between Chicago and Milwaukee.

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	10	1:32	$ 9.15
Air	18	1:05	53-60.00
Bus	20	2:00	9.15

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 1 hour, 30 minutes.

With a projected ridership of 35.9 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $4.03 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 44.88 million passenger miles per year, for an estimated annual revenue of $5.04 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train freqencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
8 Round Trips	$13.0	$5.2	Amfleet	4	5
8 RTs (+25% Demand)	13.0	9.7	Amfleet	4	5

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid Loss/PM	Rev/Cost Ratio
Projected Demand	8	72	9.1¢	46%
Current	5	75	12.5	37
Incremental	3	68	2.7	69
+25% Demand	8	90	7.6¢	49%
Current	5	75	12.5	37
Incremental	3	116	2.3	69

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 44 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 403 person-years of labor.

Community Views

On December 15, 1980, Amtrak representatives conducted two briefings -- one in Racine and one in Milwaukee -- on the proposed Chicago-Milwaukee corridor to obtain the views of the area's business and community leaders. Held at the invitation of Congressman Les Aspin, the briefings were attended by representatives from state and local transportation planning groups, colleges and universities, land-use development organizations, regional planning groups, transportation unions, and tourist bureaus, as well as elected officials of corridor localities, members of the local press, and interested citizens.

In general, the briefing participants expressed strong support for the emerging corridor concept. Noting that the Chicago-Milwaukee route fits the medium distance, high-speed, and high-frequency corridor criteria, spokesmen maintained that this highly urbanized, heavily populated area should provide a good market for increased passenger rail service.

Although the end-point destinations were agreeable to all those attending the briefing, many witnesses maintained that an alternate route via the communities located on the Lake Michigan shoreline might better serve the urban communities of southeastern Wisconsin. At the Racine meeting, representatives from Racine and Kenosha, both within commuting distance of Milwaukee and Chicago, urged Amtrak to reconsider using the Chicago and North Western line, which runs directly through their city centers. Subsequent written encouragement of the C&NW route was given by the Southeastern Wisconsin Regional Planning Commission. However, it was recognized that this route would require more substantial capital improvements to accommodate high-speed corridor trains than the currently used Milwaukee Road line. A suggested alternative was the construction of improved station facilities or additional route stops to meet the needs of these communities.

Following the briefing sessions, further written support for the Chicago-Milwaukee corridor was received by Amtrak. Various community representatives noted the benefits that would be received by corridor localities, as well as the level of local support for the required capital improvements.

With regard to developmental benefits, letters from state and local government officials stressed the importance of the current revitalization efforts in downtown Milwaukee and the potential impact of this revitalization on intercity passenger travel. The project is centered around the Wisconsin Avenue area, only three blocks from the Amtrak station. Current developments within walking distance include the "Grand Avenue" retail mall, which will add at least 100,000 square feet to the existing retail space; a new 492-room hotel; several new office buildings providing over 1.2 million square feet of new office space; and several condominium developments. Increased Amtrak service to Milwaukee would complement this downtown revitalization, increasing the probability that such development would extend to the station area. The Mayor of Milwaukee expressed the city's willingness to consider ways of integrating the Amtrak station into its revitalization efforts.

Both briefing participants and written responses emphasized the developing multimodal transportation aspect of the Amtrak station vicinity. In conjunction with the development of the Wisconsin Avenue retail mall, the city is planning a transit mall. Currently, bus service from this location connects the area and the Amtrak station to all parts of Milwaukee County. In addition, the station is directly served by two bus routes, and an extension of the downtown shuttle to the station has been proposed. The Greyhound bus terminal is only four blocks from the train terminal.

Among other benefits, the State of Wisconsin noted that Amtrak could attract a substantial number of business travelers with a 79 mph corridor service because its main competition between Chicago and Milwaukee is the automobile, the distance being too short for large-scale airline services. Indeed, the state reports that airlines have substantially reduced their flights between these two cities. In addition, the current intercity bus schedule requires about 30 minutes more travel time station to station than the current Amtrak service. However, business travel has been discouraged by an inadequate train frequency, which provides only five trips each way throughout the day. The state notes that this type of travel "would undoubtedly increase with fast and reasonably priced public [rail] transportation between the two cities."

Environmental benefits from corridor service has also been identified by respondents to Amtrak's request for community comments. The major mode of transportation between Milwaukee and Chicago is by automobile over a limited number of relatively congested highways. Although an additional highway was proposed for the corridor area, the strength of public opposition, the recognition of environmental problems, and the lack of funding moved the Southeastern Wisconsin Regional Planning Commission to

recommend that no further planning of the route be made over the next decade. Of particular environmental concern was the proposed demolition of 400-500 housing units in Milwaukee's historic Bay View area. Respondents noted that increased Amtrak service would help to relieve highway congestion immediately, thereby reducing the need to construct this highway in the future.

In addition to general support of the corridor concept, the state and many local communities have shown and expressed a willingness to contribute to the capital development requirements of an emerging corridor. With regard to grade crossings — a major capital improvement factor in rail passenger service -- significant investments have been made in recent years by state and local governments to provide rail grade separations in southeastern Wisconsin. During the past five years, for example, three new grade-separated structures have been built on the Milwaukee Road line. To improve the accessibility of the Amtrak station, the City of Milwaukee has placed small "trail blazing" signs throughout the downtown area to direct travelers. In addition, the state has provided a 96-space, long-term parking lot on land within one block of the station for use by rail travelers free of charge. The state has expressed a willingness to arrange additional parking space in this lot if increased ridership required such facilities. Finally, should investment in the Milwaukee Road line be required in future years (after 1983), the state "would be willing to discuss state participation in some form...."

In summary, the State of Wisconsin, the City of Milwaukee, and the southeastern Wisconsin communities served by the proposed corridor are optimistic about the benefits of a high frequency corridor service to Chicago. As stated by the Mayor of Milwaukee: "We can assure you of a local level of support that would make the Chicago-Milwaukee corridor a viable, successful project."

Los Angeles-Las Vegas Corridor

RECOMMENDED ROUTE

The Los Angeles-Las Vegas corridor route crosses the Mojave Desert, connecting Southern California and Las Vegas. Despite the long traveling time (7 hours, 25 minutes), the route already attracts a significant ridership on the one existing Amtrak service -- the Desert Wind (Los Angeles-Ogden, Utah).

Engineering Requirements

The 325.5-mile Los Angeles-Las Vegas emerging corridor uses a track owned by the Atchison Topeka and Santa Fe (AT&SF) Railroad (Los Angeles-Daggett) and the Union Pacific (UP) Railroad (Daggett-Las Vegas). Amtrak currently operates one daily passenger train each way over this route as part of a long-haul service to Chicago, plus a second train between Los Angeles and Daggett. Freight traffic on the line is heavy. Approximately 32 trains run daily on the San Bernardino-Barstow segment, and some 20 trains operate daily on the remainder of the route.

The track is generally in excellent condition. Continuous welded rail is used over most of the route, which is predominantly single track with a double track segment of 91 miles between San Bernardino and Daggett. A Traffic Control System (TCS) is used on the entire route. In addition, the Barstow-Daggett section (nine miles) is equipped with automatic train stop, which allows maximum speeds of 90 mph.

Because of the condition of the track, the recommended capital improvement program is aimed at increasing the flexibility of this heavily traveled route to accommodate increased passenger operations. Some new double track with TCS may be required for the single track UP line, especially for the 20-mile, 2.2 percent grade between Kelso and Cima. In addition, several sidings need to be restored or added to improve the train passing capacity of the line.

With regard to the Las Vegas terminal, extensive rebuilding of station and storage track facilities is necessary to accommodate a corridor-type service. In addition, new facilities are required at Barstow to house crews laying over at that stop. It should be noted that UP also suggests the construction of a new bridge over the Mojave River to allow double track operations between Daggett and Yermo. This significant capital improvement element has not been included in the program or estimated costs.

Amtrak estimates that track and signal improvements for the operation of a corridor service over the route would be in the range of $26 to $43 million. Improving signal protection or eliminating grade crossings would require a further expenditure of $1 million, and station improvements would run approximately $1 million. It should be noted that these figures do not include the necessary engineering costs.

Ridership Projections

The SMSAs included in this corridor are Los Angeles and Las Vegas, with a total population of 7,584,800, or 24,076 persons per route mile. This corridor region has 10 military installations with a population of 25, 098, and a federal civilian employee population of 88,963.

Passenger train traffic currently consists of one long-haul train (Desert Wind, Los Angeles-Salt Lake City/Ogden). Amtrak's Southwest Limited (en route to Chicago) serves the Los Angeles-Barstow segment of this route. Scheduled airlines serve Los Angeles-Las Vegas on a 50 minute schedule. Frequent express bus service is available at schedules of less than six hours. For the auto traveler, Interstates 10 and 15 parallel this route throughout.

The following table shows common carrier service and fares as of February 1981 between Los Angeles and Las Vegas:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	2	7:25	$39.50
Air	69	0:44	55-85.00
Bus*	33	6:05	33.20

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to six hours.

With a projected ridership of 96.8 million passenger miles per year, Amtrak estimates that the annual revenues for this corridor would be $9.92 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 121 million passenger miles per year, for an estimated annual revenue of $12.39 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
4 Round Trips	$9.3	$13.4	Amfleet	2	5
4 RTs (+25% Demand)	9.3	13.4	Amfleet	2	5

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. In addition to the projected demand, Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	4	102	3.5¢	62%
Current	1	76	9.2	45
Incremental	3	111	2.2	68
+25% Demand	4	128	1.2¢	74%
Current	1	76	9.2	45
Incremental	3	145	(0.2)	84

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 223 people in such categories as engine and train crews, heavy and running maintenance crews, and station services personnel. In addition, the capital improvements described for this corridor would require 2,274 person-years of labor.

Community Views

On January 14, 1981, Amtrak representatives conducted a briefing on the Los Angeles-Las Vegas corridor to hear the views of the business and community leaders in Las Vegas. Held at the invitation of Senator Howard W. Cannon, the meeting was attended by state, county, and city officials; the city planning agency; representatives of the gaming, hotel, and tourism industries; as well as interested residents and the press.

The overall response to the corridor concept for Los Angeles-Las Vegas was enthusiastic. Speakers stressed that the economic health of Las Vegas is dependent on tourism as its main industry. Because of its remote geographic location, the city needs many transportation alternatives to bring visitors to and from the area.

Considering the escalating gasoline prices and the possibility of further periods of shortages, the area's spokesmen expressed concern about the long-term future of car travel between Southern California and Las Vegas. Corridor service was viewed as a good alternative should gasoline prices and availability reduce automobile travel.

Speakers did note, however, that the current train service on the corridor route was not competitive with cars, buses, or airplanes. Many travelers from the Southern California area come to Las Vegas on short Thursday-Monday visits. The long running time (7 hours, 25 minutes) required by the Desert Wind limits the attractiveness of train travel for this significant segment of the market. If corridor service provides more trains running on fast schedules, area representatives believe that increased ridership would result. A great deal of interest was shown for a bullet train service between the two regions. If significantly shorter running times cannot be achieved because of track curvatures or steep grades, it was suggested that increased ridership could be encouraged through marketing packages, such as a year-round convention service.

Subsequent written responses noted the excellent downtown location of the Amtrak station at Las Vegas' Union Plaza. A transit company is located in an adjacent building, and taxi service is readily available and inexpensive, adding intermodal elements to the location.

Although Nevada does not support any 403(b) services, the state has pledged support for the corridor concept. As stated by the Nevada Department of Transportation: "In particular, we are in full agreement that this program must be a true partnership between all levels of government.... If this program is to be truly successful and receive full support, the states and local governments must be totally involved during all phases of the program."

Los Angeles-San Diego Corridor

RECOMMENDED ROUTE

The route between San Diego and Los Angeles is one of the few in the United States on which there is more rail passenger service today than at the peak of the era of train travel. This emerging corridor is characterized by a sound physical system, frequent Amtrak service, and heavy — and growing — ridership. Measured by passenger miles, ridership tripled between 1975 (30.6 million PM) and 1979 (89.4 million PM). In 1980, Amtrak carried 1.23 million passengers, an 11.2 percent increase over 1979.

Engineering Requirements

The 127.9-mile Los Angeles-San Diego emerging corridor uses a route owned by the Atchison Topeka and Santa Fe (AT&SF) Railroad. Amtrak currently operates seven daily passenger trains each way. This frequency of service already constitutes a corridor-type service. Freight traffic is uneven -- heavy over the 25 miles between Los Angeles and Fullerton (averaging 20 trains daily) but light between Fullerton and San Diego (approximately 4 plus trains daily plus occasional extra trains).

The predominantly jointed rail track is in good condition, with FRA Class 4 double track between Los Angeles and Fullerton and essentially single track between Fullerton and San Diego. A major portion of the single track — the 73.3 miles between Santa Ana and Sorrento -- is maintained to FRA Class 5 standards, allowing maximum speeds of 90 mph. The entire route uses a Traffic Control System, with the double track portions signaled for reverse movements and with automatic train stop on the Santa Ana-Sorrento segment. The track is well maintained and has minimal slow orders.

Given the overall good condition of the track, only a modest program of capital improvements is anticipated to accommodate additional passenger trains. Because of the heavy freight traffic over the Los Angeles-Fullerton segment, two interlockings must be added. The result would be interlocked crossovers at intervals of about every three miles, giving this portion of the route tremendous flexibility and improving both freight and passenger operations.

On the single-track segment, a siding improvement program would also improve reliability of operations for increased passenger service. At least two new controlled sidings must be constructed, and several existing sidings must be signaled to increase the speed of trains using the sidings and minimizing delays when trains meet.

Although grade crossings are not a significant problem, some crossing signal circuits must be extended to accommodate higher speeds. In addition, minimal curve elimination work and modest terminal upgrading (at San Diego) is required.

Amtrak estimates that the cost of upgrading track and signals for this corridor would be in the range of $6 million to $9 million, not including the cost of lengthening crossing protection circuits. The cost of upgrading station and yard facilities is estimated to be approximately $1 million. Engineering costs would be in addition to these estimates.

Ridership Projections

The SMSAs included in this corridor are Los Angeles, Anaheim, and San Diego, with a total population of 10,735,300, or 89,417 persons per route mile. The corridor has by far the largest military population (161,173) of any emerging corridor considered in this study; it also has a federal civilian employee population of 108,412.

Passenger train traffic currently consists of seven each way daily on 2 hour, 45 minute schedules. There are also Amtrak connections in Los Angeles to San Francisco/Seattle, Las Vegas/Chicago, Kansas City/Chicago, and Phoenix/New Orleans. Other transportation services include frequent scheduled airline service between Los Angeles and San Diego on a 35 minute schedule and hourly express bus service between all points on about a three hour schedule Los Angeles-San Diego. For the auto traveler, Interstate 5 parallels this route throughout the corridor.

The following table shows common carrier service and fares as of February 1981 between Los Angeles and San Diego:

	One-Way Daily Frequencies	Best Schedules	One-Way Fare
Rail	14	2:35	$13.50
Air	32	0:34	29-57.00
Bus*	98	2:20	8.89

*December 1980 data.

Given the increased speed corridor trains, it is projected that the rail schedule would be improved to 2 hours, 10 minutes.

With a projected ridership of 167.1 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $18.54 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 208.9 million passenger miles per year, for an estimated annual revenue of $23.16 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies. Because

of the extensive service already operating on this route, Amtrak does not believe that additional equipment is necessary to provide the proposed incremental service. In addition, equipment needs and costs have been calculated for an assumed demand of 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
10 Round Trips	$27.2	—	Amfleet	5	5
10 RTs (+25% Demand)	27.2	$4.5	Amfleet	5	5

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	10	180	0.7¢	78%
Current	7	186	1.4	72
Incremental	3	167	(1.3)	92
+25% Demand	10	225	(0.4)	86
Current	7	186	1.4	72
Incremental	3	317	(3.0)	112

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 69 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 416 person-years of labor.

Community Meetings

Amtrak was invited to provide community briefings in the proposed corridor in both Los Angeles, on September 15, 1980, and San Diego, on November 21, 1980. Community spokesmen at

both meetings noted the vital importance to the local economy of passenger rail service between the two cities.

According to speakers at the San Diego meeting, more than 50 percent of the visitors to San Diego are from other parts of California — many from Los Angeles. Rail service is considered extremely convenient. Los Angeles is the most popular travel destination in the United States, while San Diego is fourth in that category behind New York City and Chicago according to the U.S. Department of Commerce.

Speakers at the San Diego meeting stressed that rail service between the two cities is heavily used by the public and has become vital to the economic well-being of the entire area. Passengers are predominantly those on business or tourist trips, they said, but many passengers are military personnel and college students. Speakers called for additional frequencies at higher speeds. Several communities asked to be considered as stops for increased Amtrak service.

In a discussion of alternative modes of travel, speakers noted that the highway between San Diego and Los Angeles is congested. They said that construction costs of additional highway lanes is extremely expensive, largely because of the high costs of land acquisition.

The City of San Diego, in cooperation with other local transportation agencies, is planning to renovate the Santa Fe Depot in San Diego's Centre City redevelopment effort. The existing station will be redeveloped to increase bus-to-rail connections. A large visitor and convention center will be constructed adjacent to the existing Santa Fe Depot.

Because of this new development in the downtown area, and the ripple effect that it will have on the surrounding area, there is expected to be a sharp increase in out-of-town visitors, employees, and residents coming into the downtown. This development will likely stimulate increased rail corridor use as well as a more effective interchange of transportation modes at the Santa Fe Depot.

The San Diego Trolley project, developed by the Metropolitan Transit Development Board, will go from the Santa Fe Depot to the Mexican border. By 1995, it is expected that approximately 30,000 daily passenger trips will be generated by this trolley line.

State support for rail passenger service between San Diego and Los Angeles shows a history of strong commitment. California now jointly finances three round trips daily under 403(b) service between the two cities (in addition to two round trips daily between Oakland and Bakersfield). The state also has

applied for additional 403(b) service between Los Angeles and Sacramento. The state has participated in financing the renovation of the station in San Diego and Los Angeles.

Cities along the route have shown their commitment to rail passenger travel. Anaheim has stated its intention to finance construction of a new station at Anaheim Stadium, which is near Disneyland. Fullerton is participating in renovation of the station in that city, while Oceanside and Santa Ana are planning multi-modal transportation centers in their respective cities.

San Jose-Reno Corridor

The San Jose-Reno corridor runs through dense urban areas and rugged mountains. San Jose, at one end, is a major business center; along the route are Oakland, a major population center, and Sacramento, the capital of California; at the other end is Reno, a major gambling resort. The markets that would be served by this corridor are diverse.

Engineering Requirements

The San Jose-Reno corridor can be viewed as two corridors -- San Jose-Oakland-Sacramento, and Sacramento-Reno. The first runs 130 miles over Southern Pacific track; the second, 153 miles, also over Southern Pacific track.

Freight traffic over the San Jose-Oakland line is light, while freight traffic over the Oakland-Sacramento segment is moderate. Amtrak currently operates passenger trains over the route. Except for a short section of single track between San Jose and Oakland and a very short section of single track at Roseville, the entire route consists of double track that is in very good condition. Corridor service most likely would require a limited amount of modification to the existing plant. This modification might include additional sidings and/or installation of some traffic control territory.

The maximum authorized speed on this line is presently 70 mph; however, speed is restricted to 30 mph on the steep grades and severe curvature over the Sierra Mountains between Roseville and Reno. Significant modification of the route to permit higher speeds over the Sierras is not economically justifiable.

With respect to terminals, Amtrak currently operates a station at San Jose. A corridor service would necessitate additional facilities for servicing and for passengers. If the corridor were to end at Sacramento, the terminal there would also have to be expanded significantly. If the corridor were developed as far as Reno, the Sacramento station would need only modest improvements.

The terminal at Reno actually consists of two separate facilities. The passenger station is in Reno proper, while the servicing and turnaround facility is about 3.3 miles beyond at Sparks. The capacity of the latter facility would need to be enlarged to handle a corridor service.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $5 and $10 million; of improving signal protection or eliminating grade crossings, $1 million; and of upgrading the operational capacity of station facilities, $6 million. These figures do not include engineering and design costs.

Ridership Projections

The SMSAs included in this corridor are Sacramento, San Francisco/Oakland, Fairfield/Vallejo, and San Jose, with a total population of 5,379,400, or 43,990 persons per route mile.

Passenger train traffic currently consists of one long-haul daily between Oakland and Reno (San Francisco Zephyr, en route to Chicago), which is scheduled for 6 hours, 18 minutes. There is also one long-haul daily from Davis (13 miles west of Sacramento) to San Jose (Coast Starlight en route between Seattle and Los Angeles), which is scheduled for 3 hours, 18 minutes. There are also two San Joaquin trains daily between Oakland-Martinez en route to Bakersfield. Southern Pacific operates an extensive commuter service between San Jose and San Francisco, and there is a joint depot at Richmond between Amtrak and BART.

Airlines operate between all combinations of Sacramento, San Francisco/Oakland, and San Jose, with flying times of 30 minutes or less between Sacramento-San Jose direct (2 hours, 40 minutes); the San Jose-Oakland service involves a connection at San Francisco.

For the auto traveler, Interstate 80 parallels the segment between Sacramento and Oakland, while the Nimitz Freeway parallels the segment between Oakland and San Jose.

The following table shows common carrier service and fares as of February 1981 between San Jose and Reno:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail		NO RAIL SERVICE	
Air	8	0:40	$45.00
Bus	8	6:25	28.00

Following the implementation of corridor service, it is projected that the rail schedule would be 6 hours, 32 minutes.

With a projected ridership of 49.5 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $5.46 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 61.9 million passenger miles per year, for an estimated annual revenue of $6.83 million. With respect to the San Jose-Sacramento segment, the base ridership projection would be 15.1 million passenger miles per year, and the enhanced ridership projection would be 18.9 million. The corresponding annual revenue projections are $1.67 million and $2.09 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
3 Round Trips	$13.4	Amfleet	3
3 RTs (+25% Demand)	13.4	Amfleet	3
San Jose-Sacramento Segment			
3 Round Trips	$10.4	Amfleet	3
3 RTs (+25% Demand)	10.4	Amfleet	3

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated the same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	80	14.3¢	36%
+25% Demand	3	100	9.8	44
San Jose-Sacramento Segment				
Projected Demand	3	53	29.1¢	23%
+25% Demand	3	67	21.7	28

Employment Benefits

Operation of the service described here would provide ongoing employment for 250 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 1,036 person-years of labor.

Community Views

Amtrak solicited community response to the proposed corridors at briefings in San Jose, Sacramento, and Reno, the three major destinations along the San Jose-Reno corridor. The meetings were held at the invitation of Rep. Norman Y. Mineta, Rep. Robert T. Matsui, and Sen. Howard W. Cannon, respectively.

All three meetings were attended by representatives from state, regional, and city transportation and development agencies, state and city legislative and executive branches, residents and officials from smaller communities along the route, business groups, labor groups, associations of citizens interested in promoting railroads, environmental groups, universities, students, railroads, and other interest groups such as the handicapped and senior citizens.

There was general enthusiasm over the possibility of a passenger operation that would provide more frequent and more rapid service in the corridor. Three particularly important markets were noted — skiers, tourists to the casinos of Reno, and college students. In addition, there are 18 military facilities with a population of about 50,000; the federal civilian population numbers about 50,00 also. Several people noted the popularity of the "Fun Train" which Amtrak now operates between Oakland and Reno. Several people suggested that increased frequency of passenger trains could alleviate the congestion along Interstate 80, which parallels the corridor, where up to four hours delays can be experienced on weekends.

Spokesmen for both San Jose and Sacramento noted that their cities were pursuing the redevelopment of their downtown areas. They stated that a corridor service would complement those efforts, providing a further impetus to downtown revitalization. In Sacramento, there has been a proposal to upgrade the Southern Pacific station now being used by Amtrak by converting it into a multimodal, multipurpose facility, serving as the hub for all transportation modes -- bus, air, rapid transit, taxi, car, and train. The station would contain a hotel, restaurants, shops, offices, and a performing arts center. The State has been implementing its "Capitol Area Plan," whereby all offices are to be located within a 10 minute walking radius of the proposed transportation center. Both the state and the City of Sacramento have committed funds to the project and are now seeking the remainder from the federal government and the private sector.

The transportation director of Santa Clara County, where San Jose is located, pointed out the logical link between a corridor service and plans there to improve commuter service in the Guadalupe Corridor around San Jose. In addition, he noted that

San Jose has been studying the development of a downtown transit mall and expressed his hope that the train station would be relocated to it.

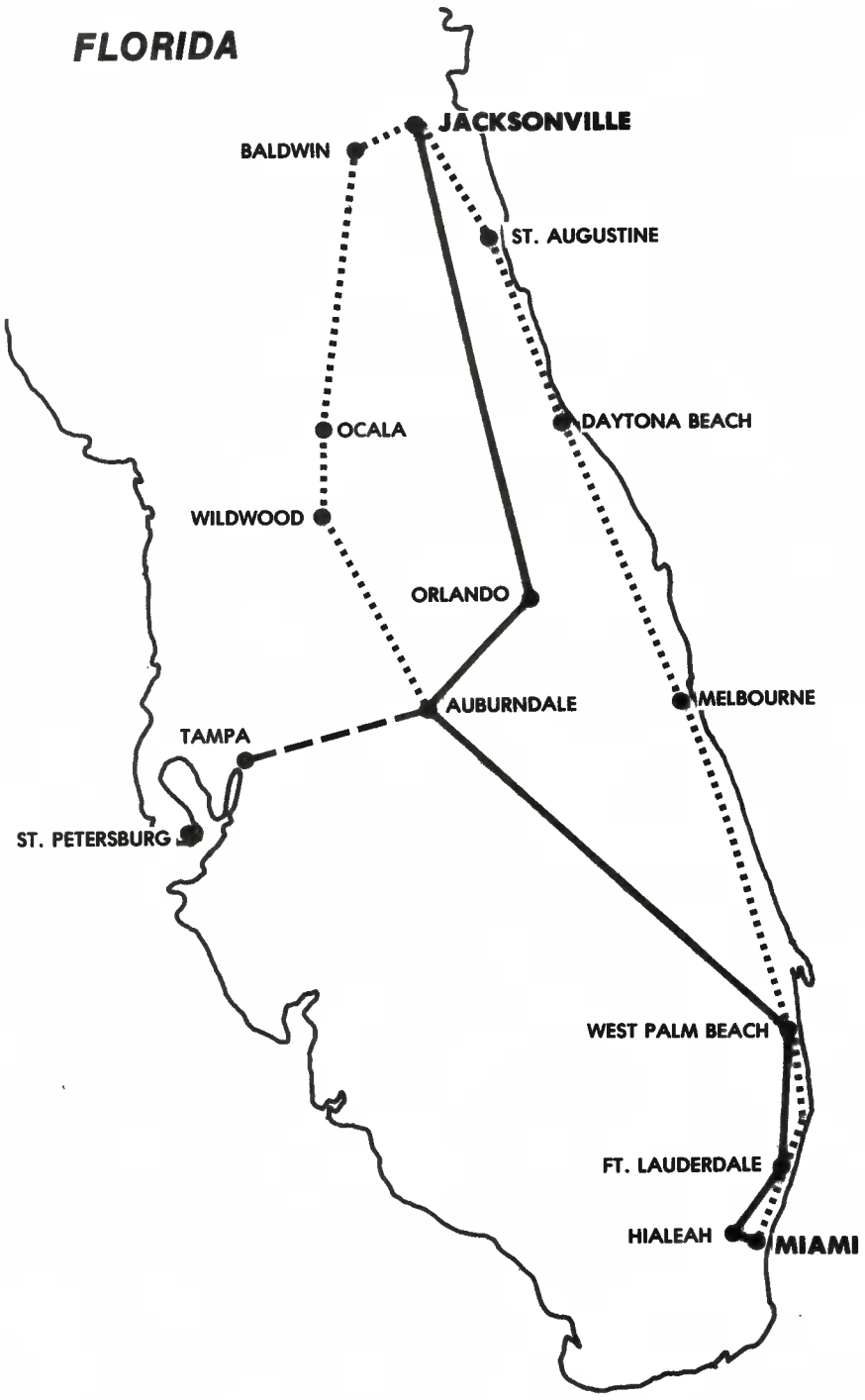
Spokesmen for Reno voiced concern over the escalating price of gas and its potential impact on tourism, the city's biggest industry. If the corridor service were to prove rapid enough, they believe it could be one answer to the problem. They also suggested that having Reno as a terminal would provide steady support for the entire corridor.

Subsequent to the meetings, various groups sent additional comments. The Sacramento Regional Area Planning Commission commented that a corridor service could help offset the loss of revenue from freight traffic that might result from the Western Pacific-Union Pacific merger. It could also help stabilize employment on the Southern Pacific line in the region. Further, if the service were to result in a shift from automobile traffic, Sacramento might see a reduction in automobile congestion and emissions. Several Sacramento spokesmen expressed their belief that a corridor service would yield a savings in energy. No new construction of highways is planned around Sacramento, but there may be a need to expand the airport, work that would have to take place regardless of a corridor operation.

All state, regional, and city agencies pledged support for a corridor service. CALTRANS, the California state transportation department, noted that it is already committing funds to upgrade passenger service in the state. San Jose and Sacramento indicated that they will provide funds for station improvements and the proposed transportation centers. The Nevada Department of Transportation has improved two grade crossings along the proposed corridor and has plans to improve two more. A spokesman stated that additional improvements would have to be carried out by Washoe County, where Reno is located, or the private sector. At present, the state has no program for mainline track improvements, largely because of legal restrictions on the use of transportation-related funds such as state gas tax monies. The state indicated willingness to pursue legislation for a tax incentive for railroad development if it could be shown that such a program would prove valuable to a corridor operation.

The private sector has also indicated that it would support the development of a corridor service. Businesses will commit funds to the downtown redevelopment and establishment of transportation centers in Sacramento and San Jose. Casinos in Reno have stated that they would extend their cash bonus program for bus travelers to the city to include train passengers as well.

Miami-Jacksonville Corridor



The Miami-Jacksonville corridor serves an area that attracts millions of tourists every year. The proposed route provides a rail link between Jacksonville on the northeastern coast via Orlando, site of Walt Disney World, and Miami. From West Palm Beach to the Miami terminal in Hialeah, the route connects many popular beach resort communities, including Boca Raton, Ft. Lauderdale, and Hollywood.

The Governor of Florida has requested appropriations from the state legislature to begin Miami-Tampa Bay-Orlando service in the second half of 1981 under the 403(b) program. This service would provide, for the first time, rail passenger service between the two largest urban areas of Florida: Miami-West Palm Beach and Tampa Bay. The service would connect the largest intercity tourist flows in the state and would reach 60 percent of the state's 10 million people. The 403(b) service could complement and significantly assist in the development of the emerging corridor.

Engineering Requirements

Two main options exist for development of the Miami-Jacksonville corridor:

- The Seaboard Coast Line (SCL) from Jacksonville to Miami via Orlando; and
- The Florida East Coast (FEC) route between Jacksonville and West Palm Beach and the SCL between West Palm Beach and Miami.

The 411-mile SCL route operates over a single track line. Amtrak currently provides two trains daily to and from Miami-Jacksonville over this route as part of long-haul services originating in New York City. Freight traffic is light, with three to four trains daily each way.

This route is generally in excellent condition. Consisting of a mix of jointed and continuous welded rail with a Traffic Control System (TCS), the track is maintained to FRA Class 4 (79 mph) standards, and slow orders are negligible. The route has an excellent flexibility for increased traffic, and would require a minimal amount of work.

This single track route has numerous controlled sidings that are well spaced -- seven to nine miles apart. However, those siding that are not signaled should be modified to provide signaling throughout. Although considerable progress has been made in improving crossing protection on this route, some additional work of this type is required. The terminals at both Miami and

Jacksonville are suitable for corridor service, although Jacksonville would require comprehensive work to provide parking, storage, and servicing facilities.

A major alternative route is the FEC line that operates along the Atlantic Coast, running through St. Augustine, Daytona Beach, the Cape Kennedy area, and Melbourne, for a total trip length between Jacksonville and Miami of 348 miles. The single track is in excellent condition, using continuous welded rail maintained in excess of FRA Class 5 standards. Indeed, freight trains are operated at a maximum speed of 65 mph. A Traffic Control System is used throughout the entire route, and concrete ties are in service over approximately 90 percent of the line. Sidings are maintained to the same high standards as the main track. Slow orders are negligible, with existing ones used to facilitate current track improvements. Freight traffic is moderate to heavy with 16 to 20 movements daily.

Because passenger trains have not operated over the FEC line in approximately 18 years, all new station facilities, including shelters or stations, platforms, lighting, and parking areas at intermediate stops, is required for corridor service over this route. In addition, crossing protection circuits would have to be lengthened to accommodate changes in operating speeds. The present number of controlled sidings is adequate for existing levels of freight traffic but would be inadequate for corridor-type service. South of West Palm Beach the frequency of highway road crossings is such that the use of this segment of the FEC line is not recommended. However, a connecting track currently exists between the FEC and the SCL lines at West Palm Beach. Construction of a new connection on the FEC end of this track and upgrading the existing track would permit direct access between the FEC and SCL for continuous operation into the Amtrak station and terminal facility at Miami via the SCL line.

In addition to the SCL route via Orlando and the FEC route via the Coast, another alternate route exists. The SCL owns a single track that runs between Jacksonville and Auburndale via Baldwin (188.7 miles), for a total trip length to Miami of 402 miles. This route is well maintained for 79 mph passenger train operation. However, more freight trains use this route, especially between Baldwin and Wildwood, and about a dozen new controlled sidings and signals for many existing sidings would be required for corridor use of this line. Another disadvantage would be the limited population served.

Another variation of the corridor would include a connecting service between Miami and Tampa (42.3 miles) via Auburndale. This single track segment uses a TCS, has 50 percent continuous welded rail, and is maintained to FRA Class 4 standards. Minimal work is required to accommodate corridor-type operations.

All highway crossings except one near Tampa and several in Plant City have flashing lights and gates. The remaining heavy crossings should have flashing lights and gates for corridor service. The connection at Auburndale requires upgrading, signaling, and an interlocking. A considerable amount of work is also required to make the Tampa station suitable for corridor service — both for passengers and for servicing of corridor equipment. Station improvements or station relocation in Tampa have been considered for several years for long-distance service. Something will most likely need to be done even without the proposed state-supported trains of two frequencies each way.

Amtrak estimates that the track and signal work required for corridor operations for the SCL Miami-Jacksonville via Orlando route are in the range of $6 to $16 million. Improving signal protection or eliminating grade crossings would require a further expenditure of $11 million, and station improvements would run approximately $9 million. It should be noted that these figures do not include the necessary engineering and design costs. A similar estimate for the FEC route has not been prepared; however, the major expense on the FEC route would be the modification of crossing protection circuits and the construction of appropriate passenger station facilities, additional sidings, and upgrading the connection at West Palm Beach.

Ridership Projections

The SMSAs included in this corridor are Jacksonville, Orlando, West Palm Beach, Ft. Lauderdale, and Miami, with a total population of 4,286,000, or 11,285 persons per route mile. Along this route there are seven military installations with a population of 26,446, and a federal civilian employee population of 36,906; these figures do not include the large MacDill Air Force Base and other federal employees in the Tampa area.

Passenger train traffic currently consists of two long-haul trains each way daily on schedules of 7½ to 9 hours (trains en route to and from New York). Scheduled airline service is available between all combinations of Miami, Ft. Lauderdale, West Palm Beach, Orlando, and Jacksonville, with flying times ranging from 25 minutes to 1 hour. Express bus service is also available between all points, with Miami-Jacksonville schedules of seven to nine hours. For the auto traveler, Interstate 95 provides a direct Miami-Jacksonville route, while Florida's Turnpike/Interstate 4 generally parallels the railroad and includes Orlando/Winter Park.

The following table shows common carrier service and fares as of December 1980 between Miami and Jacksonville:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	4	8:05	$39.50
Air	7	1:00	90.00
Bus*	40	7:05	26.35

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 7 hours, 15 minutes.

With a projected ridership of 86.9 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $9.38 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 108.6 million passenger miles per year, for an estimated annual revenue of $11.73 million. These estimates do not include the Tampa Bay area, which will have a projected population of 1.7 million people in 1985 and is a major tourist area.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs	
		Type	Proposed Train Sets
3 Round Trips	$16.8	Amfleet	4
3 RTs (+25% Demand)	16.8	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round-Trips Per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	3	97	6.4¢	52%
+ 25% Demand	3	121	3.4	63

It should be noted that although Amtrak currently provides the Miami-Jacksonville corridor with train service, it was determined that the service (long-distance trains from New York City) was not equivalent to corridor operations for calculation purposes. The Tampa Bay and tourist-adjusted (i.e., special international) demands were not evaluated because of a lack of data. Results of a more complete analysis might be significantly better.

Employment Benefits

Operation of the service described here would provide ongoing employment for 269 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 1,911 person-years of labor.

Community Views

During a one-week period in January 1981, Amtrak representatives conducted four briefing sessions to hear the views of the business communities and the public officials from the Miami-Jacksonville corridor -- Jacksonville, January 19; Orlando, January 20; Tampa, January 21; and Miami, January 23. Held at the invitation of the Florida Department of Transportation (FDOT), all four meetings resulted in a high level of community interest and attracted large audiences, including city, county, and state officials; representatives of Chambers of Commerce, military installations, tourist bureaus, colleges, universities, Congressional offices, transportation planning and study groups, operating railroads, and labor unions; as well as interested residents.

At all stops on the briefing schedule, response to the Amtrak proposal for increased rail service was enthusiastic. A succession of spokesmen pointed to Florida's need for rail service focused on in-state travel. Currently, Amtrak service covering the corridor route is limited to the Silver Meteor and the Silver Star -- two long-haul trains from New York City to Miami via Jacksonville, with a side service to St. Petersburg. Because they link Florida cities with the Northeast, the trains' schedules are oriented for the convenience of passengers traveling long-distances, not within the state. For example, the Silver Star departs Jacksonville for Miami at 5:25 a.m. In addition, availability of seats for passengers boarding and

traveling in Florida is unreliable because of long-distance reservations.

Speakers stressed that increased Florida-oriented passenger service would attract a large in-state market -- not only residents (up to 70 percent of Florida's population lives along the route), but also large numbers of tourists who arrive daily at Miami's international airport. This is especially true for foreign tourists from Western European countries and South America. The half-million people per year from rail-accustomed Western Europe represent an especially good market for rail corridor development. Over the past several years this market has been growing at the rate of more than 40 percent per year. With the recent introduction of low-cost skytrain and similar air service from Europe, this market could grow at a faster rate. If an emerging rail passenger corridor in Florida increased the present 2 million non-Canadian market into Florida by 10 percent, the result would be an estimated $200 million in annual additional foreign expenditures in this country. Indeed, the representative of the FDOT stated that international travel to Florida could be increased by 10 percent if convenient rail connections with the numerous tourist attractions are established. What Floridians need and want is a rail service with a south-to-north focus that takes into account the predominant tourism entry via Miami, instead of the current north-to-south emphasis that only accounts for tourism from the Northeast region of the United States.

Another major issue of the briefing sessions was the routing of the corridor. Speakers emphasized that to serve Florida's large tourism business, as well as large segments of the state's population, the corridor route should travel between Miami and Tampa/Orlando, not between Miami and Jacksonville. Many reasons were given for this rerouting. First, the major tourist attractions such as Busch Gardens, Sea World, and Walt Disney World, as well as many attractions under construction, are located within this corridor. Fast, reliable train service between southeast and central Florida would result in a sizable increase in tourism traffic. Second, because current Amtrak service within Florida is relegated to the long-haul services, no Tampa-Miami connections are available. Travelers can use trains between Orlando and Tampa or Orlando and Miami, but not between Miami and Tampa -- the two major urban areas and the primary tourism route. Participants also noted that the Miami-Jacksonville route is too long (411 miles, and currently 8 hours, 5 minutes) to attract business travelers. Because of the importance of the Miami-Tampa connection to Floridians, the FDOT has proposed the implementation of a 403(b) service between the two communities.

In support of the Miami-Tampa/Orlando focus, the FDOT provided population data. Between 1970 and 1980, the population of Florida increased by 40 percent to 9.6 million people. Florida is expected to continue to be one of the fastest growing parts of the country over the next decade. The following table shows the 1985 population projections, populations per route mile, and the percent of population served by the total and the subparts of the corridor:

	1985 Population	1985 Population Per Route Mile	Percent of State Population
Miami-Orlando-Jacksonville	5,895,500	14,665	55%
(with Auburndale-Tampa extension)	7,456,400	16,832	70
Miami-West Palm Beach	3,896,400	60,881	36
Miami-Orlando	4,895,800	19,275	45
Miami-Tampa	5,706,100	22,465	53
Miami-Tampa, Orlando	6,456,700	21,887	60
Orlando-Jacksonville	1,750,300	11,826	16

In addition to the large tourism market, briefing participants identified another significant source of ridership -- Florida's growing population of retired older people. Reliable and inexpensive public transportation is important to elderly people, who may no longer be financially or physically able to drive automobiles.

In response to Amtrak's request for information on the expected impact of corridor service, numerous letters of support were received from communities along the route. With regard to developmental benefits, the City of Orlando noted that the Amtrak station has been designated and restored as a historic structure, while plans have been made to develop an intermodal station in Tampa. The stations in Orlando and Tampa are well located in their cities, although Jacksonville and Miami representatives expressed the need for downtown terminals in their cities. The Amtrak stations in both communities are located in suburban areas, but provide ample parking space for travelers' automobiles. Also, Miami, Jacksonville, and Tampa are evaluating downtown people-moving systems.

Another consideration is the dominance of the automobile in Florida travel. With rising gasoline prices and the possibility of future shortages, spokesmen emphasized the need for alternative modes of transportation between Florida communities and tourist attractions. These spokesmen noted that Florida's highways are already quite congested, and airlines have reduced their short-haul services between Florida communities. Corridor service along the route could provide a needed supplemental transportation service. In addition, the representative from Broward County (Ft. Lauderdale area) expressed the need for commuter rail service between Miami and the Palm Beach area. Some interest was also shown in the development of a high-speed, bullet train between Jacksonville and Miami over the extremely good track of the Florida East Coast Company, which skirts the Atlantic Coast for 348 miles. The FDOT is starting a feasibility study of high-speed rail service in the state.

Support for the costs of corridor service was also indicated. As previously mentioned, the FDOT has proposed a Miami-Tampa 403(b) service -- the first such program for the state. In addition, in a nationally recognized pilot project, the FDOT and Amtrak are sharing equally in the costs for the systematic improvement of grade crossings between Tampa and Jacksonville; to date, 34 crossings have been upgraded, and 42 additional crossings are slated for reworking. Following the completion of this program, another 56 crossings in the Auburndale-Miami corridor will receive attention. The state also plans to conduct a study on how to provide economically viable, improved passenger rail service in Florida. As stated by the FDOT: "The Jacksonville-Orlando-Miami corridor provides a timely opportunity to implement a viable emerging corridor project with little fixed capital cost...."

New York-Buffalo ["Empire"] Corridor

RECOMMENDED ROUTE

The Empire corridor connects New York City with the state capital, Albany, and extends to the westernmost major city in the state, Buffalo. It passes through several of the major cities of the state.

Engineering Requirements

The Empire corridor stretches for 463 miles from Grand Central Terminal in New York City through Buffalo to Niagara Falls, N.Y. The preponderance of this corridor has two or more main tracks.

The Metropolitan Transit Authority (MTA) owns the line from Grand Central Terminal to Poughkeepsie, and Conrail owns the line from Poughkeepsie to Buffalo, with the exception of sections owned by Amtrak between Schenectady and Hoffmans.

The entire route is generally in excellent condition with the exception of the Buffalo terminal and the route between Buffalo and Niagara Falls. Generally the line has a maximum speed of 75 mph for passenger trains; however, Conrail has reduced the maximum speed on curves over certain segments. Between Poughkeepsie and Hoffmans the line has been upgraded to FRA Class 6 track with a maximum speed of 110 mph.

From Albany to Hoffmans, some work would be necessary to upgrade short portions of a second track, and two sidings (with Cab signals) would be needed for corridor operations.

Corridor operations would require new station platforms in various locations where only one platform exists. In addition, the Buffalo terminal needs track modification and related signal work.

Although Buffalo is designated as the terminus of the Empire corridor, no terminal facilities exist. Niagara Falls has limited terminal facilities, which would most likely be inadequate for any substantial increase in frequency (depending on schedule times). The proposed terminus should be changed to Niagara Falls, provided an efficient use of run-through train and engine crews between Niagara Falls and Syracuse could be attained.

Between Buffalo and Niagara Falls, a limited number of slow orders still exist. Some track work would be required for corridor service. The terminal at Niagara Falls consists of two short stub tracks in addition to the main track. There is no room to expand these facilities. If Niagara Falls is designated as the terminus of the Empire corridor, the station and maintenance facility could be relocated on an 11-acre parcel of vacant land immediately west of the existing facility.

The work required to provide adequate facilities at the northern terminus of the corridor accounts for the largest single expense item for the Empire corridor.

Amtrak estimates that the cost of upgrading the track and signal systems for this corridor could be in the range of approximately $21 million to $35 million. Amtrak estimates the cost of improving signal protection or eliminating grade crossing at approximately $1 million. It is estimated that the cost of upgrading station and yard operations would be approximately $10 million. The cost of engineering would be in addition to these estimates.

Ridership Projections

The SMSAs included in this corridor are New York City, Poughkeepsie, Albany, Utica, Syracuse, Rochester, and Buffalo, with a total population of 16,165,300, or 36,807 persons per route mile. The military population is 5,293 and the federal civilian employee population is 115,916 along the route.

Passenger train traffic currently consists of eight round trips daily between New York and Albany, four round trips daily to Syracuse, and one as far as Buffalo. There is also frequent MTA commuter service operated over this route between Poughkeepsie and New York. Scheduled airlines operate between New York and Albany (40 minutes flying time), Syracuse (59 minutes flying time), Rochester (1 hour flying time), and Buffalo (1 hour, 2 minutes flying time). There is air taxi service to Utica (55 minutes flying time). In addition, there are flights between Albany and Rochester (41 minutes flying time), and Buffalo (47 minutes flying time). There is also scheduled service between Buffalo and Rochester with 25 minutes flying time. Express bus service is available between all points. For the auto traveler, Interstates 87 and 90 parallel this route throughout.

The following table shows common carrier service and fares as of February 1981 between New York City and Buffalo:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	3	7:36	$46.50
Air	29	0:53	94.00
Bus*	8	7:50	47.05

*December 1980 data.

Following the implementation of corridor service, it is projected that the rail schedule would be improved to 6 hours, 30 minutes.

With a projected ridership of 312.4 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $31.07 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 390.5 million passenger miles per year, for an estimated annual revenue of $38.79 million. With regard to the New York City-Albany segment of this route, the projected ridership is 84.5 million passenger miles per year (105.63 million for the +25 percent projection), for an estimated annual revenue of $8.68 million ($10.84 million for the +25 percent projection).

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
			Entire Route		
6/11 Round Trips	$87.7	$7.8	Amfleet/ Turboliner	8	10
6/11 RTs (+25% Demand)	87.9	12.3	Amfleet/ Turboliner	8	10
			New York City-Albany Segment		
11 Round Trips	$39.2	$8.0	Amfleet/ Turboliner	5	6
11 RTs (+25% Demand)	39.2	8.0	Amfleet/ Turboliner	5	6

The assumption that both Amfleet and Turboliner equipment will be used for this corridor offers the most efficient use of the mix of equipment currently used in this service.

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips Per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
		Entire Route		
Projected Demand	6/11	123	3.6¢	60%
Current	3/8	101	5.4	53
Incremental	3/3	156	1.9	70
+25% Demand	6/11	153	1.5¢	72%
Current	3/8	101	5.4	53
Incremental	3/3	233	(1.1)	92
		New York City-Albany Segment		
Projected Demand	11	74	11.9¢	38%
Current	8	60	15.3	32
Incremental	3	112	7.0	60
+25% Demand	11	93	8.0¢	46%
Current	8	60	15.3	32
Incremental	3	180	3.0	73

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 231 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,106 person-years of labor.

Community Views

New York State officials expressed strong support for the Empire corridor at an Amtrak briefing held in Albany on January 8, 1981. The briefing was held at the invitation of the New York Department of Transportation and was attended by approximately 130 people, many of whom represented state agencies.

Representatives of business and other groups were present as well. Most people attending the meeting were enthusiastic about corridor service for this region. Business spokesmen noted that higher frequency, high-speed service would stimulate high levels of ridership and would make rail service along the Empire route more economical. According to a written submission the New York State Department of Transportation (DOT), "New York State recognize[s] that modern, attractive, high-speed intercity rail passenger service in the 'Empire Corridor' could make rail travel competitive with other modes in terms of cost and fuel efficiency as well as convenience and comfort."

As a reflection of this viewpoint, New York State voters approved in 1974 a $250 million rail bond issue to improve freight, commuter, and intercity passenger facilities. In 1979, the state's voters approved an additional $400 million for transit and rail projects. These bond issues, in combination with other appropriations, have resulted in the obligation of over $93 million in state funds for capital improvements of benefit to intercity rail service.

According to the state DOT, a result of this improvements program has been a dramatic increase in the patronage of rail service in New York State. In 1974, only 700,000 persons used the available services, but today over 1.2 million people travel on the expanded and improved intercity rail system. This rate of increase is roughly twice the national average.

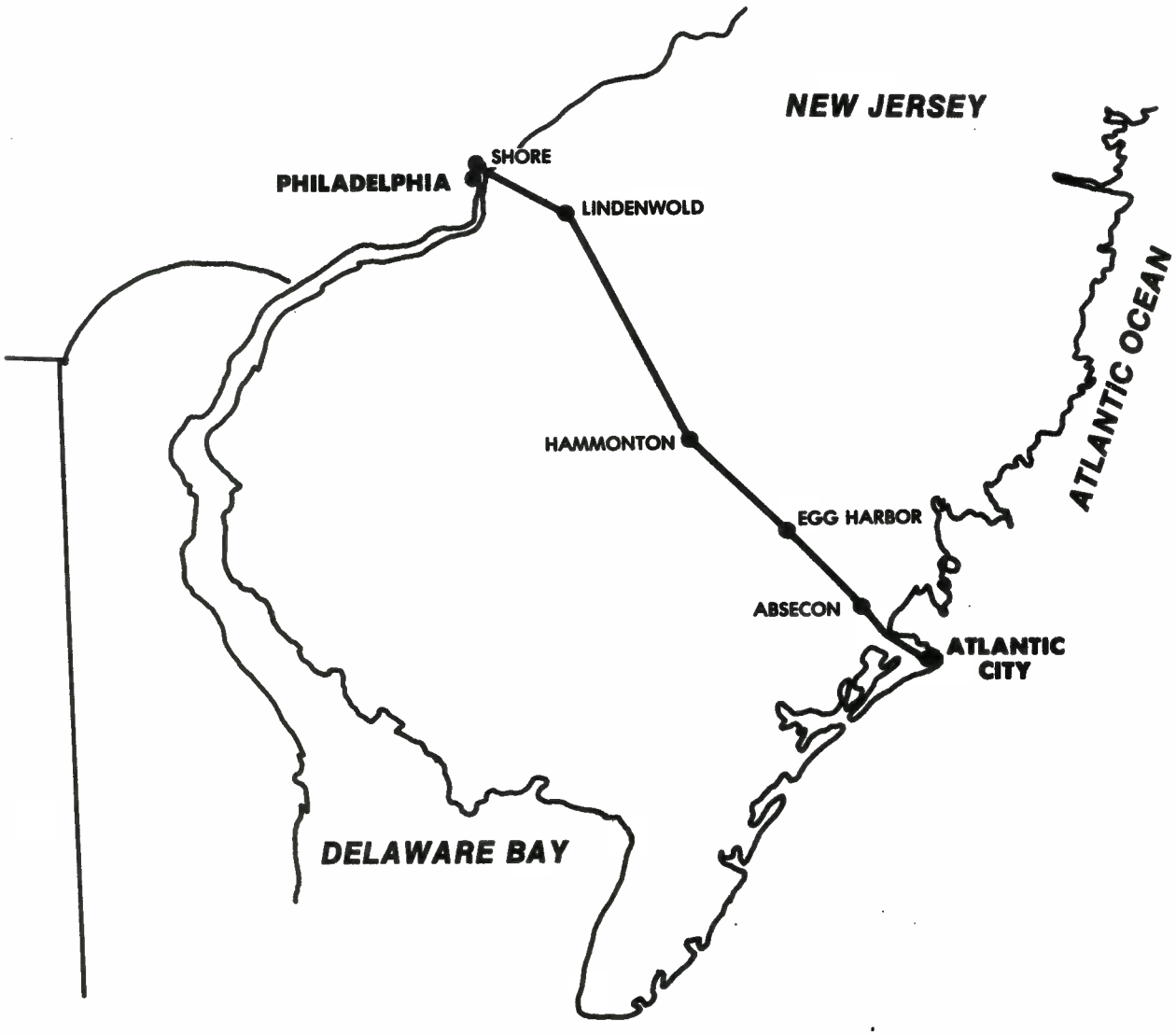
Part of the program for upgrading the track includes a section between Hoffmans and Poughkeepsie, which will achieve FRA Class 5 standards when the work is completed in 1981. Because earlier programs improved the track between Albany and Hoffmans, trains will be able to travel at speeds up to 100-110 mph over this major section of the corridor. New York will therefore have true high-speed service -- the first in the nation outside of the Northeast Corridor. Other improvement programs have resulted in the elimination of speed restrictions between Hoffmans and Buffalo.

In addition to the track work, a large station improvements program has been conducted in the state. Between New York City and Niagara Falls, every station has been either replaced or rehabilitated in a combined effort by the state, the localities, and Amtrak. New stations have been built at Rochester, Niagara Falls, Schenectady, and DePew and Exchange Street in the Buffalo area, while construction of a new station is under way at Albany-Rensselaer. In addition, parking lots and facilities at other cities have been upgraded.

The New York State Office of Parks and Recreation noted that the railroad connects the important recreational and cultural

resources of the Hudson and Mohawk River Valley and the Niagara Frontier with the Northeast's population centers. A spokesman noted that although the resulting travel involving 50 million visitors to state parks each year is largely by auto and bus, the use of passenger trains is growing, particularly along the Mohawk-Hudson corridor. Further, trends observed during the past few years, involving both gasoline scarcity and increasing prices, show that the popularity of the rail transportation mode and the dependence of the Park office on that mode, continues to grow because of these conditions. The Park Office's user statistics showed less than 5 percent rail riders during the 1970's. This figure was close to eleven percent during the past season, many of them Amtrak riders.

Philadelphia-Atlantic City Corridor



The Philadelphia-Atlantic City corridor would connect one of this country's most historic cities -- a popular tourist destination, as well as business and cultural center — with one of the country's oldest resort towns, which received a big boost with the legalization of casino gambling. The worsening congestion in downtown Atlantic City has contributed to the growing interest in rail service, which would serve not only tourists, but also commuters who live in the surrounding communities because of the lack of housing in the resort town. A distinctive feature of this corridor is its potential profitability and its consequent attractiveness to private sector investment.

Engineering Requirements

The Philadelphia-Atlantic City corridor ranges in quality over its 68.3 miles — from track that is part of the Northeast Corridor to track that has been out of service for a decade.

The corridor falls into three major segments. The first, from Philadelphia to Shore (7.5 miles), is owned by Amtrak and constitutes part of the Northeast Corridor. The track is in excellent condition and can handle additional service without capital improvements.

From Shore to Lindenwold, however, the track is in poor condition. On the segment from Shore to Jordan (five miles, owned by Conrail), only freight service -- operated at slow speeds — is permitted. The track is in a deteriorated condition and would need to be reconstructed for corridor service. From Jordan to Haddonfield (3.1 miles, owned by Conrail) and from Haddonfield to Lindenwold (6.6 miles, owned by the Port Authority Transportation Company), the line is out of service.

The line from Shore to Lindenwold contains segments that consist of old, single track that is worn out. Rail typically dates from the 1920s; records indicate that some rail dates from 1915. The condition of ties is poor. Speed is restricted to 10 mph.

From Lindenwold to Atlantic City, however, the condition of the track is substantially better. This line is owned by the New Jersey Department of Transportation and is operated by Conrail. The line consists of a single track operated with a block signal system. Maximum speed permitted for passenger trains is 60 mph; the speed was lowered from 70 mph in 1979 because of the condition of ties, which are adequate for FRA Class 3 standards. The line is generally level with long tangents, one being approximately 16 miles long. Some upgrading of track and ties is necessary.

Overall, about 40 miles of rail need to be relaid. All track for the corridor needs to be tied and surfaced to meet FRA Class 4 standards to permit a maximum speed of 79 mph. A sufficient number of controlled sidings also would have to be installed. Crossing protection circuits need to be modified to accommodate a maximum speed of 79 mph. A new signal system needs to be installed to accommodate corridor operations.

The station in Atlantic City is inadequate and needs to be replaced. No standby or servicing facilities exist. Most significant is the absence of any facility to turn locomotives or cars; a wye apparently formerly existed and possibly could be reconstructed. The need for trackage to permit overnight parking and servicing and standby capabilities would have to be addressed.

Amtrak has estimated that the capital costs of upgrading the track and signals would be between $17 and $21 million; for improving signal protection or eliminating grade crossings, $4 million; and for upgrading the operational capacity of station facilities, $2 million. These figures do not include engineering costs, which would be additional.

Ridership Projections

The SMSAs included in this corridor are Philadelphia and Atlantic City, with a total population of 5,225,584, or 80,394 persons per route mile.

Passenger train traffic currently consists of three trains each way, Monday-Friday, between Lindenwold and Atlantic City, plus one (two in the summer) additional trains each way between Lindenwold and Winslow Junction (14.5 miles) en route to Ocean City/Cape May, N.J. All trains are scheduled to serve people commuting into Philadelphia. During summer weekends, there is one passenger train each way to Ocean City and Cape May, but not to Atlantic City.

Other transportation services include a rapid transit connection between Lindenwold and downtown Philadelphia. There is also frequent commuter air service between Philadelphia and Atlantic City, with 30 minute flying times. Frequent express bus service is available, with a 1 hour, 15 minute schedule. For auto travelers, the Atlantic City Expressway (a toll road) provides a direct link between Philadelphia and Atlantic City.

The following table shows common carrier service and fares as of February 1981 between Philadelphia and Atlantic City:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail		NO RAIL SERVICE	
Air	18*	0:30	$55.00
Bus**	101	1:05	4.80

* Air taxi service.
** December 1980 data.

Following the implementation of corridor service, it is projected that the rail schedule would be 1 hour, 30 minutes.

With a projected ridership of 181 million passenger miles per year, it is estimated that the annual revenue for this corridor would be $18.13 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 226.3 million passenger miles per year, for an estimated annual revenue of $23.75 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs	
		Type	Proposed Train Sets
12 Round Trips	$41.0	Amfleet	4
12 RTs (+25% Demand)	48.5	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	12	304	3.8¢	60%
+25% Demand	12	380	2.5	66

Employment Benefits

Operation of the service described here would provide ongoing employment for 338 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,426 person-years of labor.

Community Views

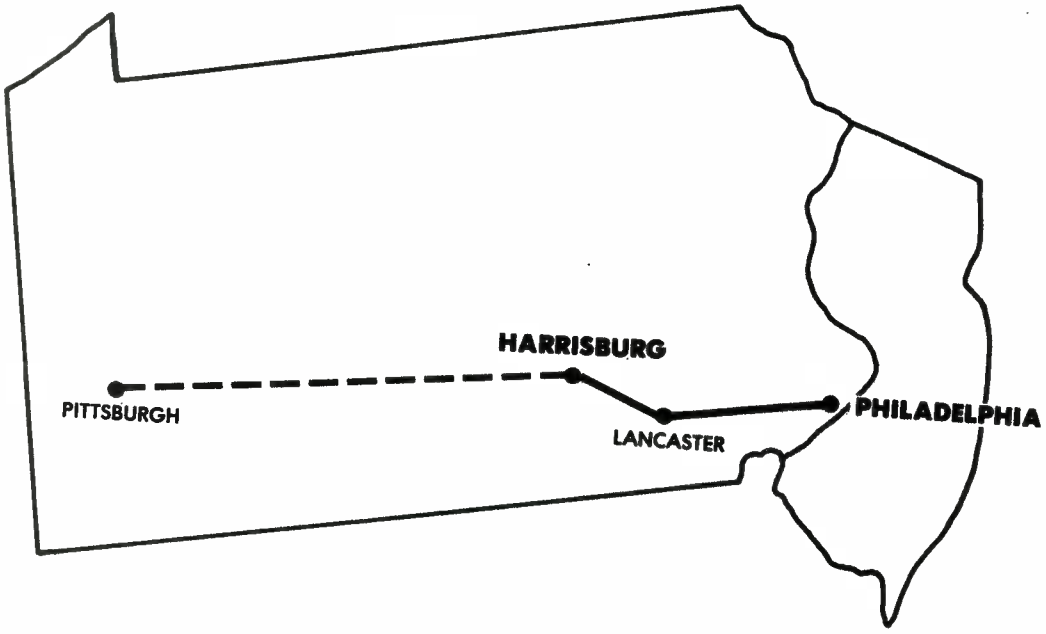
On October 27, 1980, for the first time in 11 years, a train was run over the 65-mile line between Philadelphia and Atlantic City that was once served by the former Pennsylvania-Reading Seashore Line. The trip was arranged by Amtrak and the Department and included Representatives James J. Florio, Chairman of the House Transportation and Commerce Subcommittee, and William J. Hughes. The Congressmen were accompanied on the trip by federal, state, and local leaders and members of the press. The track was examined in connection with the emerging corridor study. Many of the travelers were members of a special advisory committee of federal, state, and local officials and businessmen who are also studying the corridor and are to report their recommendations to the Congress in the spring of 1981 under the provisions of P.L. 96-254.

Also on the trip were representatives from four private companies that are seriously examining the possibility of operating the rail service. The Philadelphia-Atlantic City corridor is one of the few that promises to be profitable and that could be left to the private sector to develop and operate. One obstacle to private operations is the multiple ownership of the track and the many state and local agencies that would have to enter into any negotiations. The special advisory committee was formed in part to help obtain long-term leases for the track and to assist in discussions with these many jurisdictions.

The October trip was just one of several studies of the potential of the corridor. The Federal Railroad Administration has hosted several meetings to examine the possible role of the private sector in reinstituting service in the corridor. A number of private firms have done likewise, and Bechtel is currently conducting a major feasibility study under contract with FRA.

Support for the corridor service appears to be widespread. The casino and hotel owners in Atlantic City have expressed enthusiasm, particularly since the downtown has become increasingly congested and inconvenient to drive in, a situation that promises to get worse. There is also a large potential commuter market because housing is no longer readily available in the city, and there is very little land on which to build more. A large part of the work force has had to seek housing outside the city, sometimes quite a distance away, and has no satisfactory mode of travel to their jobs. The military and federal civilian population along the corridor numbers about 80,000. Finally, many communities in southern New Jersey, whose transportation alternatives are now quite limited, see in the corridor service the potential for developing a network of feeder lines that would serve their populations.

Philadelphia-Harrisburg Corridor



RECOMMENDED ROUTE
POSSIBLE EXTENSION

This corridor would link one of the major cities of the East Coast, Philadelphia, with the capital of Pennsylvania, Harrisburg. Popular sentiment and official recommendations in Pennsylvania appear to favor extending the corridor from Harrisburg to Pittsburgh.

Engineering Requirements

The 104-mile Philadelphia-Harrisburg corridor uses a route owned by Amtrak, which currently runs (each way) 3 daily passenger trains, 13 local trains, 1 SEPTA commuter train that serves Downingtown, Pa., plus frequent SEPTA commuter service between Philadelphia and Paoli. Freight traffic has declined over this route, although it remains relatively heavy east and moderate west of Park.

The major engineering consideration for this proposed corridor is the rail. The route has two to four main tracks with an Automatic Block Signal system, and the rail is a mix of jointed and continuous welded rail (CWR). In order to raise the maximum speed of the route in some sections from 60 mph to 79 mph, the remaining jointed rail must be replaced. In addition, some existing continuous welded rail has become worn and requires replacement. This rail upgrading program would involve considerable tie replacement and surface rehabilitation work, as well as some signal upgrading. Grade crossings do not pose a problem, although some crossing start circuits must be lengthened to accommodate higher speeds. With regard to terminals, the 30th Street Station in Philadelphia and the Harrisburg terminal both require some additional servicing and storage facilities. The Harrisburg Redevelopment Authority is now discussing plans with Amtrak that involve major improvements to the Harrisburg station.

Another consideration for this corridor is the possibility of extending it another 247 miles to serve Pittsburgh. The Harrisburg-Pittsburgh section is a two-to-four track route owned by Conrail. Currently, Amtrak provides two trains daily to and from Philadelphia. Freight traffic is very heavy. In order to extend corridor service to Pittsburgh, a fairly extensive rehabilitation program for the roadbed is required with some upgrading of the Automatic Block Signal system. There are significantly more grade crossings on this portion of the route, which would require crossing circuit lengthening and some protection system replacement.

Amtrak estimates that the cost of upgrading track and signals between Philadelphia and Harrisburg would range from approximately $31 million to $52 million. Amtrak estimates the cost of improving signal protection at or eliminating grade crossings at $100,000. It is estimated that upgrading station and yard operations would

cost approximately $1 million. Engineering costs would be in addition to these estimates. Amtrak was not able to provide engineering estimates for a Pittsburgh extension because of the short timeframe.

Ridership Projections

The SMSAs included in this current corridor are Philadelphia, Lancaster, and Harrisburg, with a total population of 5,576,400, or 53,600 persons per route mile. A military population of 15,988 and a federal civilian employee population of 57,137 live in the corridor area.

Passenger train traffic currently consists of 13 trains per day each way on a 1 hour, 45 minute schedule. There is also commuter rail service (SEPTA) over the portion of the route between Downingtown and Philadelphia, a distance of 32 miles. Scheduled airlines operate between Harrisburg: and Lancaster (45 minutes flying time), and New York (1 hour, 5 minutes flying time); and between Philadelphia: and Lancaster (30 minutes flying time), and New York (1 hour, 5 minutes flying time). There is extensive bus service between the end points of the corridor, with the fastest schedule between Harrisburg and Philadelphia of 2 hours, 25 minutes. For the auto traveler, Interstate 76 parallels the rail route throughout, but does not reach the intermediate communities served by the railroad. This highway is the Pennsylvania Turnpike toll road.

The following table shows common carrier service and fares as of February 1981 between Philadelphia-Harrisburg:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	28	1:46	$11.50
Air	22*	0:40	$57.00
Bus**	24	2:04	$ 8.70

*Air taxis only.
**December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 1 hour, 33 minutes.

With a projected ridership of 58.7 million passenger miles per year, it is estimated that the annual revenue for this corridor would be $6.2 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 73.38 million passenger miles per year, for an estimated annual revenue of $7.74 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies. Because of the extensive service already operating on this route, Amtrak does not believe that additional equipment is necessary to provide the incremental service proposed. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
16 Round Trips	$26.0	--	Jersey Arrow	5	5
16 RTs (+25% Demand)	26.0	--	Jersey Arrow	5	5

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	16	48	7.6	48%
Current	13	50	8.6	41
Incremental	3	44	3.0	72
+25% Demand	16	60	4.4¢	58%
Current	13	50	8.6	41
Incremental	3	109	(3.8)	112

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 55 people in such categories as engine and train crews, heavy and running maintenance crews, and station services. In addition, the capital improvements described for this corridor would require 2,215 person-years of labor.

Community Views

Corridor service for the Philadelphia-Harrisburg segment drew strong official and public support at an Amtrak briefing held in Harrisburg on November 17, 1980. About 40 people attended the briefing, which was held at the invitation of and conducted by Representative Allen Ertel.

At the Harrisburg meeting, several persons spoke of the potential ridership that the corridor offered. The state deputy secretary for local and area transportation said, "Pennsylvania is one of the few states where population densities are such to support high-speed service. Please let us talk seriously about extending service all the way across the state."

The chairman of the Keystone Association of Railroad Passengers called the route "a viable corridor -- probably the best corridor in the Amtrak system." He urged that corridor rail service be coordinated with other modes of travel, specifically bus travel; joint routing, ticketing, and scheduling would benefit both bus and rail carriers, he said.

In a statement submitted subsequent to the meeting, the transportation committee of the Greater Harrisburg Area Chamber of Commerce made several points in expressing its "enthusiasm" for a corridor service. Harrisburg, as the capital of Pennsylvania, is a center for governmental and tourist activities. Many people travel to the Harrisburg area on a daily basis, and a corridor service would expedite federal and state business. Gettysburg, the Dutch country, historic York, and Hershey Park are all popular, nearby destinations. Annually, about 2.5 million people visit the area.

Travel and tourism, the Chamber noted, are the second largest industry in the state, contributing much to its well-being. For example, in Dauphin County, where Harrisburg is located, travel generated $434,000 in local taxes last year. This county ranks sixth in Pennsylvania in total travel expenditures. Hershey Park, which is east of Harrisburg, was the subject of considerable discussion. Hershey Park draws substantial numbers of visitors. A representative of the amusement park expressed interest in cooperating with Amtrak to bus visitors from the nearest rail station to the park.

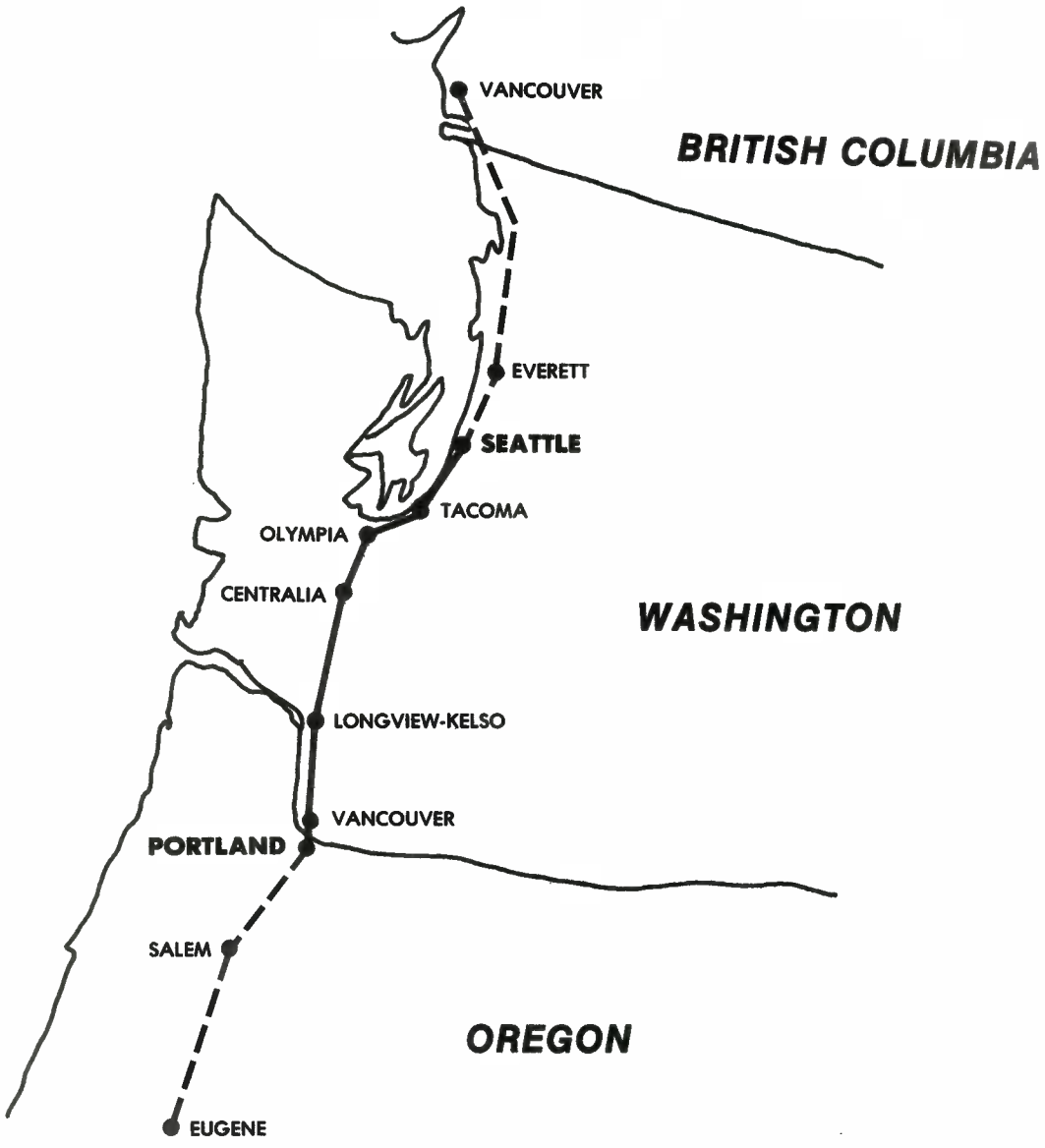
Because of the many recommendations that corridor service be extended from Harrisburg to Pittsburgh, Amtrak held a second meeting, on January 7, 1981, in Pittsburgh. The Pittsburgh meeting was held at the invitation of Representative Doug Walgren, who also was chairman of the session. About 60 persons attended.

Statements of support for corridor service to Pittsburgh were delivered by three county commissioners and a representative of the

Chamber of Commerce, among others. They stressed the growth of the Pittsburgh area in recent years, particularly in the downtown area adjacent to the station. This area contains a new convention center, which is part of the city's major redeveloped plan known as Renaissance II.

Representatives of the Commonwealth of Pennsylvania said that the Philadelphia-Pittsburgh segment had a high density of students and of elderly persons who were likely to use passenger rail service. The end points of the corridor, Philadelphia and Pittsburgh, are the highest population centers of the state with intermediate densities comparable to France and, in some cases, equalling densities in Great Britain.

Seattle-Portland Corridor



The Seattle-Portland corridor route serves the rapidly growing Pacific Northwest. Both cities are major transportation and distribution centers with deep-draft seaports that link the area with other U.S. cities, Alaska, and the Far East. The region is known for its physical beauty, attracting large numbers of tourists to enjoy the mountain and seashore recreation areas.

Strong local sentiment would prefer that the corridor route be extended -- south of Portland to Eugene and north of Seattle to Vancouver, B.C. Both extensions offer additional large population centers that could increase ridership along the route.

Engineering Requirements

The 186-mile Seattle-Portland corridor uses a double track route owned by the Burlington Northern (BN). Amtrak currently operates three daily passenger trains each way over this route. In addition, tri-weekly service is provided over the Seattle-Auburn segment as part of the Seattle-Chicago route. Freight traffic is heavy, with 15 to 25 trains each way daily operating over a major portion of the line.

To provide an expeditious corridor service over this route, a relatively extensive capital improvements program is required. Although the double track is predominately continuous welded rail (CWR) maintained to FRA Class 4 standards, small segments of jointed rail should be replaced with new CWR. Additional superelevation is also required on approximately 60 miles of the main tracks to increase speeds over the line's large number of curves. In addition, some existing track at various crossover points needs rehabilitation as well as some signal work.

A major consideration on this line is the extensive number of speed restrictions imposed by local jurisdictions -- a factor that substantially slows the average speed of passenger trains. Improved crossing protections may be required at numerous road crossings. Relief from local speed restrictions is essential before expanded service can be provided with expeditious schedules.

Seattle's King Street Station requires a fair amount of upgrading to function as the primary terminal for the corridor. Specifically, the water supply needs upgrading, new storage and station tracks are required, servicing facilities and standby 480-volt AC power must be added, a new engine repair and servicing facility must be built, and the wye turning facility requires rehabilitation.

Amtrak estimates that the track and signal work required for corridor service will require expenditures in the range of $33 to $66 million. Improving signal protection or eliminating grade crossings will require a further $2 million, and upgrading terminal

and station facilities will run approximately $2 million. It should be noted that these figures do not include engineering and design costs.

Ridership Projections

The SMSAs included in this corridor are Seattle, Tacoma, and Portland, with a total population of 3,036,000, or 16,731 persons per route mile. The region has nine military installations within a population of 30,469, and a federal civilian employee population of 43,145.

Passenger train traffic currently consists of three trains each way daily on 3 hour, 50 minute schedules. Amtrak's Empire Builder (en route to Chicago) serves the Seattle-Auburn segment of this route tri-weekly. Scheduled airline service between Seattle/Tacoma and Portland offers a 36 minute schedule. Express bus service is available between all points, with Seattle-Portland schedules as low as 3½ hours. For the auto traveler, Interstate 5 parallels this route throughout the corridor.

The following table shows common carrier service and fares as of February 1981 between Seattle and Portland:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	6	3:50	$18.00
Air	41	0:33	26-55.00
Bus*	42	3:30	13.15

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to 3 hours, 30 minutes.

With a projected ridership of 53.3 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $5.91 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 66.63 million passenger miles per year, for an estimated annual revenue of $7.37 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
6 Round Trips	$13.4	$ 7.4	Amfleet	3	6
6 RTs (+25% Demand)	13.4	13.4	Amfleet	3	6

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	6	65	13.5¢	37%
Current	3	99	8.7	40
Incremental	3	32	28.7	34
+25% Demand	6	82	10.7¢	42%
Current	3	99	8.7	40
Incremental	3	64	13.8	44

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 147 people in such categories as engine and train crews, heavy and running maintenance crews, and station and on-board service personnel. In addition, the capital improvements described for this corridor would require 3,299 person-years of labor.

Community Views

On January 15 and 16, 1981, Amtrak conducted briefing sessions in Portland and Seattle, respectively, on the proposed corridor between these two cities. The meetings were held to obtain the views of the region's community and business leaders and were called by the Mayor of Portland, Frank Ivancie, and the Secretary of the Washington Department of Transportation, W. A. Bulley. Both meetings attracted a large audience of state, county, and city

officials; mayors of corridor communities; representatives from railroad companies, transportation unions, Chambers of Commerce, convention and tourist bureaus, transit companies, transportation planning departments, Congressional offices, and passenger associations; as well as interested private citizens.

Response to the corridor concept outlined by Amtrak representatives was enthusiastic at both briefing sessions, as well as in subsequent written submissions. Participants expressed optimism about growing ridership. In addition to the sizable and increasing tourist market attracted to the Pacific Northwest, respondents noted that a great deal of business travel occurs along the Portland-Olympia-Tacoma-Seattle corridor.

A major issue at both briefing sessions was the extension of the corridor -- south to Eugene and north to Vancouver, B.C. As noted by the Oregon Association of Railway Passengers, the population concentrations along the current corridor are significant, but to delete Eugene and Vancouver is to ignore the potential of additional large populations. Although 70.1 percent of Washington's population lives along the Portland-Seattle route, 69.2 percent of Oregon's population lives along the Willamette Valley between Eugene and Portland, and 56.1 percent of the entire population of British Columbia lives in the Vancouver/Victoria area. In addition, the area north of Seattle to Everett and beyond is also growing rapidly. Although Oregon currently offers a 403(b) service in conjunction with Amtrak twice daily between Portland and Eugene, and Amtrak offers a daily service between Seattle and Vancouver, both oral and written testimonies stressed the need for the greater frequencies and improved schedules that are part of corridor service in order to take full advantage of the ridership potential of these segments. In particular, the strong working relationship between the two state governments in Salem and Olympia was suggested as a significant source of business travelers. The State of Oregon subsequently informed Amtrak of its strong support for extending the corridor to Eugene.

Representatives for both end-point cities expect initiation of corridor service to act as a stimulus to ongoing revitalization projects around their stations. In Portland, the Union Station is well located in the downtown area with a number of new office buildings and hotels within walking distance. Seattle's King Street Station is also conveniently located in the downtown area, and currently several revitalization projects are underway or planned within the station's vicinity. In addition, the Seattle station is adjacent to the Kingdome, which attracts a large audience for its sports events, many of whom travel from down-line communities by train.

To encourage ridership, Seattle and Portland and the two state departments of transportation encourage the intermodal concept in

their development plans. Both Portland and Seattle have excellent progressive transit systems with downtown area "free zone" bus programs that serve the Amtrak stations. In addition, at the suggestion of the Oregon DOT, an intercity transit company and Amtrak have coordinated their schedules around the daily Pioneer Portland stop to enable passengers to connect with bus services to their off-line communities. Portland also has installed automated kiosks that give information on intermodal transportation alternatives to given locations, including Amtrak's train routes. One intermodal concern raised at the Portland briefing by associations for bicycle riders was the need for facilities on trains to allow them to bring their bicycles on board, as is done in Europe.

Seattle and the State of Washington are also emphasizing the intermodal concept. Not only do many bus routes connect the Seattle Amtrak station with urban and suburban areas, but also a regional transit agency is considering the construction of a major public transportation terminal in the vicinity of the King Street Station. In addition, several en route stops are directly served by intercity bus connections. Even the remote station in East Olympia will soon be served by transit services to the city center. Finally, the state is investigating an intermodal information and referral system to promote forms of travel other than by automobile.

Several additional factors relevant to corridor rail service were noted:

- Currently, the one major road connecting Seattle and Portland (Interstate 5) is very congested. The Washington Department of Transportation's recently completed plan estimates approximately $400 million in highway improvements along the corridor between 1981 and 1993. Although improved rail service will not eliminate the need for all improvements, the state believes that some upgrading projects may not be required if congestion is reduced by increased use of trains.

- Air service between Seattle and Portland is often suspended because of fog cover. Increased train service could provide an attractive alternative during these periods.

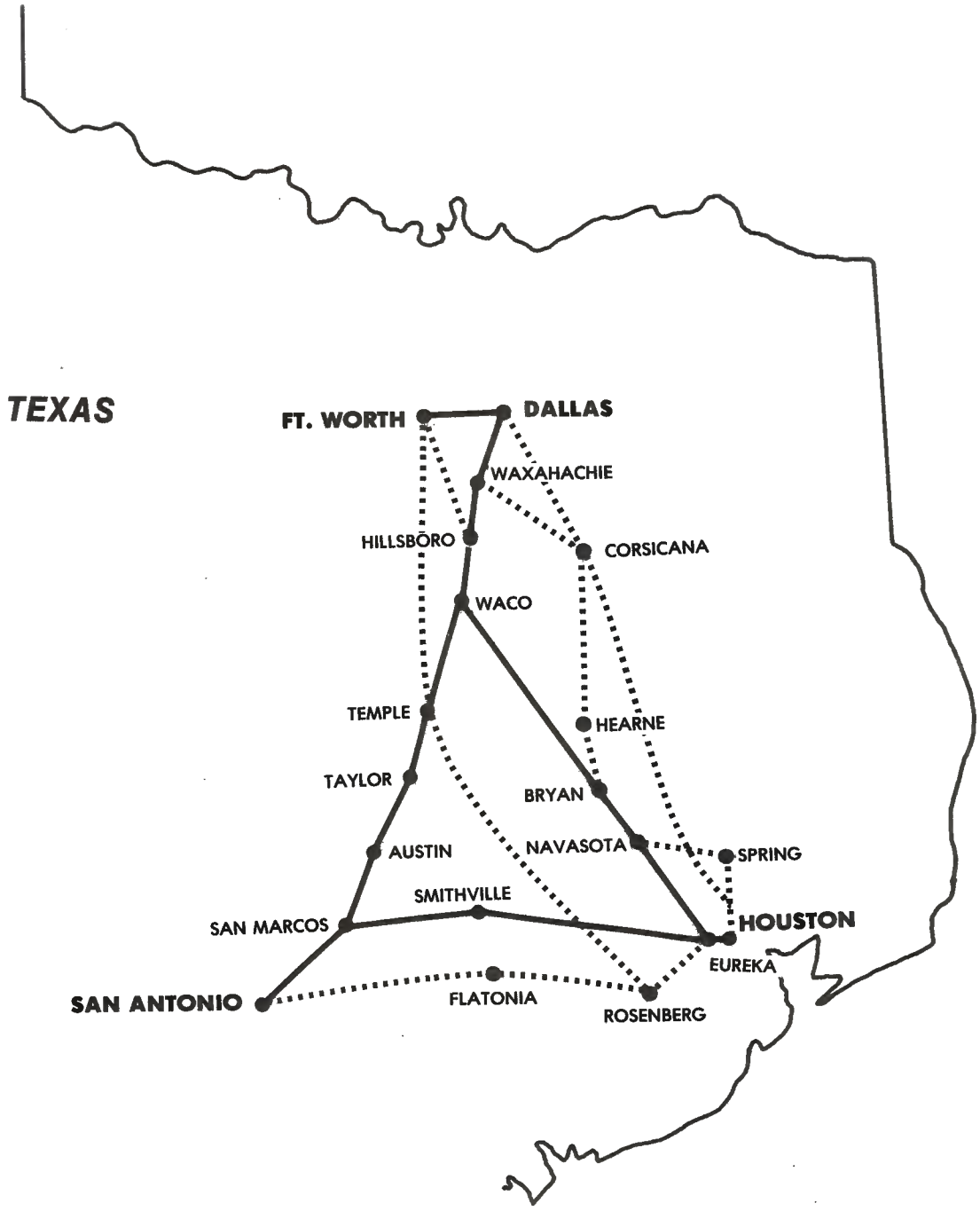
- Airlines have reduced their frequency of service from Portland to Seattle and for en route communities, leaving a transportation need that could be filled by increased train frequencies.

In addition to general support for a corridor service, both Oregon and Washington have shown and expressed a willingness to contribute to the development requirements and supplemental needs of a

corridor service. Oregon is already participating in the state-supported 403(b) Willamette Valley Express service between Portland and Eugene. In connection with this service, the state has funded the construction of station facilities and has provided an aggressive advertising and promotion campaign. In addition, the state has a significant grade crossing improvement program, and generally has shown a strong commitment to rail improvements in the state.

Washington State's ability to contribute to the capital and operating costs is more problematic. The extent to which the state may become involved in upgrading track, rehabilitating stations, providing equipment maintenance facilities, and securing additional equipment is governed by the Washington State Constitution, which prohibits state and local governments from lending faith and credit to private enterprises. Because there is some doubt as to whether this restriction applies to Amtrak, the state DOT is working to have this issue clarified by the state attorney general. In the meantime, the state participates in rail service within its constitutional contraints. For example, the Washington DOT and the Washington Utilities and Transportation Commission have taken a coordinated approach in programming grade crossing improvements and have recommended the closing of some highway crossings. Currently, there are approximately 40 grade crossing projects either underway or planned in the Seattle-Portland corridor. As a result of this program, several speed restrictions have been lifted, and further elimination of speed restrictions is anticipated. In addition, the state intends to work closely with Amtrak to develop marketing strategies, such as increased use of trains by state employees.

Texas Triangle Corridors



The Texas Triangle, which is located in the fastest growing region of the state, consists of three corridors which could be developed independently or in combination. Together they would serve four of the major cities in Texas. At present, rail passenger service in this area is very limited. Freight traffic, on the other hand, is extremely heavy over the primary lines, a factor influencing the choice of routes for a corridor service.

Engineering Requirements

The three corridors making up the Texas Triangle are: Fort Worth/Dallas-Houston, Fort Worth/Dallas-San Antonio, and San Antonio-Houston. Each corridor shares common characteristics. Foremost is the very heavy freight traffic that has emerged over the past 20 years as a result of the increase in coal, petroleum, grain, and rock being shipped. The rate of growth of freight traffic, which in some cases quadrupled in the past two decades, is projected to continue increasing, particularly on the primary lines. Many of them are already near capacity, and a corridor service on these lines would pose serious conflicts.

A second prominent feature is the number of slow orders and local restrictions; a large percentage of the routes is affected by them. These slow orders and speed restrictions preclude the possibility of reliable, expeditious passenger service, and a corridor operation does not appear to be feasible unless this problem can be resolved. Legislation has been introduced in Texas that addresses this problem.

Third, although many of the primary routes have been rehabilitated for freight traffic, both they and the secondary routes are largely inadequate for a corridor-type passenger service. Almost all are single track with insufficient capacity for trains meeting and passing. Most would require significant upgrading in terms of rail, sidings, and signal systems. For example, only a few miles have a Traffic Control System, which would have to be installed throughout for a corridor service. In addition, considerable soil stabilization work will need to be carried out, a common problem in Texas. On some lines extensive bridge work would also be required. Finally, crossing protection circuits would have to be modified to accommodate higher operating speeds. On the other hand, increased superelevations are not recommended because of the heavy freight traffic.

None of the terminals is adequate for a corridor service, either in terms of mechanical facilities for servicing, maintenance, or turning of trains, or in terms of passenger services such as ticketing or parking. A particular problem at the terminals is the need for significant work on the trackage leading to the stations.

A final issue that must be considered in establishing corridor service in the Texas Triangle is the need for modified labor contracts. Because of the location of home terminals and the length of the various segments, the labor costs under the existing contracts would be excessive.

As can be seen from the map, there are several alternative routes for each corridor. The corridor descriptions below discuss only the recommended alternatives. In general, these involve secondary routes which sometimes are longer and more expensive to upgrade than the primary ones. However, they have the advantage of avoiding the congestion posed by the heavy freight traffic, and thereby offer far greater potential for reliable service and long-term development. Another factor in the selection of routes was the feasibility of connecting one leg of the Triangle with adjacent legs. In addition, the recommended Fort Worth/Dallas-Houston route would reach more population than the alternatives, since it passes through Waco, a sizable city, and Bryan, the home of Texas A&M University. The recommended Fort Worth/Dallas-Houston route also affords better access to San Antonio.

The total mileage of the preferred routes for the entire triangle is 669.9. If the entire corridor is not developed, reevaluation of the recommended routes would be necessary, since their selection assumed use by two corridors.

Amtrak estimates that if the whole Texas Triangle is developed, the capital costs of upgrading the track and signals would be between $186 and $233 million; of improving signal protection or eliminating the grade crossings, $12 million; and of upgrading the operational capacity of station facilities, $24 million. These figures do not include engineering costs.

Following are descriptions of the individual corridors. Because some of the capital improvements would benefit more than one corridor, the total of the capital costs for the three corridors when taken individually exceeds the capital costs for the Triangle as a whole.

Fort Worth/Dallas-San Antonio. The recommended route would go from Fort Worth to Dallas over the Missouri Pacific (MP) line (30.8 miles), then to Waco via the Missouri-Kansas-Texas (MKT) line (94.7 miles), on to Taylor, also via the MKT line (76.8 miles), to San Marcos via the MP line (63.4 miles), and San Marcos to San Antonio over the MKT line (53.6 miles). The total length is 319.3 miles.

The recommended route between San Marcos and San Antonio is a secondary freight line, 50 miles of which would require significant upgrading. (See also the track description for the Fort Worth/Dallas-Houston corridor.)

There are two possible terminals in Fort Worth — the Santa Fe and the former Texas & Pacific (T & P). The Santa Fe will require substantial upgrading to accommodate a possible 12 corridor trains a day, although the cost would be less than that for the T & P station, and it has a better track network. On the other hand, the city has been talking of upgrading the T & P station and making it an intermodal terminal.

The City of Dallas recently restored the former Union Station, developing it into a multipurpose facility. A substantial amount of private funds have gone into the station and surrounding area. This station is currently used by Amtrak. Support facilities do not exist for parking, storing, and servicing trains.

The distribution of population around Dallas suggests a need for beltway stations accessible to Interstate Highways 20 and 635.

At present, there are two station stops in use in San Antonio -- the Southern Pacific and the Missouri Pacific. The SP stop is a full passenger service facility located in a historic redevelopment area with many tourist attractions. It has easy access to a freeway and is near the central business district. The MP site is at a less desirable location to the west of the central business district. Passenger transfers between the two locations are made by bus. The proposed route into San Antonio via the MKT line requires construction of a new interlocked connection for access to the SP station stop.

The distribution of population suggests the feasibility of developing a beltway station convenient to Interstate Highway 410.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $100 and $125 million; of improving signal protection or eliminating the grade crossings, $12 million; and of upgrading the operational capacity of station facilities, $23 million. These figures do not include engineering costs.

Fort Worth/Dallas-Houston. The recommended route would go from Fort Worth to Dallas via the MP line (30.8 miles), then to Waco via the MKT line (94.7 miles), from Waco to Bryan over the MP line (90.3 miles), and on to Houston via the SP line (94.0 miles). The total length is 309.8 miles.

The proposed route would require restoration of the MKT line between Waxahachie and Hillsboro that has largely been out of service for some years. Sections are unusable, and the maximum average speed on those sections that are in use is only 10 mph.

This line would have to be replaced and extensive bridgework carried out.

If both the Fort Worth/Dallas-Houston and San Antonio corridors are developed, the line between Waco and Hillsboro, already near capacity because of heavy freight traffic, would be traversed by an additional 12 trains a day. To accommodate these, a second track would have to be built over most or all of the segment.

If the entire triangle is developed, the Southern Pacific terminal in Houston should be used as the Amtrak maintenance facility for the entire triangle. This would require substantial upgrading of the mechanical facilities and acquisition of a small yard that is adjacent to the terminal. A further problem at this terminal is the high number of grade crossings on the trackage approaching it.

The distribution of population around Houston suggests the desirability of developing beltway stations accessible to Interstate Highway 610.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $56 and $71 million; of improving signal protection or eliminating grade crossings, $12 million; and of upgrading the operational capacity of station facilities, $27 million. These figures do not include engineering costs.

San Antonio-Houston. The recommended route goes from San Antonio to San Marcos via the MKT line (53.6 miles) and then to Houston via the MKT line (166.3 miles). The total length is 219.9 miles.

The track between San Marcos and Smithville consists of 52 miles of branch line that would have to be replaced almost in entirety. The average maximum speed is now 15 mph. Considerable bridge work would also be required. In addition, a 20-mile segment is paralleled by two major highways, and the unusually high number of grade crossings poses a serious safety problem that would need addressing. An interlocked connection would be required going into Eureka, 4.5 miles west of Houston, to permit access to the Southern Pacific terminal.

Amtrak estimates that the capital costs of upgrading the track and signals would be between $37 and $46 million; of improving signal protection or eliminating grade crossings, $12 million; and of upgrading the operational capacity of station facilities, $15 million. These figures do not include engineering costs.

Ridership Projections

The SMSAs included in this corridor are Dallas/Fort Worth, Waco, Austin, San Antonio, and Houston, with a total population of 6,916,300, or 10,124 persons per route mile.

Passenger train traffic consists of one long-distance train each way daily between Dallas and San Antonio (the Inter- American en route to St. Louis), which is scheduled for 8 hours, 4 minutes; and one long-haul train each way tri-weekly between San Antonio and Houston (the Sunset Limited) en route between New Orleans-Los Angeles, with a schedule of 4 hours, 47 minutes. There is no direct passenger service between Houston and Dallas although a leg of the Inter-American connects Houston to Temple. There is scheduled airline service between all combinations of Fort Worth/Dallas, Austin, San Antonio, and Houston, including service every half hour or less between Dallas and Houston. Flying times are 50 minutes or less between any two points. There is express bus service between all points.

For the auto traveler, Interstates 10, 20, 35, and 45 parallel this route throughout.

The following tables show common carrier service and fares as of February 1981 within the Texas Triangle:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
	Fort Worth/Dallas-San Antonio		
Rail	2	6:32	$32.50
Air	48	0:50	40.00
Bus*	32	5:40	20.40
	Fort Worth/Dallas-Houston		
Rail	2	7:25	$29.00
Air	100	0:49	25-40.00
Bus*	28	4:30	17.95
	San Antonio-Houston		
Rail	1/2 (6 weekly RTs)	4:47	$30.00
Air	31	0:43	40.00
Bus*	28	3:50	15.05

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedules would be improved on the three segments as follows: Fort Worth/Dallas-San Antonio -- 5 hours, 48 minutes; Fort Worth/Dallas-Houston -- 4 hours; San Antonio-Houston -- 3 hours, 45 minutes.

The following table lays out the ridership projections for the total Triangle and for each segment:

	Projected Passenger Miles (in Millions)	Projected Revenues (in Millions)
Total Triangle		
Projected Demand	129.23	$12.5
Demand +25%	161.54	15.6
Fort Worth/Dallas-San Antonio		
Projected Demand	47.70	$ 4.6
Demand +25%	59.63	5.8
Fort Worth/Dallas-Houston		
Projected Demand	54.23	$ 5.2
Demand +25%	67.79	6.4
Houston-San Antonio		
Projected Demand	27.30	$ 2.7
Demand + 25%	34.13	3.3

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies and the cost of the equipment required. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs for Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
Total Triangle			
3 Round Trips	$39.0	Amfleet	12
3 RTs +25% Demand	46.5	Amfleet	12

	Capital Costs for Required Equipment (in Millions)	Equipment Needs: Type	Equipment Needs: Proposed Train Sets
San Antonio-Houston			
3 Round Trips	$13.0	Amfleet	4
3 RTs +25% Demand	13.0	Amfleet	4
Fort Worth/Dallas-Houston			
3 Round Trips	$13.0	Amfleet	4
3 RTs +25% Demand	16.8	Amfleet	4
Fort Worth/Dallas-San Antonio			
3 Round Trips	$13.0	Amfleet	4
3 RTs +25% Demand	16.8	Amfleet	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Triangle Total				
Projected Demand	3	69	19.1¢	28%
+25% Demand	3	86	14.1	33
San Antonio-Houston				
Projected Demand	3	57	18.1¢	29%
+25% Demand	3	71	12.9	35

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
		Fort Worth/Dallas-Houston		
Projected Demand	3	80	18.4¢	28%
+25% Demand	3	100	13.2	35
		Fort Worth/Dallas-San Antonio		
Projected Demand	3	67	24.8¢	23%
+25% Demand	3	84	19.4	28

Employment Benefits

Operation of the service described here would provide ongoing employment for 485 people in such categories as engine and train crews, heavy and running maintenance crews, and station and on-board service personnel. In addition, the capital improvements described for this corridor would require 12,445 person-years of labor.

Community Views

In October 1981, the Texas Transportation Institute at Texas A&M University and Representative Phil Gramm sponsored a briefing by Amtrak on the proposed Texas Triangle corridor. The meeting was attended by around 100 people representing 14 cities, several regional planning and transportation agencies, the Texas Railroad Commission, Chambers of Commerce, labor, universities, Texas Councils of Government, railroads, the state legislature, and U.S. Congress offices, as well as civic leaders, county commissioners, and judges.

Those people attending the meeting expressed considerable enthusiasm for the corridor concept. A repeated comment was that additional transportation is vital to the future of the area served by the Triangle. Its growth rate is one of the highest in the country, and by 2000 it will contain approximately 13 million people, two-thirds of Texas' projected population. Several spokesmen for smaller cities such as Waco noted the unavailability of direct air service to major cities such as Dallas and supported the idea of convenient rail links. Among those groups suggested as benefiting from a corridor service are students. Enrollment at the University of Texas at Austin, one of the cities that would be served by a corridor operation, is, for example, 45,000. Similarly, central Texas has 11 military installations with a population of 66,482; federal employees number 108,402.

At the same time that strong support was voiced for a corridor operation, it was pointed out that the travel times would have to be faster than present ones and the rail improved to provide a better ride if the service is to be successful. The necessity of dealing with the heavy freight traffic was also noted.

Representative Al Edwards of the State Assembly, a strong supporter of the corridor idea, noted that people riding Amtrak trains were three times as safe as on buses, six times as safe as on an airplane, and 140 times as safe as in a car. He also noted the fuel efficiency of railroads.

Many additional comments and information were sent to Amtrak subsequent to the meeting. Again, strong support was voiced for a Triangle service, particularly in light of the area's growth and future transportation needs. A number of resolutions favoring the corridor were submitted by groups such as the Regional Transportation Council, which called for the state to support rail service through legislation that would provide funds for rail passenger facilities. A number of people mentioned the fuel efficiency of railroads and the resulting energy savings.

The following specific comments were also offered:

- The city manager of Temple, one of the cities on the recommended route through the corridor, noted that his city had no public transportation other than buses, despite a large demand for more convenient public transportation. Ft. Hood, the nation's largest military facility, is only a few miles away; attached to it are 40,000 military personnel and 27,000 dependents, many of whom shop and work both in Temple and cities farther away such as Austin, where there are better job opportunities. Many residents in the area also seek work in the larger cities, some of which are a considerable distance away. With a good corridor service, many of these people might not have to relocate out of the area because of their jobs. Further, a corridor service might encourage industrial development in the Temple area, providing additional jobs. The city manager also noted that Temple was a major hospital center and that train service would greatly increase the convenience of those facilities.

- The city manager of Waco reiterated the city's need for convenient access to major cities such as Dallas/Fort Worth, Houston, and Austin and its strong desire to be on the route selected for the corridor. He expressed Waco's willingness to contribute funds to upgrade train facilities there. He noted the city is currently doing a feasibility study on a bus transport center, which would be located near the railroad tracks.

- An Austin spokesman also called for direct rail access to Dallas/Fort Worth via Temple and Waco.

- A representative of the Central Texas Council of Governments noted that its Carpool Outreach Program shows there is a great deal of long-distance commuting along Interstate 35 by military personnel and dependents, students, and employees of the public sector. He stated that if a rail corridor service were available, the Council would promote it as part of the program. Given the state and federal government's interest in fuel-efficient public transportation, he assumed that they, too, would encourage employees to use train service, perhaps requiring it for business trips.

- Spokesmen for Austin noted the rapid growth in that city, much of it attributable to the rapid expansion of industry. The city is undertaking a feasibility study this year for the Austin Transit Authority. A focus will be on development of the North/South corridor and further improvements to make mass transportation more accessible. There is also a possibility that the airport will be expanded. A corridor service, he noted, might reduce the need for airport expansion.

- Comments from Fort Worth focused on a joint public and private plan to develop the old T & P Terminal Building as a multimodal transportation center and office complex. Sponsors have been talking with Amtrak about relocating Amtrak trains to that center. This project is part of a broader plan to redevelop the downtown.

- It was also noted that Fort Worth is experiencing rapid growth and is planning major highway and airport expansions. These activities would take place regardless of a corridor service, but would not be competitive with it. Spokesmen for the city stated their belief that a corridor service would have a positive impact on the revitalization of downtown Fort Worth. It could be particularly beneficial to downtown hotels, which would be very accessible to the trains.

- San Antonio, likewise, is in the midst of major restoration of its downtown, particularly of the numerous historic sites, which include the Alamo. There has been talk of developing the former Southern Pacific station for use as a transportation center, and a corridor service could complement this effort. A spokesman noted that major construction of highways will be undertaken regardless of a corridor service but would not detract from it. Similarly, the airport near San Marcos to the

north of San Antonio might have to be expanded in the near future, possibly increasing the need for more rail service into San Antonio. A corridor service could also reduce the congestion in downtown San Antonio.

- The Fort Worth Chamber of Commerce suggested that a rapid rail service between Dallas/Fort Worth, Houston, and San Antionio should help reduce highway maintenance costs along the interstate highways.

Also evident from the meeting at the Texas Transportation Institute and the subsequent mail was the strong support for legislative action at the state level to support rail passenger service. In fact, several state legislators are introducing legislation to provide state funds for a corridortype service and to allow Texas to participate in Amtrak's 403(b) program. A bill is also being drafted that would give a state agency authority over local speed restrictions, which pose a severe constraint on expeditious passenger service. The Governor of Texas has expressed his support for these efforts. The State Department of Highways and Public Transportation has been providing funds for improvements of grade crossings. A bill has also been presented to the legislature instructing the highway department to erect directional signs to Amtrak stations on major state highways.

It should be noted that many cities and local communities have already shown evidence of their support for rail passenger service. Fort Worth, in addition to its encouragement of Amtrak service, has been involved in grade crossing improvements. The City of Austin, along with the Special Amtrak Committee of the Chamber of Commerce, which is headed by several leading businessmen, has been promoting rail travel. The city has participated in station improvements, donated land for additional parking, and is improving signage to the station. Dallas purchased and redeveloped Union Terminal into a multimodal transportation center which is now being used by Amtrak.

Washington-Richmond Corridor

RECOMMENDED ROUTE
POSSIBLE EXTENSION

The Washington-Richmond emerging corridor links the nation's capital with the capital of Virginia, and connects a number of communities heavily populated by military personnel and civilians who work in or around Washington. The line also offers access to some of the nation's most historic areas, which include Colonial, Revolutionary War, and Civil War sites.

State and local officials support the idea of the corridor. The State of Virginia presented a carefully documented argument in favor of the corridor, and urged that it be extended to Newport News, Va., to accommodate the large military population in that area and to provide service to the many tourist attractions en route to and around Newport News.

Engineering Requirements

The Washington-Richmond corridor consists of 108.8 miles of track that is generally in excellent condition. Slow orders are neglible. All track is double track and is equipped with a Traffic Control System throughout that is arranged for movement of trains in either direction on either track. Both main tracks have continuous welded rail over the entire route, except for 7.5 track miles (5 miles of which is planned to be relaid in 1981). All main track meets FRA Class 4 standards.

The track is owned by the Richmond, Fredericksburg & Potomac (RF&P) Railroad, except for a segment in Washington, D.C. (1.4 miles, owned by Washington Terminal Company) and the segment from Virginia interlocking to the south end of the Potomac River Bridge (2 miles, owned by Conrail).

The RF&P operates an average of 26 trains daily, including 8 Amtrak trains, 2 Autotrains, and approximately 16 freight trains. The physical plant can accommodate three additional trains each way daily without modification. In 1970, the RF&P decided to reduce the superelevation in all curves to support a maximum speed of 70 mph for passenger trains and 55 mph for freight trains. The intent was to reduce the wear on the rails from freight usage.

Thirty percent of the line is curved track. The distribution of curves is such that benefits from a maximum speed of 80 mph would be negligible without restoration of superelevation in some curves. That may increase wear on the rails, and the RF&P may require additional and continuing track maintenance payments as compensation.

The Richmond terminal lacks sufficient trackage for parking and servicing of trains. It also requires standby power, and limited mechanical servicing. Available space would permit

construction of one track to store two short trains; space at a new location not adjacent to the Amtrak station would be required for additional storage. This work would constitute the second largest category of anticipated expense.

Important but not substantial work would be necessary to improve some grade crossing protection.

Amtrak estimates that the capital costs of upgrading the track and signals for this corridor could range from approximately $6 million to $12 million. Amtrak estimates the cost of improving signal protection or eliminating grade crossings to be approximately $300,000. The cost of upgrading station and yard operations is estimated to be approximately $2 million. Engineering costs would be in addition to these estimates.

Ridership Projections

The SMSAs included in this corridor are Washington and Richmond, with a total population of 3,728,200, or 34,514 persons per route mile. The military population along the route is 38,474, and the federal civilian employee population is 372,456, the highest of any corridor considered in this report.

Passenger train traffic currently consists of four trains daily each way (one en route to Newport News, one en route to Savannah, 2 en route to Miami/St. Petersburg), with a schedule of 2 hours, 5 minutes between Washington and Richmond. There is also one Autotrain each way daily en route to Sanford, Fla. Other transportation services include airline service between Washington and Richmond on a 40 minute schedule and frequent express bus service with schedules of 2 hours, 10 minutes between Washington and Richmond. For the auto traveler, Interstate 95 parallels this route throughout.

The following table shows common carrier service and fares as of February 1981 between Washington and Richmond:

	One-Way Daily Frequencies	Best Schedule	One-Way Fare
Rail	8	2:05	$16.00
Air	2	0:30	53-63.00
Bus*	97	2:10	11.25

*December 1980 data.

Given the increased speed of corridor trains, it is projected that the rail schedule would be improved to two hours.

With a projected ridership of 36.07 million passenger miles per year, Amtrak estimates that the annual revenue for this corridor would be $3.86 million. If the demand for corridor service exceeds the base projection by 25 percent, the ridership on this corridor would be 45.09 million passenger miles per year, for an estimated annual revenue of $4.82 million.

Equipment Requirements

Amtrak has estimated the number of train sets that would be required to operate the proposed new train frequencies, the cost of the incremental equipment required, and the value of the existing equipment. In addition, equipment needs and costs have been calculated for an assumed demand 25 percent above the base projection.

	Capital Costs (in Millions)		Equipment Needs		
	Value of Existing Equipment	Required Incremental Equipment	Type	Existing Train Sets	Proposed Train Sets
5 Round Trips	$7.8	$7.8	Amfleet	2	4
5 RTs (+25% Demand)	7.8	11.6	Amfleet	2	4

Operating Statistics

To measure the projected performance of this corridor route, Amtrak has calculated three statistics using the base demand projections -- passenger miles per train mile (PM/TM), the short-term avoidable loss per passenger mile, and the ratio of revenue to long-term avoidable cost. Amtrak has also calculated these same statistics to reflect an assumed ridership 25 percent above that base projection.

	Round Trips per Day	PM/TM	Avoid. Loss/PM	Rev/Cost Ratio
Projected Demand	5	90	8.4¢	46%
Current	2	52	21.9	29
Incremental	3	116	4.4	58
+ 25% Demand	5	113	5.1¢	56%
Current	2	52	21.9	29
Incremental	3	154	1.3	73

Employment Benefits

Operation of the additional service described here would provide ongoing employment for 53 people in such categories as engine

and train crews, heavy and running maintenance crews, and station and on-board service personnel. In addition, the capital improvements described for this corridor would require 924 person-years of labor.

Community Views

An Amtrak briefing was held in Richmond on December 12, 1980 at the invitation of Richmond Mayor Henry Marsh, who was joined as host for the meeting by the Mayor of Fredericksburg, Lawrence A. Davies. Attending the meeting were representatives from the District of Columbia and the State of Virginia, municipal officials from several cities and towns in Virginia (including Alexandria, Quantico, and other locations along the line), and members of the public. About 50 people attended the meeting, which was held in City Hall in Richmond.

Response to the idea of a Washington-Richmond corridor was positive. One local newspaper commented after the meeting: "Amtrak has been cutting back passenger services from the beginning, trying to reduce expenses. It's encouraging now to see that it is on the threshold of improving service to attract more passengers, at least in the area between Richmond and Washington." (Staunton, Va. Leader, Dec. 18, 1980.)

Commuter traffic between Richmond and Washington was a key topic of discussion. Fredericksburg Delegate Lewis P. Fickett, Jr., said that from 20,000 to 50,000 local residents need safe and economical daily transportation to Washington. "A northbound train in the morning and south-bound train in the evening would cut down traffic on I-95 and result in significant savings in energy," he said.

Interstate 95, the main highway connecting Washington and Richmond, came in for criticism. The highway is becoming congested, according to speakers at the meetings, resulting in a higher accident rate and delays from traffic backups. The highway is being expanded, but expansion beyond current plans appears to be expensive. Mayor Davies called I-95 "nearly obsolete."

Local travelers cannot use existing Amtrak trains, several persons said, because those trains operate on a schedule designed for the New York-Washington-Florida run. These long-distance trains are full when they come through the Washington-Richmond segment, and they are not scheduled for local commuters.

Other spokemen suggested that traffic would be especially heavy between Fredericksburg and Washington and Northern Virginia. A representative of the Alexandria Planning Department said that

if trains were scheduled at convenient hours, riders would be able to make good connections in Alexandria with the Washington subway system, which will serve the greater metropolitan area when it is completed. Instead of taking the train all the way into Union Station in Washington, these commuters could switch to the Metro subway in Alexandria for a quick ride to major Northern Virginia employment areas such as Crystal City, the Pentagon, or Rosslyn.

If corridor service were initiated, Mayor Marsh said, Richmond would assist in the renovation of the old downtown station. Mayor Davies said that the City of Fredericksburg was prepared to develop parking facilities adjacent to the station on city land. He said that the city would be interested in a joint effort with Amtrak to renovate the station, which is in an area that is being developed as an historic area of the city and is expected to become a tourist attraction.

Tourism figured prominently in the discussion. A spokesman for the City of Doswell outlined the need for an Amtrak stop there to provide service to the tourist area at King's Dominion.

Mayor Davies said that Fredericksburg, which he described as currently the fastest growing population center in the state, depends on tourism. A councilman for the town of Quantico said in subsequent correspondence that about 35,000 tourists visit the Quantico Marine Base each year and that the number of visitors is expected to increase with expansion of the Air Museum. Many families of deceased military personnel also visit the National Cemetery near the base, which is being expanded, he said.

One of the central issues discussed at the meeting involved extending the proposed corridor to Newport News. The administrator of the Virginia Rail Division urged consideration of the extended corridor. He noted that tourism was the State's second largest industry and that several important tourist areas existed between Richmond and Newport News.

Other speakers also noted that the tourist attractions in the general environs of Newport News are considerable, including colonial Jamestown, the Revolutionary War battleground at Yorktown, and beach areas near Newport News; between that city and Richmond lie the restored colonial town of Williamsburg, Va., and Busch Gardens, which is one of the most popular tourist attractions in the state. Busch Gardens has offered to construct facilities for train passengers.

APPENDIX A

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BIBLIOGRAPHY

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APPENDIX B
ESTIMATING BASE YEAR AUTO TRAVEL

ESTIMATING BASE YEAR AUTO TRAVEL

Estimates of modal demand were required to complete an estimate of total demand for the base period for modal calibration purposes. As indicated in Chapter II, generally reliable data were available for all modes except auto. This led to the development of a procedure for estimating base year auto data.

Except in the Los Angeles-San Diego, Los Angeles-Las Vegas and New York-Albany/Buffalo Corridors where there were reliable data on auto travel between cities in the corridors, a procedure which combined the most recent traffic volume data and a trip distribution model was used to estimate auto travel between corridor cities. Auto travel data in these corridors were based on State DOT origin-destination (O-D) surveys, updated using subsequent roadside vehicle counts.

Auto travel estimates for the other corridors depend quite heavily on the large quantity of roadside vehicle volume data collected by the State DOT. In most instances, estimates of the truck/bus proportion are also available, so that it is possible to obtain reasonably accurate counts of the total number of vehicles passing various points between two cities. Of course, these data include not only traffic for the specific city-pair, but also many through-trips to or from more distant places as well as very short-distance local travel. Nonetheless, the data are current representations of the level of traffic in the corridor, and as such, comprise the basis for estimates of travel between city-pairs within the corridors. The estimation procedure is as follows:

- A minimum-volume measurement point was selected between each pair of adjacent cities along the corridor, in an attempt to minimize the level of non-intercity local traffic.

- The average daily auto traffic at the minimum-volume measurement point was multiplied by 365 to obtain an annual automobile estimate, which was then multiplied by 2.1 persons per car (a typical intercity auto travel party size obtained from the 1977 National Travel Survey) to obtain an estimate of the total auto person-trips.

- A list of contributing city-pairs was formulated for each measurement point. These lists consisted of city-pairs with both ends, one end, or neither end in the corridor. For example, the city-pair list for the measurement point between Albany and Utica included Albany-Buffalo, Buffalo-Boston, and

Cleveland-Boston, as well as many other appropriate city-pairs. Conversely, most city-pairs of interest appeared on several lists. For example, four independent estimates of Albany-Buffalo auto origin-destination demand were developed from analysis of traffic between Albany and Utica, Utica and Syracuse, Syracuse and Rochester, and Rochester and Buffalo. City-pair distances were generally limited to 500 miles, except for the Washington-Richmond Corridor, for which many Northeast-Florida city-pairs were included.

- The demand for each city-pair was estimated using the Aerospace demand model.

- Correction factors were judgmentally assigned to each city-pair. Most correction factors were 1.0; exceptions were always smaller. Non-unity correction factors were used when alternate highway routings are available (e.g., Buffalo-New York travel via I-81/NY-17 reduces the Buffalo-New York traffic at the Albany-Utica New York Thruway measurement point) or a large proportion of the city-pair's travel is non-auto (e.g., Cleveland-Boston air travel). In Texas, the volume data included only Texas-licensed vehicles, so that correction factors of 0.5 were required for city-pairs with only one end in Texas. (City-pairs with both ends outside of Texas were, of course, not used.)

- The correction factors were applied to the demand model estimates, the corrected estimated demand was summed for the entire list of city-pairs, and the auto volume was distributed among the city-pairs in the same proportion as the estimated demand.

APPENDIX C
COMPUTATION OF ENERGY SAVINGS

PART A

TABLE C-1

COMPARATIVE RESULTS OF CORRIDOR-BY-CORRIDOR RIDERSHIP DIVERSION CALCULATIONS
(Passenger Miles in 000's)

Corridor	No. Trips (Induced)	Air	Auto	Bus
Atlanta-Nashville	4846	3525	1818	5311
Atlanta-Savannah	778	1727	1147	1248
Boston-Springfield-New Haven	20960	2873	5366	23801
Cleveland-Columbus-Cincinnati	14074	3230	3247	6649
Chicago-Cincinnati	71973	9043	4611	12673
Chicago-Cleveland	3469	32273	11033	13925
Chicago-Detroit	22992	10581	10534	12593
Chicago-St. Louis	11676	3400	10680	9094
Chicago-Twin Cities	66562	28859	16611	9268
° Chicago-Milwaukee	8705	469	1112	2214
Los Angeles-Las Vegas	23210	13621	28300	13469
Los Angeles-San Diego	795	9350	16556	19599
San Jose-Reno	22456	3937	6400	16707
° San Jose-Sacramento	6284	651	5197	2988
Miami-Jacksonville	40065	13447	3844	29544
New York-Buffalo	44425	35084	46627	31764
° New York-Albany	18326	4724	5240	6410
Philadelphia-Atlantic City	5103	3752	90271	81874
Philadelphia-Harrisburg	4291	901	3242	1366
Seattle-Portland	1337	3228	5724	2531
Texas Triangle	43191	47278	12429	26302
° Dallas/Ft. Worth-Houston	22805	20092	4052	7251
° Dallas/Ft. Worth-San Antonio	17086	13434	7009	10171
° Houston-San Antonio	3300	13752	1368	8880
Washington-Richmond	19070	2773	2433	3494

* Induced demand occurs when a significant improvement is made in a transportation mode and as a result people who would not have made the trip ride the improved mode.

PART B

TABLE C-2

COMPARATIVE RESULTS OF CORRIDOR-BY-CORRIDOR
SIMULATION RUNS OF RAIL FUEL EFFICIENCIES

Corridor	Train Miles Per Gallon	Passenger Miles Per Gallon
Atlanta-Nashville	1.20	29
Atlanta-Savannah	1.30	9
Boston-Springfield-New Haven	.59	88
Cleveland-Columbus-Cincinnati	1.31	63
Chicago-Cincinnati	.77	117
Chicago-Cleveland	.80	74
Chicago-Detroit	.83	91
Chicago-St. Louis	1.08	77
Chicago-Twin Cities	.73	97
o Chicago-Milwaukee	1.18	85
Los Angeles-Las Vegas	.77	78
Los Angeles-San Diego	.47	85
San Jose-Reno	.80	63
o San Jose-Sacramento	1.06	57
Miami-Jacksonville	.83	80
New York-Buffalo	.81	100
o New York-Albany	1.15	85
Philadelphia-Atlantic City	.75	229
Philadelphia-Harrisburg	.99	48
Seattle-Portland	.88	58
Texas Triangle	1.16	80
o Dallas/Ft. Worth-Houston	1.04	83
o Dallas/Ft. Worth-San Antonio	1.23	83
o Houston-San Antonio	1.26	72
Washington-Richmond	.71	64

PART C

ESTIMATES OF AUTO FUEL EFFICIENCY

This appendix discusses the basis for the auto fuel consumption rate used in this report and defines related terms. The combined average auto fuel economy is based on a fixed weight average of total driving--55% city miles and 45% highway miles. Consequently, one could expect better economy if all travel was by highway, and lower economy if all travel was city driving. Historical factors have been derived to translate this combined average to highway economy for purposes of this study.

A distinction is made between (a) estimates of fuel economy based on the Congressionally mandated new car requirements, (b) Environmental Protection Agency (EPA) estimates based on historical trends and (c) industry projected new car estimates.1/ Congress has mandated that the new car combined average meet a progressively more stringent requirement, culminating in 27.5 mpg for 1985. Since that law was passed, industry has exceeded each year's mandated requirement. Furthermore, the projections are that industry will continue to exceed the mandated requirement each future year through 1985. Each of these estimates applies to new cars only and must be incorporated into a calculation for the entire fleet average.

A further distinction must be made between estimates based on EPA tests and estimates based on road experience. EPA test estimates have historically been laboratory-type tests conducted under ideal conditions. EPA has recognized that an adjustment factor known as "road slip" must be taken into account to arrive at the on-road average. This adjustment accounts for varying environmental conditions, driving habits, vehicle maintenance and the degree to which the sample test vehicles selected by EPA are truly representative of the same model line.

Applying the foregoing to Table C-3, the first major grouping (a), "New Car MPG Estimates, Combined City/Highway Average" reflects (1) the mandated standard; (2) the EPA estimate of new car mpg based on historical data; and (3) the projection of industry performance

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1/ These estimates are actually National Highway Traffic Safety Administration (NHTSA) projections based on EPA data, but are labeled "EPA" for the purpose of source identification. Similarly, the "industry" estimates are actually NHTSA projections based on anticipated industry improvements in technology.

on production planning and incorporation of technological advances. The combined average for new cars has been incorporated into grouping (b), "Fleet Combined Average," to combine with the mpg estimate of all the cars from earlier model years still in use. The Fleet Combined Average can be further factored to obtain major grouping (c), "Fleet Highway MPG," by increasing the rates in category (b) by 24 percent to reflect increased efficiency of highway driving (see note 2 in Table C-3). (Note that the first three groupings have been based on data resulting from EPA laboratory tests.)

These data must be factored to compute an on-road estimate. The fourth major grouping, (d), "New Car Combined On-Road MPG," is the result of applying the road slip factor to new cars. Having performed these calculations, that last group of data, (e) "Estimated On-Road Highway MPG," can be computed using the relationship discussed in Note 3 of Table C-3. Thus, an mpg estimate for intercity (or highway) driving is obtained for 1985 for the entire fleet (new and residual). A more detailed discussion of the various factors affecting these estimates is contained in EPA's September 1980 report, Passenger Car Fuel Economy; EPA and Road.

TABLE C-3

SUMMARY OF AUTO FUEL EFFICIENCY METHODOLOGY

	(a) New Car MPG Estimates Combined City/Highway Average			(b) Fleet Combined Average		(c) Fleet Highway MPG		(d) New Car Combined On-Road MPG		(e) Estimated On-Road Highway MPG	
	(1) New Car Mandated Standard (55/45)	(2) EPA New Car (55/45)	(3) Industry New Car (55/45)	(1) EPA Fleet (55/45)	(2) Industry Fleet (55/45)	(1) EPA Fleet[2] (55/45)	(2) Industry Fleet[2] (55/45)	(1) EPA New Car (55/45)[1]	(2) Estimated Industry New Car (55/45)[1]	(1) On-Road Fleet (EPA)[3]	(2) On-Road Fleet Industry
1980	20.7	22.41	22.71	16.99	17.24	21.1	21.3	18.1	18.4	17.09	17.3
1981	22.5	24.0	24.09	17.66	18.04	21.9	22.4	19.0	19.0	17.3	17.7
1982	24.2	25.5	26.68	18.5	19.07	22.9	23.6	19.8	20.1	17.9	18.4
1983	26.0	27.0	28.58	19.5	20.28	24.18	25.1	20.6	21.7	18.6	19.3
1984	27.0	27.5	30.53	20.5	21.65	25.4	26.8	20.8	23.2	19.3	20.4
1985	27.5	28.0	31.77	21.6	23.09	27	28.6	21.1	23.8	20.3	21.5

1. FRA arrived at Column (d) by taking the relationship between EPA under columns (a)(2), and (d)(1) and applying it to column (a)(3), Industry New Car (55/45).

2. Thirteen years of historical data reflect a 24% increase in EPA New Car (55/45) to Highway. An increase of 24% is applied to EPA and Industry Fleet estimates for Highway.

3. The relationship between EPA's Estimate of New Car MPG and EPA's estimate New Car to Road Slip is assumed to equal the relationship between EPA Fleet Highway and Fleet on Road MPG.

APPENDIX D
RESPONSE TO GAO INQUIRY ON DIVERSION TO BUSES

RESPONSE TO GAO INQUIRY ON DIVERSION TO BUSES

As discussed in the July 1980 Report, GAO requested that information be prepared to show the fuel savings for each corridor if passengers could be diverted from airplanes and automobiles to buses rather than trains. Again using the 1985 data for the scenario without improved rail, the information desired was calculated by adding the projected 1985 diverted demand from air and auto plus the induced rail demand to the bus demand to get the total bus ridership; the fuel required for total bus requirements under this scenario was then calculated. The next step was to subtract the fuel consumption of the incremental demand in the improved rail.

The resulting data, shown in Table D-1, represent net fuel savings. It can be seen that with the exception of Philadelphia-Atlantic City, all savings are positive. This is to be expected, since in this scenario passengers are being diverted from lower fuel efficient modes (rail, auto and air) into the highest fuel efficient mode (bus). Again, Philadelphia-Atlantic City, because of its very high demand, long train consists and high load factors, does exceed the fuel efficiency of bus and consequently a negative savings results.

It should be noted that this hypothetical scenario is not likely to occur. Although passengers are diverted from bus with an improved rail service, the reverse is not necessarily true, because passengers have distinct modal preferences. In the absence of an improved rail service, some passengers would indeed go to bus, but many would go to auto or air. Thus, the fuel savings shown are very optimistic.

TABLE D-1

ESTIMATED FUEL SAVINGS THROUGH DIVERSION TO BUS
(000's)

Corridor	Gallons of Gas/Diesel Fuel Per Year*
Atlanta-Nashville	419
Atlanta-Savannah	508
Boston-Springfield-New Haven	303
Cleveland-Columbus Cincinnati	231
Chicago-Cincinnati	112
Chicago-Cleveland	371
Chicago-Detroit	203
Chicago-St. Louis	194
Chicago-Twin Cities	352
o Chicago-Milwaukee	54
Los Angeles-Las Vegas	426
Los Angeles-San Diego	202
San Jose-Reno	419
o San Jose-Sacramento	153
Miami-Jacksonville	442
New York-Buffalo	409
o New York-Albany	151
Philadelphia-Atlantic City	(551)
Philadelphia-Harrisburg	166
Seattle-Portland	126
Texas Triangle	262
o Dallas/Ft. Worth-Houston	252
o Dallas/Ft. Worth-San Antonio	222
o Houston-San Antonio	177
Washington-Richmond	228

*Savings expressed as gallons saved above improved rail.

APPENDIX E
CORRIDOR COMPARISONS TO THE NORTHEAST CORRIDOR

APPENDIX E

ATLANTA-NASHVILLE

Characteristics	Measures	% of NEC New York - Washington
Population	3.4 million	14.5
Distance	296 miles	126.0
Average Speed	47.5 mph	56.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	45.9 million	3.8
Trip Time	6 hours	225.0
Total Passenger Miles	15.5 million	0.9
Total Revenues	$1.6 million	0.7
Total Capital Costs	58.9 million	4.0
Annualized Capital Costs	6.5 million	4.0
Avoidable Cost	10.1 million	5.1
Avoidable Loss	8.5 million	**
Annual Public Expenditure	15.0 million	11.9
Annual Public Expenditure/PM	$0.968	1396.8
Avoidable Loss/PM	$0.535	**

ATLANTA-SAVANNAH

Characteristics	Measures	% of NEC New York - Washington
Population	2.6 million	11.0
Distance	293 miles	121.0
Average Speed	51.5 mph	61.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	33.6 million	2.8
Trip Time	5.5 hours	206.0
Total Passenger Miles	4.9 million	0.3
Total Revenues	0.5 million	0.2
Total Capital Costs	46.6 million	3.2
Annualized Capital Costs	5.3 million	3.3
Avoidable Costs	9.9 million	5.0
Avoidable Loss	9.4 million	**
Annual Public Expenditure	14.7 million	11.6
Annual Public Expenditure/PM	3.003	4320.9
Avoidable Loss/PM	$1.918	**

BOSTON-SPRINGFIELD-NEW HAVEN

Characteristics	Measures	% of NEC New York - Washington
Population	5.4 million	23.0
Distance	160 miles	71.0
Average Speed	49 mph	58.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	68.7 million	5.7
Trip Time	3.25 hours	122.
Total Passenger Miles	53.0 million	2.9
Total Revenues	$5.9 million	2.5
Total Capital Costs	84.5 million	5.7
Annualized Capital Costs	9.2 million	5.7
Avoidable Cost	9.0 million	4.6
Avoidable Loss	3.1 million	**
Annual Public Expenditure	12.3 million	9.7
Annual Public Expenditure/PM	0.232	333.8
Avoidable Loss/PM	0.059	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

APPENDIX E (Continued)

CLEVELAND-COLUMBUS-CINCINNATI

Characteristics	Measures	% of NEC New York - Washington
Population	5.5 million	24.0
Distance	261.7 miles	116.0
Average Speed	52.3 mph	62.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	78.7 million	6.5
Trip Time	5.0 hours	188.0
Total Passenger Miles	27.2 million	1.5
Total Revenues	2.7 million	1.2
Total Capital Costs	91.7 million	6.2
Annualized Capital Costs	9.8 million	6.1
Avoidable Cost	10.7 million	5.4
Avoidable Loss	8.0 million	**
Annual Public Expenditure	17.8 million	14.1
Annual Public Expenditure/PM	$0.654	940.4
Avoidable Loss/PM	.294	**

CHICAGO-CINCINNATI

Characteristics	Measures	% of NEC New York - Washington
Population	9.8 million	41.9
Distance	296. miles	129.0
Average Speed	54 mph	64.0
Intercity Rail Frequency*	8	12.0
Improvement Costs	78.6 million	6.5
Trip Time	5.5 hours	2.1
Total Passenger Miles	98.3 million	5.4
Total Revenues	10.1 million	4.3
Total Capital Costs	99.1 million	6.7
Annualized Capital Costs	10.9 million	6.8
Avoidable Costs	13.6 million	6.9
Avoidable Loss	3.5 million	**
Annual Public Expenditure	14.4 million	11.4
Annual Public Expenditure/PM	0.146	210.7
Avoidable Loss/PM	.036	**

CHICAGO-CLEVELAND

Characteristics	Measures	% of NEC New York - Washington
Population	10.9 million	46.6
Distance	341 miles	151.0
Average Speed	60.2 mph	71.0
Intercity Rail Frequency*	8	12.0
Improvement Costs	21.9 million	1.8
Trip Time	5.66 hours	213.0
Total Passenger Miles	82.0 million	4.5
Total Revenues	8.1 million	3.5
Total Capital Costs	48.7 million	3.3
Annualized Capital Costs	6.2 million	3.9
Avoidable Cost	19.4 million	9.8
Avoidable Loss	11.3 million	**
Annual Public Expenditure	17.5 million	13.9
Annual Public Expenditure/PM	0.214	307.4
Avoidable Loss/PM	0.138	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

CHICAGO-DETROIT

Characteristics	Measures	% of NEC New York - Washington
Population	13.4 million	57.3
Distance	289 miles	127.8
Average Speed	57.8 mph	68.0
Intercity Rail Frequency*	12	18.2
Improvement Costs	43.9 million	3.6
Trip Time	5.0 hours	188.0
Total Passenger Miles	134.3 million	7.4
Total Revenues	13.6 million	5.9
Total Capital Costs	70.0 million	4.7
Annualized Capital Costs	8.3 million	5.2
Avoidable Cost	22.6 million	11.4
Avoidable Loss	9.0 million	**
Annual Public Expenditure	17.3 million	13.7
Annual Public Expenditure/PM	$0.129	185.4
Avoidable Loss/PM	.067	**

CHICAGO - ST. LOUIS

Characteristics	Measures	% of NEC New York - Washington
Population	9.8 million	41.9
Distance	284 miles	126.0
Average Speed	56.8 mph	66.8
Intercity Rail Frequency*	12	18.2
Improvement Costs	45.8 million	3.8
Trip Time	5.0 hours	188.0
Total Passenger Miles	87.8 million	4.8
Total Revenues	9.0 million	3.9
Total Capital Costs	68.1 million	4.6
Annualized Capital Costs	7.9 million	4.9
Avoidable Costs	19.1 million	9.7
Avoidable Loss	10.0 million	**
Annual Public Expenditure	17.9 million	14.2
Annual Public Expenditure/PM	0.204	293.0
Avoidable Loss/PM	0.114	**

CHICAGO - TWIN CITIES

Characteristics	Measures	% of NEC New York - Washington
Population	11.7 million	50.0
Distance	418 miles	185.0
Average Speed	62 mph	73.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	144.3 million	12.0
Trip Time	6.75 hours	254.0
Total Passenger Miles	121.3 million	6.7
Total Revenues	12.0 million	5.2
Total Capital Costs	164.8 million	11.2
Annualized Capital Costs	17.5 million	10.9
Avoidable Cost	19.6 million	9.9
Avoidable Loss	7.7 million	**
Annual Public Expenditure	25.2 million	20.0
Annual Public Expenditure/PM	0.208	298.9
Avoidable Loss/PM	0.064	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

**NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

CHICAGO-MILWAUKEE

Characteristics	Measures	% of NEC New York - Washington
Population	8.65 million	37.0
Distance	85 miles	37.6
Average Speed	62.7 mph	73.7
Intercity Rail Frequency*	6	9.1
Improvement Costs	2.8 million	0.2
Trip Time	1.35 hours	50.8
Total Passenger Miles	35.9 million	2.0
Total Revenues	4.0 million	1.7
Total Capital Costs	23.3 million	1.6
Annualized Capital Costs	3.3 million	2.0
Avoidable Cost	8.8 million	4.5
Avoidable Loss	4.8 million	**
Annual Public Expenditure	7.8 million	6.2
Annual Public Expenditure/PM	$0.217	312.8
Avoidable Loss/PM	$0.134	**

LOS ANGELES - LAS VEGAS

Characteristics	Measures	% of NEC New York - Washington
Population	7.8 million	33.3
Distance	325 miles	143.8
Average Speed	54 mph	64.0
Intercity Rail Frequency*	8	12.1
Improvement Costs	36.6 million	3.0
Trip Time	6 hours	225.6
Total Passenger Miles	96.8 million	5.3
Total Revenues	9.9 million	4.3
Total Capital Costs	59.3 million	4.0
Annualized Capital Costs	7.1 million	4.4
Avoidable Costs	16.1 million	8.1
Avoidable Loss	6.2 million	**
Annual Public Expenditure	13.3 million	10.5
Annual Public Expenditure/PM	0.137	197.6
Avoidable Loss/PM	.064	**

LOS ANGELES- SAN DIEGO

Characteristics	Measures	% of NEC New York - Washington
Population	11.4 million	48.7
Distance	128 miles	56.6
Average Speed	56.4 mph	66.4
Intercity Rail Frequency*	20	30.3
Improvement Costs	9.4 million	0.7
Trip Time	2.25 hours	84.6
Total Passenger Miles	167.1 million	9.2
Total Revenues	18.5 million	8.0
Total Capital Costs	36.5 million	2.5
Annualized Capital Costs	5.0 million	3.1
Avoidable Cost	23.9 million	12.1
Avoidable Loss	5.3 million	**
Annual Public Expenditure	10.3 million	8.2
Annual Public Expenditure/PM	0.062	88.8
Avoidable Loss/PM	0.032	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

SAN JOSE-RENO

Characteristics	Measures		% of NEC New York - Washington
Population	5.9	million	25.2
Distance	282	miles	124.7
Average Speed	51	mph	60.0
Intercity Rail Frequency*	6		9.1
Improvement Costs	14.3	million	1.2
Trip Time	5.5	hours	207.0
Total Passenger Miles	49.5	million	2.7
Total Revenues	5.5	million	2.4
Total Capital Costs	27.7	million	1.9
Annualized Capital Costs	3.4	million	2.1
Avoidable Cost	15.2	million	7.7
Avoidable Loss	9.7	million	**
Annual Public Expenditure	13.1	million	10.4
Annual Public Expenditure/PM	$0.265		380.6
Avoidable Loss/PM	0.196		**

SAN JOSE-SACRAMENTO

Characteristics	Measures		% of NEC New York - Washington
Population	13.6	million	58.1
Distance	126.	miles	56.0
Average Speed	51.6	mph	61.0
Intercity Rail Frequency*	6		9.1
Improvement Costs	9.0	million	0.7
Trip Time	2.5	hours	94.0
Total Passenger Miles	15.1	million	0.8
Total Revenues	1.7	million	0.7
Total Capital Costs	19.4	million	1.3
Annualized Capital Costs	2.5	million	1.6
Avoidable Costs	7.4	million	3.7
Avoidable Loss	5.7	million	**
Annual Public Expenditure	8.2	million	6.5
Annual Public Expenditure/PM	0.543		782.0
Avoidable Loss/PM	0.377		**

MIAMI-JACKSONVILLE

Characteristics	Measures		% of NEC New York - Washington
Population	4.8	million	20.5
Distance	413	miles	182.7
Average Speed	55.4	mph	65.2
Intercity Rail Frequency*	8		12.1
Improvement Costs	30.9	million	2.6
Trip Time	7.25	hours	272.5
Total Passenger Miles	86.9	million	4.8
Total Revenues	9.4	million	4.0
Total Capital Costs	47.7	million	3.2
Annualized Capital Costs	5.6	million	3.5
Avoidable Cost	18.1	million	9.2
Avoidable Loss	8.8	million	**
Annual Public Expenditure	14.4	million	11.4
Annual Public Expenditure/PM	0.166		238.6
Avoidable Loss/PM	0.101		**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

NEW YORK CITY-BUFFALO

Characteristics	Measures		% of NEC New York - Washington
Population	19.2	million	82.1
Distance	430.4	miles	190.4
Average Speed	61	mph	71.8
Intercity Rail Frequency*	24		36.4
Improvement Costs	39.6	million	3.3
Trip Time	7	hours	263.2
Total Passenger Miles	312.4	million	17.2
Total Revenues	31.1	million	13.4
Total Capital Costs	135.1	million	9.2
Annualized Capital Costs	18.3	million	11.4
Avoidable Cost	51.4	million	26.0
Avoidable Loss	20.4	million	**
Annual Public Expenditure	38.7	million	30.6
Annual Public Expenditure/PM	$0.124		178.3
Avoidable Loss/PM	.065		**

NEW YORK CITY-ALBANY (Combo Turbo & Amfleet)

Characteristics	Measures		% of NEC New York - Washington
Population	12.6	million	54.0
Distance	142	miles	63.0
Average Speed	61.6	mph	72.4
Intercity Rail Frequency*	6		9.1
Improvement Costs	23	million	1.9
Trip Time	2.3	hours	86.5
Total Passenger Miles	84.5	million	4.7
Total Revenues	8.7	million	3.7
Total Capital Costs	70.3	million	4.8
Annualized Capital Costs	9.4	million	5.8
Avoidable Costs	22.7	million	11.5
Avoidable Loss	14.0	million	**
Annual Public Expenditure	23.4	million	18.5
Annual Public Expenditure/PM	0.277		398.6
Avoidable Loss/PM	0.166		**

PHILADELPHIA-ATLANTIC CITY

Characteristics	Measures		% of NEC New York - Washington
Population	5.2	million	22.2
Distance	64.7	miles	28.6
Average Speed	42.6	mph	50.1
Intercity Rail Frequency*	24		36.4
Improvement Costs	25.1	million	2.1
Trip Time	1.5	hours	56.4
Total Passenger Miles	181.0	million	10.0
Total Revenues	18.1	million	7.8
Total Capital Costs	66.1	million	4.5
Annualized Capital Costs	8.7	million	5.4
Avoidable Cost	30.3	million	15.3
Avoidable Loss	12.2	million	**
Annual Public Expenditure	20.9	million	16.5
Annual Public Expenditure/PM	0.115		166.1
Avoidable Loss/PM	0.067		**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

PHILADELPHIA-HARRISBURG

Characteristics	Measures		% of NEC New York - Washington
Population	5.5	million	23.5
Distance	104	miles	46.0
Average Speed	67	mph	78.8
Intercity Rail Frequency*	32		48.5
Improvement Costs	$ 42.7	million	3.5
Trip Time	1.50	hours	56.4
Total Passenger Miles	58.7	million	3.2
Total Revenues	$ 6.9	million	3.0
Total Capital Costs	68.7	million	4.7
Annualized Capital Costs	8.8	million	5.5
Avoidable Cost	13.0	million	6.6
Avoidable Loss	6.0	million	**
Annual Public Expenditure	27.2	million	21.5
Annual Public Expenditure/PM	$0.463		666.7
Avoidable Loss/PM	$ 0.612		**

SEATTLE-PORTLAND

Characteristics	Measures		% of NEC New York - Washington
Population	3.5	million	15.0
Distance	186	miles	82.3
Average Speed	53.1	mph	62.5
Intercity Rail Frequency*	12		18.2
Improvement Costs	53.4	million	4.4
Trip Time	3.50	hours	131.6
Total Passenger Miles	53.3	million	2.9
Total Revenues	5.9	million	2.5
Total Capital Costs	74.2	million	5.0
Annualized Capital Costs	8.5	million	5.3
Avoidable Costs	15.9	million	8.0
Avoidable Loss	10.0	million	**
Annual Public Expenditure	18.5	million	14.6
Annual Public Expenditure/PM	0.347		499.4
Avoidable Loss/PM	0.188		**

TEXAS TRIANGLE

Characteristics	Measures		% of NEC New York - Washington
Population	6.9	million	29.5
Distance	818.5	miles	362.2
Average Speed	57.2	mph	67.3
Intercity Rail Frequency*	6		9.1
Improvement Costs	245.7	million	20.4
Trip Time	14.30	hours	535.0
Total Passenger Miles	129.2	million	7.1
Total Revenues	12.5	million	5.4
Total Capital Costs	284.7	million	19.3
Annualized Capital Costs	30.4	million	18.9
Avoidable Cost	45.0	million	22.8
Avoidable Loss	32.5	million	**
Annual Public Expenditure	62.9	million	49.8
Annual Public Expenditure/PM	0.488		701.9
Avoidable Loss/PM	0.252		**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

DALLAS/FT. WORTH - HOUSTON

Characteristics	Measures	% of NEC New York - Washington
Population	6.2 million	26.5
Distance	309.8 million	137.1
Average Speed	57.2 mph	67.3
Intercity Rail Frequency*	6	9.1
Improvement Costs	10.5 million	0.9
Trip Time	5.40 hours	203.0
Total Passenger Miles	54.2 million	3.0
Total Revenues	5.1 million	2.2
Total Capital Costs	115.5 million	7.8
Annualized Capital Costs	12.2 million	7.6
Avoidable Cost	18.4 million	9.3
Avoidable Loss	13.2 million	**
Annual Public Expenditure	25.4 million	20.1
Annual Public Expenditure/PM	0.469	675.5
Avoidable Loss/PM	0.244	**

DALLAS/FT. WORTH - SAN ANTONIO

Characteristics	Measures	% of NEC New York - Washington
Population	4.9 million	21.0
Distance	288.8 miles	128.0
Average Speed	57.2 mph	67.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	147.3 million	12.2
Trip Time	5.0 hours	187.0
Total Passenger Miles	47.7 million	2.6
Total Revenues	4.6 million	2.0
Total Capital Costs	160.3 million	10.9
Annualized Capital Costs	16.7 million	10.4
Avoidable Costs	20.0 million	10.1
Avoidable Loss	15.3 million	**
Annual Public Expenditure	32.0 million	25.3
Annual Public Expenditure/PM	0.671	965.7
Avoidable Loss/PM	0.321	**

HOUSTON - SAN ANTONIO

Characteristics	Measures	% of NEC New York - Washington
Population	3.9 million	17.0
Distance	219.9 miles	97.0
Average Speed	57.2 mph	67.0
Intercity Rail Frequency*	6	9.1
Improvement Costs	67.8 million	5.6
Trip Time	3.80 hours	142.0
Total Passenger Miles	27.3 million	1.5
Total Revenues	2.7 million	1.2
Total Capital Costs	80.8 million	5.5
Annualized Capital Costs	8.7 million	5.4
Avoidable Cost	9.2 million	4.7
Avoidable Loss	6.6 million	**
Annual Public Expenditure	15.3 million	12.1
Annual Public Expenditure/PM	0.562	808.3
Avoidable Loss/PM	0.242	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** NEC Avoidable Loss is actually a $34.7 million surplus of revenues over avoidable costs for the section between New York and Washington. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.

WASHINGTON-RICHMOND

Characteristics	Measures	% of NEC New York - Washington
Population	4.0 million	17.1
Distance	109 miles	48.2
Average Speed	54.5 mph	64.1
Intercity Rail Frequency*	10	15.2
Improvement Costs	11.3 million	0.9
Trip Time	2.00 hours	75.2
Total Passenger Miles	36.1 million	2.0
Total Revenues	3.9 million	1.7
Total Capital Costs	26.9 million	1.8
Annualized Capital Costs	3.5 million	2.2
Avoidable Cost	8.4 million	4.3
Avoidable Loss	4.5 million	**
Annual Public Expenditure	8.0 million	6.3
Annual Public Expenditure/PM	$0.222	318.9
Avoidable Loss/PM	$0.1247	**

NEC: NEW YORK-WASHINGTON**

Characteristics	Measures	% of NEC New York - Washington
Population	23.4 million	100
Distance	226 miles	100
Average Speed	85 mph	100
Intercity Rail Frequency*	66	100
Improvement Costs	1205.4 million	100
Trip Time	2.66 hours	100
Total Passenger Miles	1817.0 million	100
Total Revenues	232.3 million	100
Total Capital Costs	1475.4 million	100
Annualized Capital Costs	161.0 million	100
Avoidable Costs	197.6 million	100
Avoidable Loss	(34.7) million	**
Annual Public Expenditure	126.3 million	100
Annual Public Expenditure/PM	0.0695	100
Avoidable Loss/PM	$(0.0191)	**

* Represents number of dispatched train trips. Does not include long distance or commuter traffic within the corridor.

** Relative to 1987 service levels on New York-Washington segment of NEC. Since breakeven operations are projected, with revenues equal to operating expenses, a surplus (negative loss) over avoidable costs is earned of $34.7 million. Similarly, the NEC Avoidable Loss per Passenger Mile is actually a $0.019 surplus. Percents are not calculated.