Attachment A

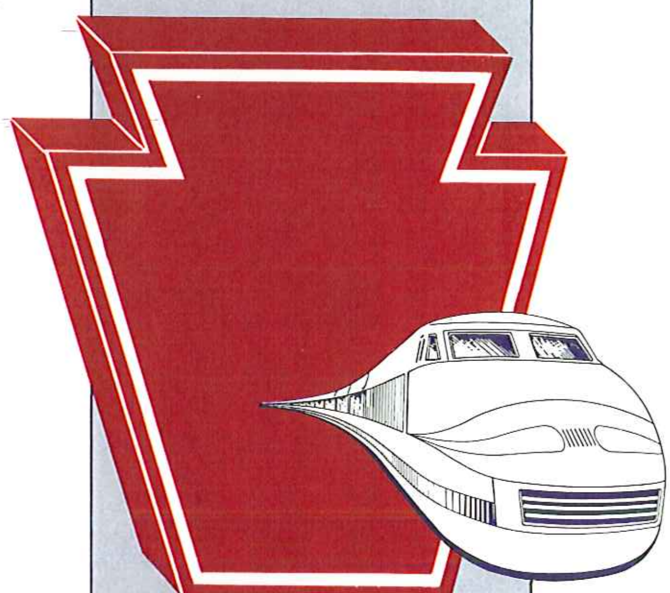
PENNSYLVANIA HIGH SPEED RAIL FEASIBILITY STUDY

EXECUTIVE SUMMARY

PHASE 1

PREPARED FOR:

PENNSYLVANIA HIGH SPEED INTERCITY RAIL PASSENGER COMMISSION



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FEBRUARY 1985

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The preparation of this report, dated February 1985, has been financed in part through a grant from the U.S. Department of Transportation, Federal Railroad Administration, to the Pennsylvania High Speed Intercity Rail Passenger Commission.

This executive summary is based on methodology, data, and assumptions contained in the study working papers and reports. Included in the assumptions are projections, made as of November 1984, concerning future events and economic conditions that cannot be assured. Therefore, actual results achieved may vary from the projections.

INTRODUCTION

A high-speed rail passenger system across Pennsylvania could not only offer rapid, all-weather travel between Philadelphia and Pittsburgh but also create tens of thousands of jobs, pump billions of dollars into the state economy, and spark countless opportunities for real estate development.

Such a super-railroad—able to move millions of riders a year from city center to city center in safety, style, and speed—also could boost state tax revenue by hundreds of millions of dollars and position Pennsylvania to export high-speed rail technology to other states.

In addition, such a network probably could generate enough revenue to pay its operating and maintenance costs, and perhaps make a contribution to the capital construction cost.

These are among the preliminary findings of a program begun in 1983 for the Pennsylvania High Speed Intercity Rail Passenger Commission by an engineering joint venture of Parsons Brinckerhoff Quade & Douglas, Inc., and Gannett Fleming Transportation Engineers, Inc.

Under most of the options studied, comfortable trains would zip along on approximately hourly schedules. The trains would ride new passenger-only trackage separate from existing freight tracks (but in many locations adjacent and parallel to them) and free from grade crossings.

By the year 2000, the study estimates, a high-speed rail system could carry 4 million to 12 million riders a year. The figure could run even higher if rail connections materialize at either end of the state—to Atlantic City, N.J., and to a proposed multistate Midwest high-speed network that has been envisioned to link Pittsburgh with Cleveland, Detroit, and Chicago.

Building the railroad, an 8- to 12-year program, could help stabilize the state's economy at a time when the national shift to a service society has forced many smokestack industries to close their plant gates.

Clearly, Pennsylvania stands at a crossroads of economic opportunity with high-speed rail.

For travelers, this service could slice the nearly 7-hour, 352-mile passenger-train run from Philadelphia to Pittsburgh to as little as:

- 2¼ hours (express service) for new magnetic levitation trains on special guideways, or
- 3¼ hours for advanced high-speed trains on steel wheels following a mostly new alignment, or
- 4 hours for a substantially improved steel-wheel system primarily following the existing right-of-way.

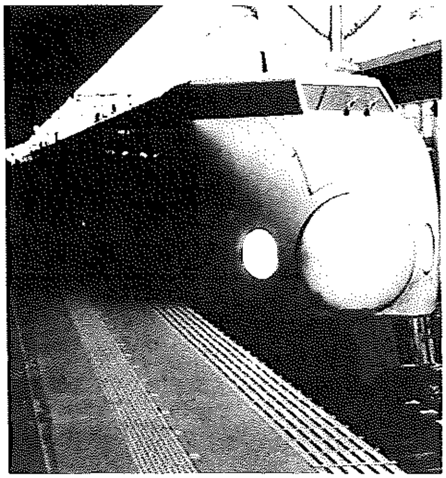
Such a system would give Pennsylvania a quality and frequency of service unknown in America but widely available in Japan and Europe, where clean trains safely and routinely whisk between major cities at speeds of between 125 mph and 168 mph. It also would help meet a growing demand for intercity transportation, which is expected to nearly double by the year 2000, according to a federal study.

The main line envisioned by the Commission's study would connect with Amtrak's New York-Washington Northeast Corridor at 30th Street Station in Philadelphia. In Pittsburgh, the line could terminate either at Pennsylvania Station, as Amtrak trains now do, or at Station Square, the P&LE Terminal complex being redeveloped as a retail-hotel-restaurant center. Some of the route alignments studied closely follow the former Pennsylvania Railroad main line (today owned by Amtrak east of Harrisburg and by Conrail west of Harrisburg) for much of the distance, while others deviate widely from it. In all cases studied, however, trains would serve Paoli, Lancaster, Harrisburg, Altoona, Johnstown, and Greensburg. One route realignment proposal would add State College, home of Pennsylvania State University and a growing center for technology and research.

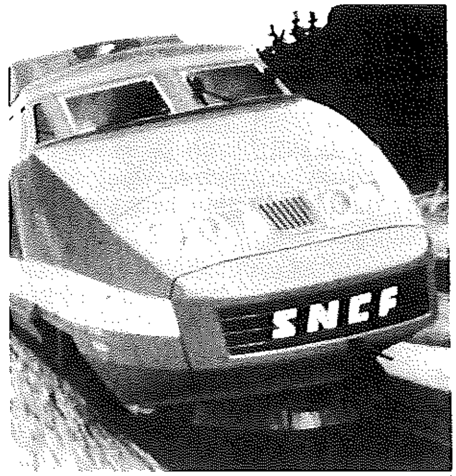
Highlights of other findings, which are covered elsewhere in this executive summary and in detail in the technical study itself, are listed below. Known as Phase 1, this part of the study laid a broad framework for more specific and intensive examination in Phase 2. Phase 2 will include a detailed market survey and a right-of-way inventory. Phase 3 will focus on economic development that high-speed rail (HSR) could stimulate and on a financing package.

Among other findings, Phase 1 determined that:

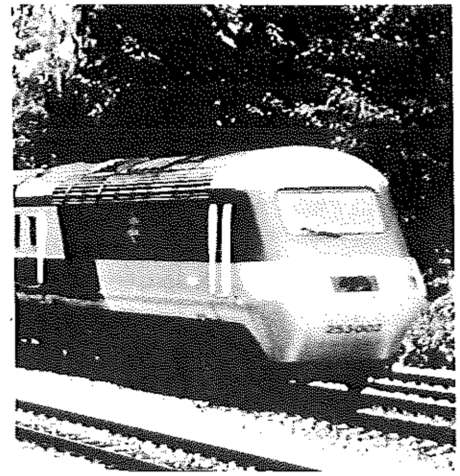
- Pennsylvania residents and firms can capture approximately 70 percent of the construction costs ($1.8 billion to build a 4-hour steel-rail system, up to $10 billion to build a 2½-hour [trains making all stops] magnetic levitation [maglev] system).
- Pennsylvania residents and firms can capture an even greater share—approximately 80 percent—of operating expenditures, year after year.
- A "multiplier effect" of successive rounds of spending might triple the impact of initial expenditures.
- The dollar value of time savings alone could exceed the capital costs of an HSR system.
- State tax revenues would increase.
- New jobs directly created in Pennsylvania by HSR can boost the Commonwealth's employment growth rate by 20 to 68 percent during the construction period and by 23 to 35 percent when service begins, depending on which of the high-speed rail systems is chosen.
- Existing commuter systems, such as the Southeastern Pennsylvania Transportation Authority (SEPTA) and Port Authority Transit of Allegheny County (PAT) might gain riders by serving as feeder service to HSR.
- Pennsylvania firms could leap to the forefront of a new HSR industry in the United States, benefiting from the development of a trained labor force, a strengthened base for an HSR supply industry, and investments in the new technology drawn to Pennsylvania by an HSR system.
- The competitive position of Pennsylvania industries relative to those of other states could be enhanced by the better transportation HSR will provide. This definite transportation advantage and its intangible effect on the state's image could attract new businesses.



JNR Series 961 Bullet Train



SNCF TGV Train



British Rail HST Train

- Tourism could benefit. As tourists are drawn from farther afield by the improved accessibility, this market improvement might induce the creation of new tourist attractions and better amenities, drawing still more tourists in a synergistic effect. HSR service itself could be a tourist attraction, particularly in the more advanced forms.

PENNSYLVANIA AND THE WORLD'S HIGH SPEED RAIL SYSTEMS

State Perspective. Pennsylvania has always been in the vanguard in the development of transportation, including canals, railroads, and the world's first limited-access superhighway, the Pennsylvania Turnpike, which is a financial success as well as an efficient transportation facility. Some of America's earlier fast trains were in Pennsylvania—in 1956 the Aerotrain's low center of gravity allowed it to traverse the largely twisting and mountainous Pennsylvania Railroad main line at speeds of well over 85 mph, reducing the travel time between Philadelphia and Pittsburgh to 6 hours—an hour less than the currently scheduled time. But in Pennsylvania as elsewhere in the country, the years from the 1950s on have brought comparative neglect of the rail system as national transportation policy—and heavy federal funding—gravitated toward an emphasis on highways and airports. To remedy the neglect of rail, boost the state's economy, and regain a leading role in transportation, the Pennsylvania General Assembly created the High Speed Intercity Rail Passenger Commission by Act 144 of 1981 "to investigate, study and make recommendations concerning the need for and establishment and operation of a high speed intercity rail passenger system in the Commonwealth."

National Trends. The need for HSR passenger service is dictated by transportation growth trends. The final report of the National Transportation Policy Study Commission (1979) estimated that, even if the population were to stay constant in the 25-year period from 1975 to 2000, the number of intercity person-trips could be expected to rise by some 88 percent, from more than 13.5 billion annually to nearly 25.5 billion. According to the study, this results from the following trends:

- Expansion of service industries and white-collar occupations will cause business travel to increase faster than general economic growth.
- Increased affluence and leisure time will stimulate pleasure travel.
- Changing age distributions mean that there will be more persons in high-travel-potential age groups.
- The trend toward fewer dependents will allow more time and disposable income for travel.
- The rising relative affluence of other countries will increase tourism to the United States.

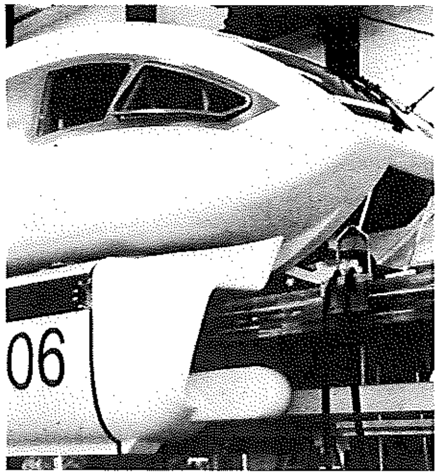
The federal study took special note of the absence of an efficient travel mode for short-distance intercity markets—a niche HSR might fill:

> Present intercity service offers limited speed and cost options. In short-range markets, there are no substantial high-speed options—air being relatively slow due to excessive access times, and the auto and bus being fixed at a maximum upper speed limit of 55 miles per hour. This market is often indicated as having potential for high-speed rail service; however, substantial capital investment is required. Where auto, bus and air speeds are often impaired by road and airway congestion, rail services may gain market share when rail speeds and service levels begin to compare favorably with the other modes.

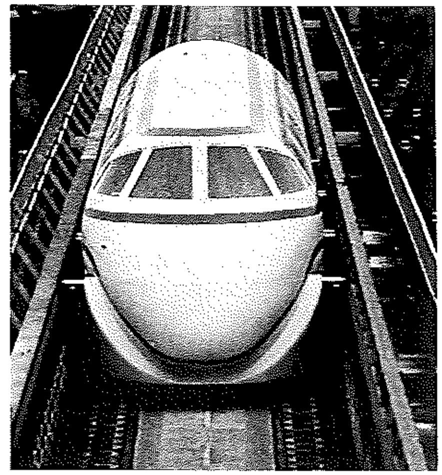
The World View. Two basic systems were selected from world technologies as possible models for Pennsylvania:

- Steel-wheel-on-steel-rail. These systems are currently running at speeds of 125 mph or more in France, Great Britain and Japan—hundreds of route-miles in each country. They are fast, comfortable, and—particularly those propelled by electric power—produce little wayside air pollution. For electric trains, combustion takes place in the power generating plant, where it can be controlled, and fuel at the plant can be coal or hydropower instead of scarce oil. The initial Japanese high-speed line, known as the Shinkansen, has been running "Bullet Trains" since

VIA Rail LRC Train



Transrapid 06 Maglev Test Train


JNR MLU-001 Maglev Test Car

1964—at a profit year after year. Tested at a maximum speed of 198 mph and operating at about 130 mph, it has sped along for more than 20 years without a single fatality or serious injury to passengers, making it the safest transportation system in history. The new French TGV (três grande vitesse or "very high speed") trains run even faster—168 mph normal top speed; tested to as high as 236 mph—again, at a profit for the initial line. Since 1975, British Rail has operated "Inter-City 125" service with HST (High-Speed Train) diesel-powered equipment at 125 mph. In addition, British Rail is running an electric-powered train called APT (Advanced Passenger Train) with coaches that tilt, enabling them to round conventional curves faster than otherwise would be comfortable for passengers. Canada also has a tilt-body design, the LRC (Light, Rapid, Comfortable), in service and undergoing continuing development. Using AEM-7 electric locomotives with Swedish-licensed technology and Amfleet coaches, Amtrak's Northeast Corridor intercity service runs at a top speed of 120 mph on certain stretches.

- Maglev. In a magnetic levitation, or maglev, system, magnets on the train interact with conductors embedded in a special guideway, propelling the train forward and, as it gathers speed, lifting it up. The train floats from a fraction of an inch to a few inches above the guideway surface itself, avoiding contact noise, vibration, and friction. Experimental maglevs are now running in Japan and Germany at speeds as high as 250 mph, based on different approaches. They are termed "repulsion" and "attraction" maglevs respectively, after the differing ways in which each country uses magnets to provide levitation. An early Japanese maglev attained a world speed record of 321 mph. One maglev has entered low-speed regular service at the Birmingham Airport in England. For Pennsylvania, 250 mph seems a reasonable top practical speed—avoiding the worst aerodynamic drag and noise.

The Commission and eventually a broader group of Pennsylvania leaders will face one fundamental distinction between these two classes of HSR systems: maglev operates on a different principle from rail, requires its own guideways, and cannot be simply added on to an existing rail system. Steel-wheel-on-steel-rail technology, on the other hand, can be developed by stages, with advanced vehicles running at less than top speeds over ordinary tracks for a time, or a diesel system built first and electrified later.

ALTERNATIVES FOR PENNSYLVANIA

Achieving Higher Speeds. Travel times can be cut by using combinations of engineering techniques. Several alternative systems are described here, each using an integrated combination of track, alignment, operations, and equipment improvements. Among track, alignment, and operations improvements considered in the study were:

- Upgrading track to higher Federal Railroad Administration (FRA) classification—may be a requirement for higher speed.
- Raising superelevation (banking curves more steeply)—an inexpensive way of obtaining higher speed curves if track can be "dedicated" to passenger service.
- "Designation" of track for passenger service—may avoid the expense of constructing additional trackage specifically designed and dedicated for passenger service.
- Curve straightening—may avoid the cost and impact of route realignment, with nearly the same improvement in speed capability.
- Route realignment—may be desirable in areas where existing route is circuitous or where sharp curves exist.
- New alignment—may be the only way to obtain desired shorter trip times.

Among equipment improvements considered in the study were various combinations of the following:

- Increased power density (horsepower per ton)—may provide improved performance at a reasonable cost.
- Running with increased cant deficiency (tilt-body vehicles)—may increase passenger comfort and raise speed on curves, thus significantly improving performance at a reasonable cost.
- Electrification—though costly be-

cause of the need for an overhead catenary, saves train weight and may be the best way to provide the desired performance.

- Advanced technology (maglev)—though costly and not yet proven in commercial operations, it is the only way to provide ground transportation times as low as 2¼ hours (express) between Philadelphia and Pittsburgh.

Existing Service. Today, Amtrak cross-state passenger trains (the Broadway Limited and the Pennsylvanian) use Electro-Motive F40PH-type diesel locomotives to draw Amfleet and Heritage Fleet cars. The trip is slow, averaging 47 to 50 mph, mainly because of track and route bottlenecks and because of the mixture of freight and passenger trains on one of the highest tonnage railroads in the country. The 352-mile route has 40 grade crossings, 593 bridges, two tunnels, and 392 curves, or 1.1 per mile, a substantial proportion. With top speeds of 70 mph on the Conrail line west of Harrisburg and 90 mph on the Amtrak line east of Harrisburg, total trip time is a calculated 6½ hours, though currently scheduled with leeway at 6 hours 56 minutes. Amtrak service on the electrified Philadelphia-Harrisburg line is more frequent—nine trains a day each weekday—and runs at a slightly higher average speed—about 65 mph. These trains use Budd-built Metroliner coaches originally used in Northeast Corridor service.

The study focuses on three progressively faster—and costlier—systems, each of which uses a specific vehicle type and route alignment. For purposes of the study, these are Alternatives "C," "D," and "E." (Alternative "A" was existing or "baseline" service, used as a point of comparison only; and Alternative "B" embraced only minor improvements to existing service—it was dropped from further consideration because it fell too far short of the Commission's stated performance goals.)

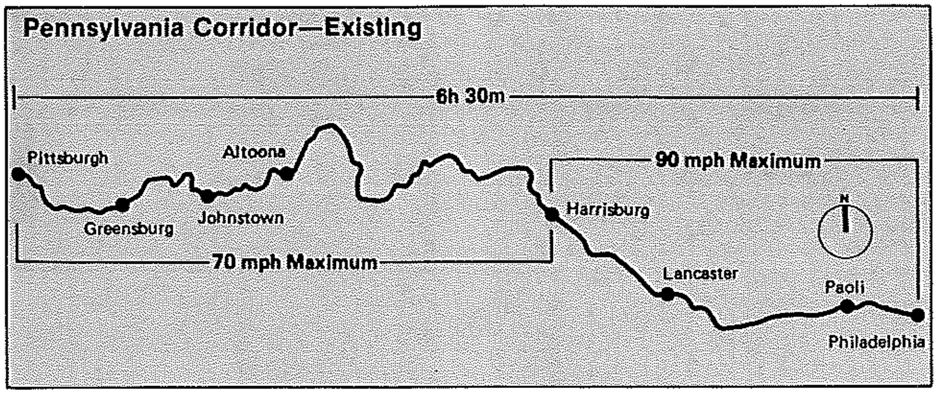
Cities to be Served. In all alternatives, seven population centers would be served, as required in the Commission's original Request for Proposal: Lancaster, Harrisburg, Altoona, Johnstown, and Greensburg, in addition to the terminal cities of Pittsburgh and Philadelphia. Service at Paoli was also examined to draw on the large suburban ridership base of the metropolitan Philadelphia area, including the new high-tech corridor that is developing along Route 202 near Paoli. Another growing high-tech area, Centre County, could be served by a routing through State College (studied under Alternative D, but also possible under C or E).

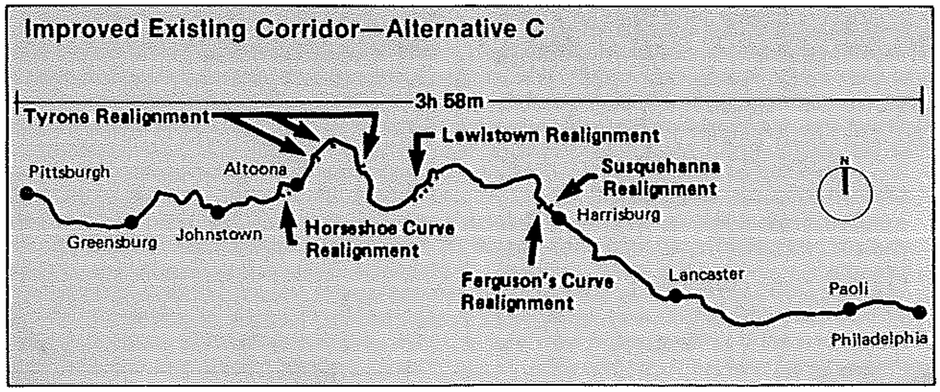
The details of providing commuter service and intermediate stops can be studied later, but it should be possible to operate these services in coordination with through trains.

Alternative C—Improved Existing. Alternative C is a big step up from the existing service, and could well serve as a transition to even higher-speed service later. It represents the best service that could be provided on essentially the existing right-of-way (or one parallel to it) with dedicated passenger tracks, limited curve improvements at many points, and route realignments at five current bottlenecks. Listed east to west, these realignments are:

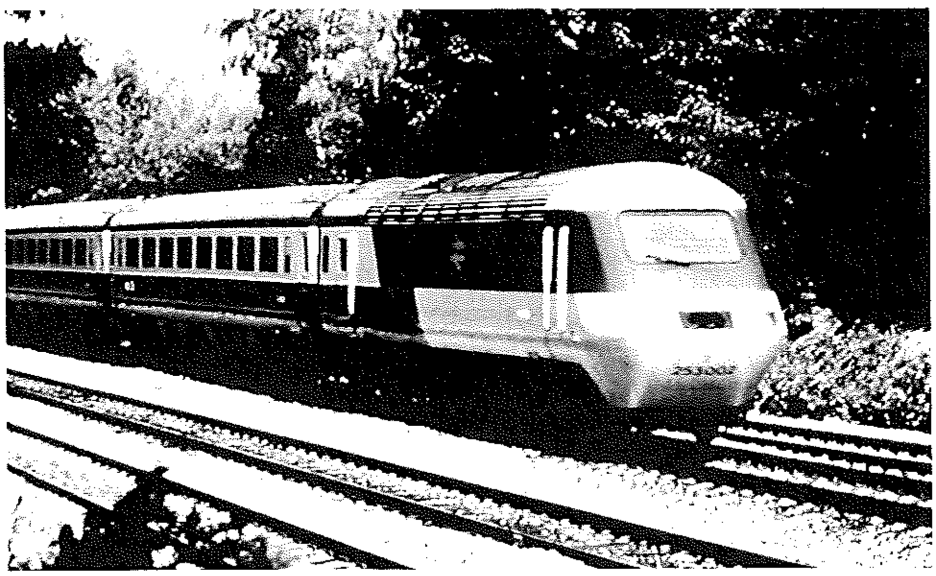
- Susquehanna River reroute: runs north from Rockville, roughly following Conrail's Harrisburg-Buffalo main line and crossing river to Duncannon (saving 9.0 minutes).
- Ferguson's Curve east of Newport: straightens wide curve along the Juniata River (2.3 minutes).
- Lewistown to west of McVeytown: follows base of Blue Mountain on straight alignment (12.3 minutes).
- Tyrone: series of curve straightenings between Petersburg and Tyrone (15.3 minutes).
- Horseshoe Curve: bypasses the historic engineering landmark on a high viaduct (6.3 minutes).

High-speed locomotives and cars would be used, perhaps of tilt-body design; grade crossings and other obstacles eliminated where possible; and speed, comfort, and reliability much improved. Diesel or electric locomotives could be used (the electified option was termed Alternative C—Electric): diesel offers freedom from the capital expense of electrification, but electric trains operating from wayside power offer quicker acceleration or higher top speed. Diesels might be either the Canadian LRC (a tilt-body train built to North





VIA Rail LRC Train (Canada)



British Rail HST Train

Amtrak AEM-7/Amfleet Train (United States)

American standards and used in Canada since 1982, desirable if substantial route curvature is present) or the lightweight but nontilting British HST. Several electric trainsets are candidates in Alternative C—Electric: the American AEM-7 locomotive with Amfleet cars, as used in current Metroliner service on the Northeast Corridor; an electric version of Canada's LRC now under development; the West German ET 402, the Italian ETR 401 (tilt-body); or the British APT (tilt-body). Top speeds in this improved existing system would be 110 to 120 mph—nearly as high as true HSR service—and the trains could sustain high speeds throughout more of the trip than at present for substantially improved typical trip times (estimated at 3 hours 58 minutes; or 3 hours 50 minutes if electrified—both times assume trains stop at all stations considered in the study). Many of the improvements envisioned in Alternative C can be seen as steps toward even higher-speed service, allowing a smooth transition and the early inauguration of a service much superior to the present standard.

Alternative D—True High Speed Rail. Alternative D represents the best service possible with advanced steel-wheel-on-steel-rail rolling stock and motive power, using essentially new right-of-way. It uses a new alignment and advanced HSR technology modeled after the French TGV or Japanese Bullet Train, but realistically adapted to Pennsylvania topography to avoid excessive construction through tunnels or on structures. Three trainsets are candidates:

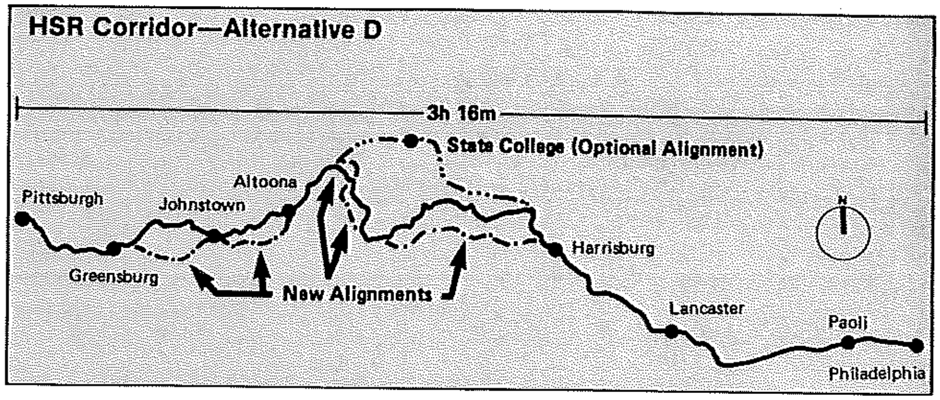
- French TGV (currently operating to as high as 168 mph; the export version intended for the United States would use synchronous alternating-current traction motors in place of the direct-current motors used in France).
- Japanese Series 961 Bullet Train (currently operating at 130 mph and somewhat more powerful than others in the Bullet Train series).
- Proposed German Intercity Experimental (IC-E) train (expected to begin prototype testing in December 1985).

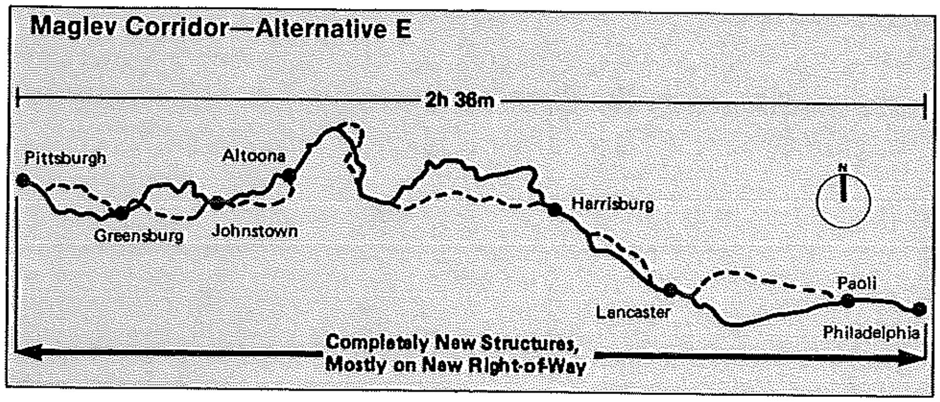
As originally conceived, Alternative D would not have followed the existing Amtrak/Conrail route as much as it does; an analysis of the marginal trip time savings, the high cost, and the large environmental impact of new alignments in urban areas, however, persuaded the study team to propose using the existing right-of-way between Philadelphia and Harrisburg, between Greensburg and Pittsburgh, and in the vicinity of passenger stations; elsewhere it would be new. Electrically powered trains would operate on new, passenger-dedicated trackage at a top speed of 160 mph (180 mph was also analyzed, but grade and curvature severely limit the marginal trip time savings). With six intermediate stops, the 314-mile route would take an estimated 3 hours 16 minutes.

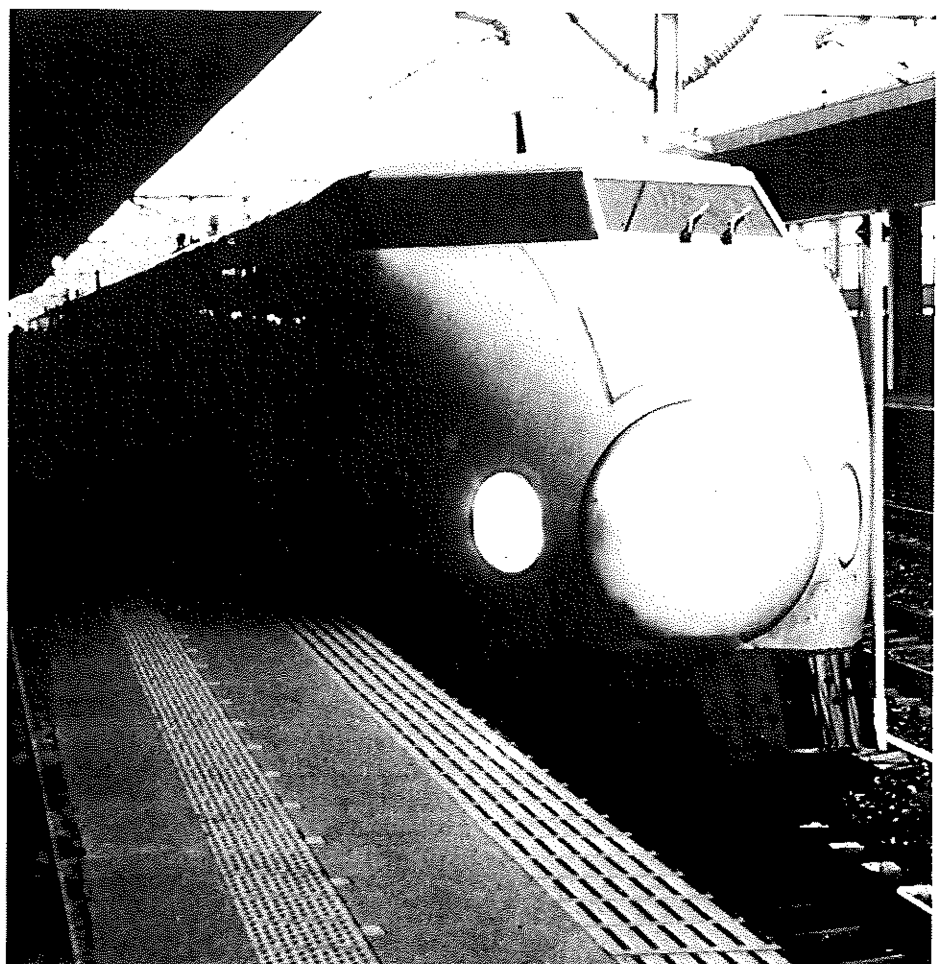
Alternative D—State College. An alternative routing via State College was examined, the only realignment studied for market reasons rather than for trip-time improvement. Although studied as a variant of Alternative D, placing State College on an HSR corridor also could be done with Alternative C or E.

West of Harrisburg, the line would follow the Conrail main line as far as Millerstown, where it would diverge, tunneling through three mountains before emerging into the Nittany Valley. The route would pass south of State College and climb over Bald Eagle Mountain, joining the right-of-way of the former Conrail Bald Eagle Branch a few miles west of Port Matilda. From there, the alignment follows the branch until joining the main line at Tyrone.

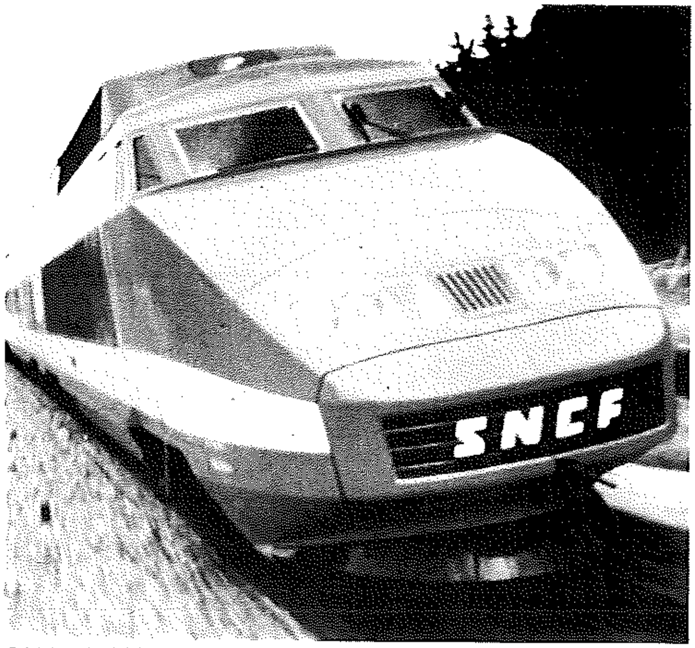
This realignment would add about 5 miles and 10 to 12 minutes to the running time estimated for Alternative D. The cost of routing Alternative D through State College is estimated at $77 million above the base cost for Alternative D. If built as part of Alternative C, it would save about 7 minutes of running time. The cost of routing Alternative C through State College, while not estimated in Phase 1, would be substantial. For Alternative D, the additional market could boost ridership by as much as 650 to 1,690 passengers a day, or 237,250 to 616,850 riders annually.



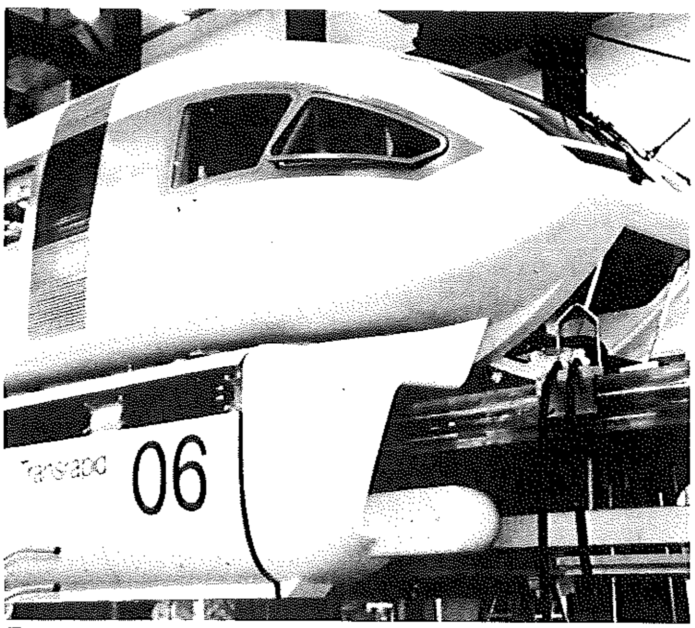




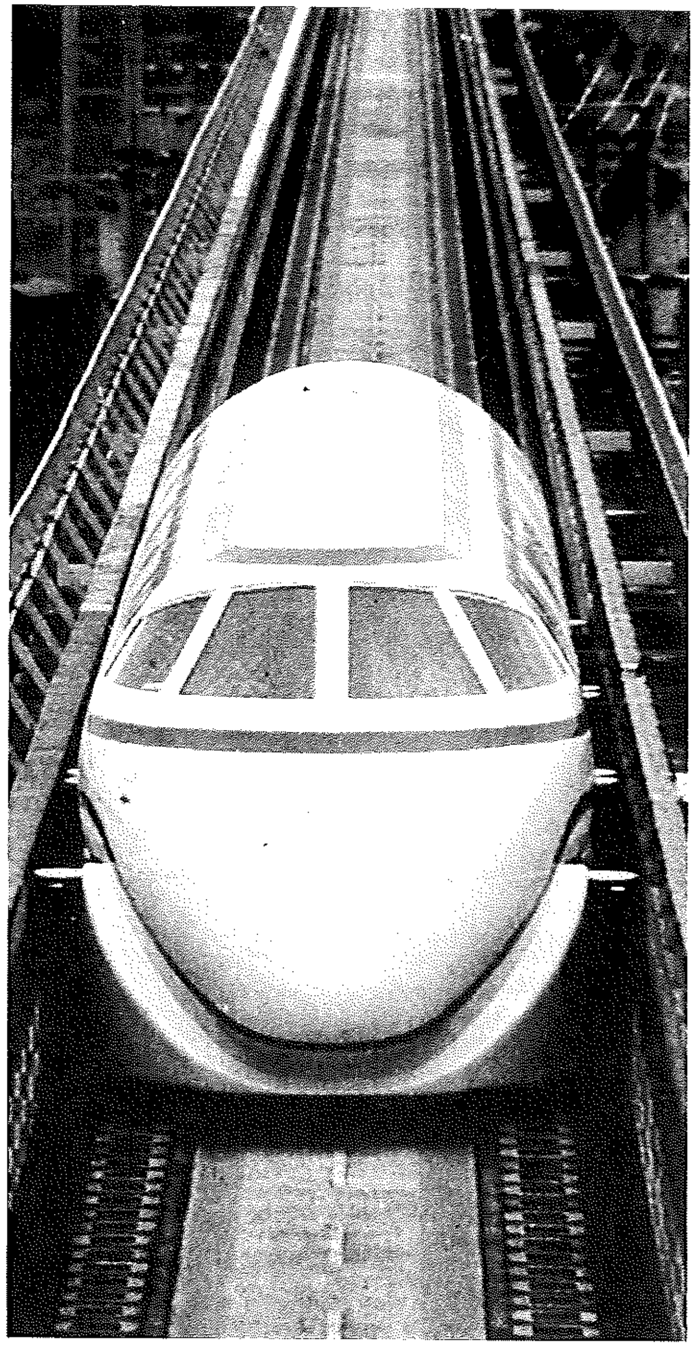
JNR Series 961 Bullet Train (Japan)



SNCF TGV Train (France)



Transrapid 06 Maglev Test Train (Germany)



JNR MLU-001 Maglev Test Car (Japan)

Alternative E—Magnetic Levitation. Alternative E represents the best service possible with magnetic levitation, using a totally new right-of-way. This new very-high-speed system could be modeled after either of two experimental vehicles:

- German attraction maglev, using a T-shaped guideway
- Japanese repulsion maglev, using superconducting coils and a U-shaped guideway.

A new system of guideway would be built within a portion of the existing right-of-way between Philadelphia and Malvern, and on a new right-of-way from there west to Pittsburgh. The guideway would principally be double, but near stations it would return to the existing right-of-way and become single. A full double guideway would be impractical in narrow rights-of-way through cities. Elevating the guideway when crossing sensitive areas such as farmland would permit continued use of the surrounding land. Tunneling and earthwork can be minimized because maglev can negotiate steeper grades than steel-wheel HSR systems (the study assumed use of 6 percent grades, though steeper grades are possible). Maglev acceleration and maximum speed are high enough that route length (313 miles) becomes a secondary issue, and straightness of primary concern. Speeds as high as 250 mph would be practical, providing an estimated trip time of 2 hours 36 minutes if all station stops are made.

Infrastructure Component Summary

Item	Alternative C	C-Electric	D	E
Track	Upgraded existing 2 tracks (Philadelphia-Harrisburg) 1.5 new tracks (Harrisburg-Pittsburgh) (wood ties)		Entirely new double (concrete tie) track	New guideway
Maximum Track Super-elevation/Guideway Bank Angle	6"		6"	12°
Maximum Grade	3 percent		3.5 percent	6 percent
Maximum Speed (mph)	110-120		160-180	250
Grade Crossings	Eliminated where feasible		100% eliminated	100% eliminated
Fencing	10% of ROW	10% of ROW & OH Bridge	100% at-grade ROW & OH Bridge	100% at-grade ROW & OH Bridge
Electrification	Not used	Upgraded: Philadelphia-Harrisburg New: Harrisburg-Pittsburgh	Upgraded: Philadelphia-Harrisburg New: Harrisburg-Pittsburgh	All new
Communications & Signals	Upgraded existing	Upgraded: Philadelphia-Harrisburg New: Harrisburg Pittsburgh	All new	All new
Stations	Rehabilitated existing and new (high-level platforms)		Rehabilitated existing and new (high-level platforms)	All new
Maintenance Facilities	All new		All new	All new

COST ESTIMATES

Cost estimates are shown in the table. For a system that would handle a base ridership demand (more conservative estimate), the target estimates range from $1.8 billion for Alternative C to $7.2 billion for D and $10.0 billion for E.

Capital Cost Estimate Summary

Base Demand, 1983 Dollars in Millions

Element	Alternative C	C-Electric	D	D-State College	E
Track/Guideway & Structures	$ 997.7	$ 1,051.1	$ 4,646.4	$ 4,671.1	$ 4,304.2
Stations	31.7	31.7	40.8	45.1	48.6
Electrification, Communications & Signaling	128.6	325.9	384.1	412.3	2,678.2
Maintenance Facilities	50.2	55.5	61.8	61.8	105.5
Subtotal 1	$ 1,208.3	$ 1,464.2	$ 5,133.1	$ 5,190.3	$ 7,136.5
Engineering & Construction Management @ 18%	217.5	263.6	924.0	934.3	1,284.6
Subtotal 2	$ 1,425.8	$ 1,727.8	$ 6,057.1	$ 6,124.6	$ 8,421.1
Contingency @ 15%	213.9	259.2	908.6	918.7	1,263.2
Subtotal 3	$ 1,639.7	$ 1,987.0	$ 6,965.7	$ 7,043.3	$ 9,684.3
Vehicles (Including Test @ 10% & Contingency)	205.2	216.8	203.3	203.3	339.8
Target Cost Estimate	$ 1,844.9	$ 2,203.8	$ 7,169.0	$ 7,246.6	$ 10,024.1
Additional Contingency @ 25% of Subtotal 2	356.4	432.0	1,514.3	1,531.2	2,105.3
Maximum Cost Estimate	$ 2,201.3	$ 2,635.8	$ 8,683.3	$ 8,777.8	$ 12,129.4

BENEFITS

Transportation Benefits. HSR brings shorter trip times—as low as 2½ hours end-to-end for Alternative E (maglev). Riders also benefit from the greater choice of arrival and departure times and the generally better service than that available today. The better the service and the more advanced the HSR system, the more riders attracted: Alternative C is estimated to draw an annual base demand of 4 million passengers, Alternative E nearly 6 million.

Time savings are fundamental. Over the years, the dollar value of these time savings could equal the

Operating and Maintenance Costs
Base Demand, 1983 Dollars in Millions

Item	Alternative C	C-Electric	D	E
Track/Structures				
Labor	$ 15.64	$ 15.64	$ 19.78	$ 21.07
Material	15.24	15.24	15.40	12.89
Electrical Maintenance				
Labor	--	5.86	6.60	32.77
Material	--	2.77	3.08	21.49
Vehicle Maintenance				
Labor	17.73	9.57	15.84	11.64
Material	8.82	4.68	8.77	8.61
Station Operation & Maintenance				
Labor	5.92	5.92	6.95	9.91
Material	1.00	1.00	1.20	1.50
Signals & Communications Maintenance				
Labor	7.84	7.84	6.60	(Incl. in
Material	2.77	2.77	3.70	Elect.)
Train Operations				
Vehicle Crew	9.81	8.19	9.55	8.69
Power	8.17	10.98	11.41	18.74
Central Operations & Administration				
Operations Schedule	1.55	1.55	1.55	1.55
Administration	3.89	3.68	4.44	5.44
Material & Services	6.09	5.93	5.91	7.91
Insurance	1.71	1.71	1.97	2.43
Security	1.44	1.44	1.44	1.44
TOTAL	$107.62	$104.77	$124.19	$166.19

Selected Train Parameters

Parameter	Alternative C		C-Electric		D		E
Equipment Type	HST	Lightweight LRC	AEM7/ Amfleet	Electric LRC	TGV	961	TR-06
Proposed Base Case Train Consist	1-8-1	1-6-1	1-6	1-6-1	1-11-1	8	6
Train Weight (Tons) Fully Loaded *	395	560	430	500	640	605	375
Horsepower	4,500	7,000	7,000	12,000	8,650	11,800	13,200
Hp/Ton	11.4	12.5	16.3	24.0	13.5	19.5	35.2
Seating Capacity +	396	480	480	480	524	520	600
Assumes Maximum E_u (in)	4.5	9	4.5	9	4.5	4.5	3

* Weights of all foreign equipment include structural modifications thought to be required to meet U.S. requirements (Based on IPEEP).

\+ Seating capacity based on Amfleet seating density for all but the TR-06 (Maglev) vehicle.

system's capital costs—in as little as 4.8 years for the lowest-cost Alternative C or 12.4 years for Alternative D and maglev (Alternative E), which save more time for more people, but also cost more.

Less favorable assumptions for ridership demand and for the value of time require longer payback periods, from 36.4 years (C) to 85.7 years (E), but in all cases, the value of time savings is a benefit to riders that could compensate public support.

Economic Benefits. Beyond these transportation benefits, HSR would boost employment, personal income, the gross state product, and state tax revenue.

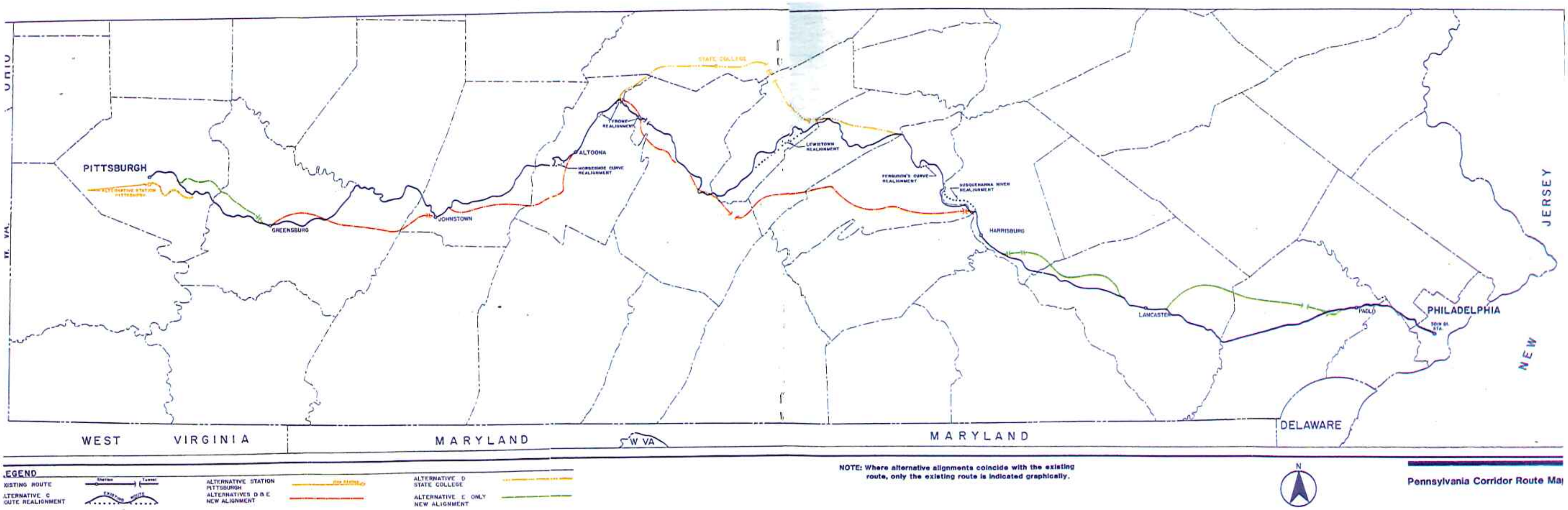
Unemployment is a key issue for Pennsylvania, as noted in the State Planning Board's 1980 *Choices for Pennsylvanians*:

> In Pennsylvania, the lack of sufficient jobs is one of the most severe problems facing us today. During the last 10 years, the Commonwealth has lost 190,300 manufacturing jobs. . . . Hardest hit have been the cities and towns that once relied on factory and service workers for support of their economic base. Fewer people with fewer dollars has meant less business for the retail establishments and less municipal revenue for the communities of Pennsylvania.

These negative trends have continued since the 1980 report. HSR could provide:

- From 58,000 to 292,000 person-years of employment (for Alternatives C and E, respectively), or 7,000 to 24,000 jobs on average for each year of the construction period.
- New permanent employment once operation begins—8,300 jobs under Alternative C by the year 2000; 12,500 jobs under Alternative E.
- Increases in the employment growth rate of from 20 to 68 percent during construction years and from 23 to 35 percent when service begins.

Naturally, the more money spent on the system, the greater the returns, particularly during the construction period (8, 10, or 12 years for Alternatives C, D, and E, respec-



Pennsylvania Corridor Route Map

System Features

Item	Alternative			
	C	C-Electric	D	E
	Improved Existing	Improved Existing (Electrified)	HSR	Maglev
Alignment	Base case: Existing route with 5 route realignments & 44 curve realignments		Existing Route: Philadelphia-Harrisburg and Greensburg-Pittsburgh New Route: Harrisburg-Greensburg	Existing Route: Philadelphia-Malvern New Route: Malvern-Pittsburgh
Track	Upgraded existing 2 tracks: Philadelphia-Harrisburg; 1.5 new tracks: Harrisburg-Pittsburgh (wood ties)		Entirely new double track (concrete tie)	New Guideway
Traffic Separation	Designated passenger tracks		Dedicated HSR	Dedicated
Maximum Effective Curve Elevation*	Up to 15" (6" E_a + 9" E_u)		Up to 10.5" (6" E_a + 4.5" E_u)	Up to 14.5" (12° bank angle + 3" E_u)
Maximum Grade	3 percent		3.5 percent	6 percent
Maximum Speed, mph	110 to 120		160 to 180	250
Grade Crossings	Eliminated where feasible		100% eliminated	100% eliminated
Fencing	10% of ROW	10% of ROW & overhead bridges	100% At-grade ROW & overhead bridges	100% At-grade ROW & overhead bridges
Electrification	Not used	Upgraded: Philadelphia-Harrisburg; New: Harrisburg-Pittsburgh	Upgraded: Philadelphia-Harrisburg; New:Harrisburg-Pittsburgh	All new
Signals & Communications	Upgraded existing	Upgraded: Philadelphia-Harrisburg; New: Harrisburg-Pittsburgh	All new	All new
Stations	Rehabilitated existing and new (high-level platforms)		Rehabilitated existing and new (high-level platforms)	All new
Maintenance Facilities	All new	All new	All new	All new
Equipment Type	Diesel trainset (tilt-body or conventional)	Electric trainset (tilt-body or conventional)	High-speed electric train	TR-06 or MLU-001 type train

* Maximum Effective Curve Elevation is defined as the sum of track superelevation (actual elevation, E_a) and unbalanced elevation (E_u).

Potential Payback from Time Savings

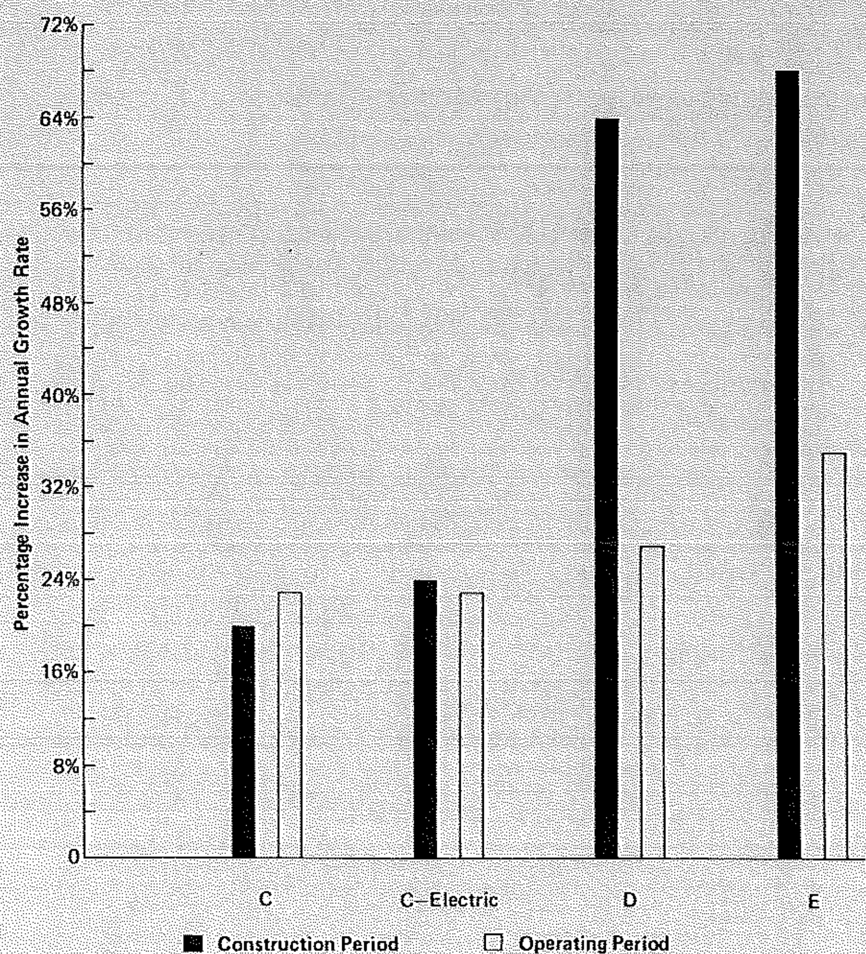
ALTERNATIVE	Demand	PAYBACK PERIOD, YEARS Case A	Case B
C	Base	11.6	36.4
D	Base	27.3	85.7
E	Base	25.6	80.5
C	High	4.8	15.1
D	High	12.4	39.0
E	High	12.4	38.9

Typical Trip Times

	ALTERNATIVE				
	Existing	C	C-Electric	D	E
	TIME (MIN)	TIME (MIN)	TIME (MIN)	TIME (MIN)	TIME (MIN)
Philadelphia – Paoli	23	19	18	19	16
Paoli – Lancaster	40	31	30	30	19
Lancaster – Harrisburg	32	23	23	24	16
Harrisburg – Altoona	145	79	76	55	53
Altoona – Johnstown	58	29	27	21	17
Johnstown – Greensburg	52	32	31	21	16
Greensburg – Pittsburgh	40	25	25	26	19
Time, Total Route (hr:min)	390 (6:30)	238 (3:58)	230 (3:50)	196 (3:16)	156 (2:36)
Route Length, miles	352.0	340.1	340.1	314.3	312.9
Average Speed, mph	54	86	89	95	120

NOTE: Times include 90 sec dwell at all intermediate station stops.

Impact of HSR on Employment Growth Rate
Base Demand



Annual Ridership Summary
Year 2000 (thousands)

	Base Demand	High Demand
Alternative C		
Estimated Riders	4,183	10,256
Additional (Atlantic City)	32	77
Additional (Mid-State Resort)	110	430
Total	4,325	10,763
Alternative D		
Estimated Riders	5,146	11,676
Additional (Atlantic City)	43	74
Additional (Mid-State Resort)	110	430
Total	5,299	12,180
Alternative E		
Estimated Riders	5,866	12,658
Additional (Atlantic City)	51	87
Additional (Mid-State Resort)	130	500
Total	6,047	13,245

tively). Most of the money spent would stay in Pennsylvania—70 percent during construction and a continuing 80 percent after operation begins.

All alternatives provide the state government with additional financial resources that could assist in financing HSR, stemming solely from the existing tax structure:

- $12 million to $41 million per year during construction
- $13 million to $19 million per year during service, base ridership demand—or $18 million to $26 million, high ridership demand.

These additional tax revenues represent 1 percent or less of total current state government revenues, but boost the projected annual growth rate by as much as 31 percent. The additions could finance part of the HSR system's construction or operation, should the Commonwealth decide to make a financial commitment to the system. Costs to state government may decline modestly by the reduction in expenditures for new construction and for maintenance in other modes of transportation, and by the reduction in unemployment and associated public costs.

Urban economic development could be enhanced and downtown areas revitalized. New employment and greater personal income could be felt all along the route. How each city handles the fostering of development can make for differences among the cities. So can sheer size. The large urban areas have more heavy construction and railroad supply industries than the smaller ones and can capture larger percentages of Pennsylvania's share of construction costs: the Philadelphia Standard Metropolitan Statistical Area can capture 22 percent, Pittsburgh (including Greensburg) 28 percent. During both construction and operation, the larger general economies can also absorb more of the multiplier effect as new income is spent in the community. Proportionally, however, the smaller urban areas—Altoona, Harrisburg, Johnstown, and Lancaster—can look for equal or greater benefits relative to their smaller overall economies. Each city's success will depend on its own development policies and basic economic vitality, but HSR can become a strategic spur to growth.

Summing up, economic impacts to Pennsylvania of an HSR corridor could include:

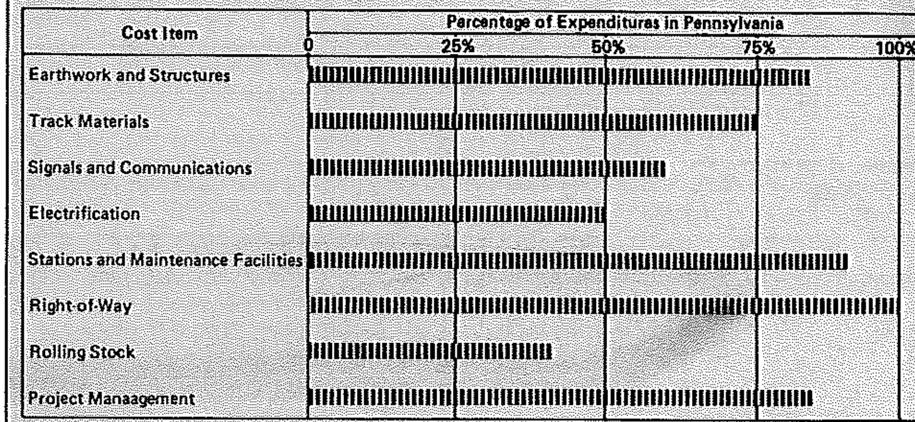
- $145 million to $415 million of new, direct expenditures annually during construction
- $115 million to $175 million annually during operation
- Total economic impacts over the 8- to 12-year construction period, including the multiplier effects of successive rounds of spending (approximately three times the size of the direct effects):
  - Between $3.9 billion and $22.7 billion in total expenditures for goods and services
  - Between $1.2 billion and $6.1 billion in gross state product
  - Between $1.0 billion and $5.2 billion in total personal income
  - Between 58,000 and 292,000 person-years of employment.

Relative Benefits of Alternatives. All the alternatives offer benefits, and in general, the greater the costs, the greater the benefits. Economic benefits correspond closely to costs, but transportation benefits begin to give less return per dollar at the highest costs. This behavior is typical of transportation projects: each additional minute of time savings costs more to achieve than the previous minute.

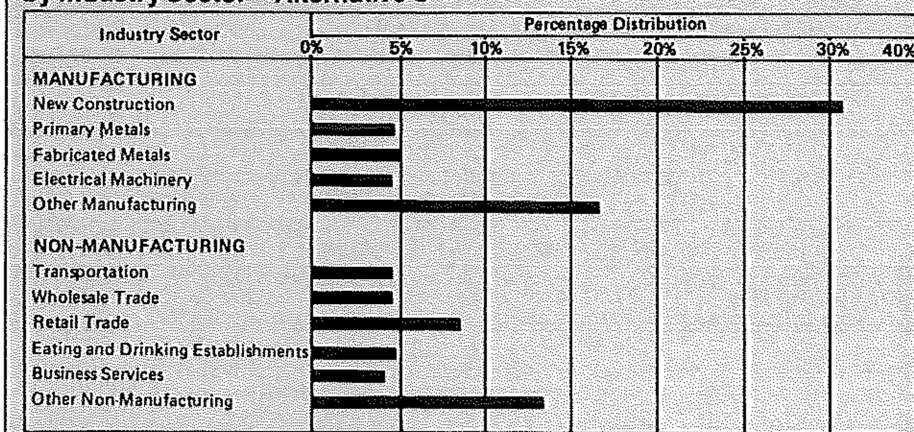
For producing transportation benefits, Alternatives D and E generate more total benefits than Alternative C, but at more than proportionately greater cost. For economic benefits, however, all are approximately equally efficient in generating benefits from costs.

Return on Investment. HSR could pay for its own operation. Sources of revenue include both fares and "other revenues"—associated business enterprises such as package service; baggage and mail fees; charter services to special events; auxiliary revenue from station concessions and advertising; and the rental of space in stations. From these are subtracted the costs of travel agent commissions, food-service losses on the trains, and advertising. Calculated this way, revenues for the first year of opera-

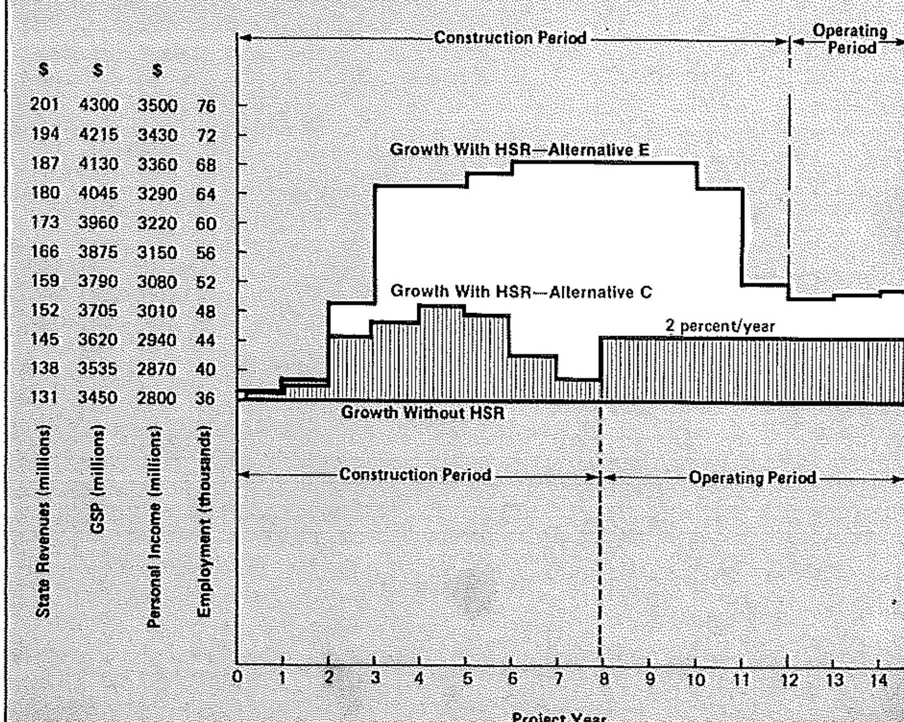
Pennsylvania's Estimated Share of Construction Expenditures



Distribution of Construction Period Impacts by Industry Sector—Alternative C



Impact of HSR on Economic Growth
Base Demand



Statewide Construction Period Impacts

Economic Indicator	Alternative C	C-Electric	D	E
Capital Cost, millions	$ 1,845	$ 2,204	$ 7,169	$10,024
Number of Construction Years	8	8	10	12
Peak Year Expenditures	23%	23%	17%	11%
Pennsylvania Capture Rate	71%	70%	72%	66%
Employment Impact				
Direct, person-years	18,000	22,000	75,000	97,000
Total, person-years	58,000	67,000	232,000	292,000
Percent Increase in Pennsylvania Growth Rate	20%	24%	64%	68%
Personal Income				
Direct, millions	$ 400	$ 500	$ 1,500	$ 2,000
Total, millions	$ 1,000	$ 1,200	$ 4,100	$ 5,200
Percent Increase in Pennsylvania Growth Rate	4%	5%	14%	15%
Gross State Product, millions	$ 1,200	$ 1,400	$ 4,900	$ 6,100
Percent Increase in Pennsylvania Growth Rate	4%	5%	14%	15%
State Tax Revenues, millions	$ 95	$ 110	$ 385	$ 490
Percent Increase in Pennsylvania Growth Rate	9%	10%	30%	31%

Statewide Operating Period Impacts
Base Demand, Year 2000

Economic Indicator	Alternative C	C-Electric	D	E
Annual O&M Cost, millions	$ 108	$ 105	$ 124	$ 166
Annual Ridership, millions	4.2	4.2	5.1	5.9
Employment Impact				
Direct, permanent jobs	4,500	4,400	5,300	6,800
Total, permanent jobs	8,300	8,100	9,600	12,500
Percent Increase in Pennsylvania Growth Rate	23%	23%	27	35%
Personal Income				
Direct, millions	$ 85	$ 85	$ 100	$ 125
Total, millions	$ 140	$ 140	$ 160	$ 205
Percent Increase in Pennsylvania Growth Rate	5%	5%	5%	7%
Gross State Product, millions	$ 165	$ 160	$ 190	$ 245
Percent Increase in Pennsylvania Growth Rate	5%	5%	5%	7%
State Tax Revenues, millions	$ 13	$ 13	$ 15	$ 19
Percent Increase in Pennsylvania Growth Rate	10%	10%	11%	15%

tion are expected to fall within the following ranges:

- Alternative C—$113.92 million to $289.73 million
- Alternative D—$141.77 million to $322.16 million (or from $153.68 million to $347.18 million if State College is added)
- Alternative E—$181.92 million to $389.39 million

A creative and flexible combination of public and private support may be workable for HSR. Each stage in the project has peculiar features affecting financing and taxes: the project might evolve in stages from public to public-private ownership and control, drawing on the special tax and financing advantages of each. Private investors will require a direct return on investment commensurate with the perceived risk in developing the system. At this stage in the study it appears that all the alternatives would return enough revenue to cover operating costs, with Alternative C providing the highest internal rate of return on investment. If capital costs must also be covered from revenues alone, private investors might need added incentives, particularly for the more expensive and higher-risk alternatives. Such alternatives, with their greater total public benefits but only somewhat greater cash revenues, are more suitable to a public financing viewpoint. When such benefits as employment and supplementary economic development are considered, a strong justification for public financial support of an HSR project could be made.

No new transportation system of this magnitude can be developed entirely risk-free. Some uncertainties must be associated with any piece of new construction on new right-of-way—which is extensive in Alternatives D and E. No system was considered in this study, however, that had not proven its technological feasibility. Alternative C uses essentially time-tested technology, except for the carbody tilt system. Alternative D also has a significant service record, but it has a greater implementation risk than C because it requires more new construction and greater care in building and maintaining track to close tolerances. Maglev has been proved as a functioning principle, but not in high-speed revenue service.

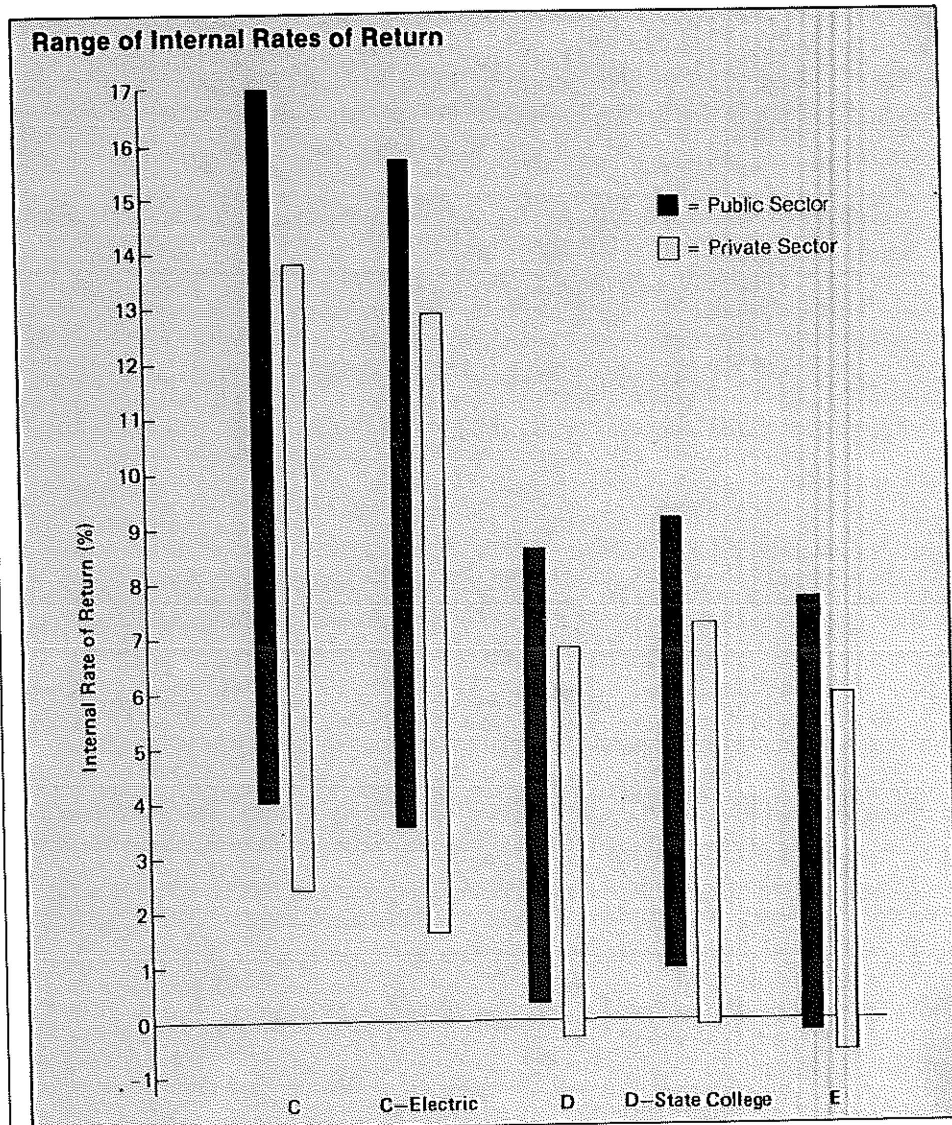
Particularly for maglev, private investors will require a higher rate of return than for a risk-free investment. At present, it appears that only Alternative C surpasses the risk-free rate of 9 percent, and then only from ridership above the base-demand conditions. It therefore seems likely that public policy, rather than investment profitability, will decide the level of support for HSR. As the study continues, public policymakers must eventually decide whether benefits themselves—time savings, greater economic impact—should be maximized, as in Alternatives D and E, or the efficiency of achieving those benefits (Alternative C).

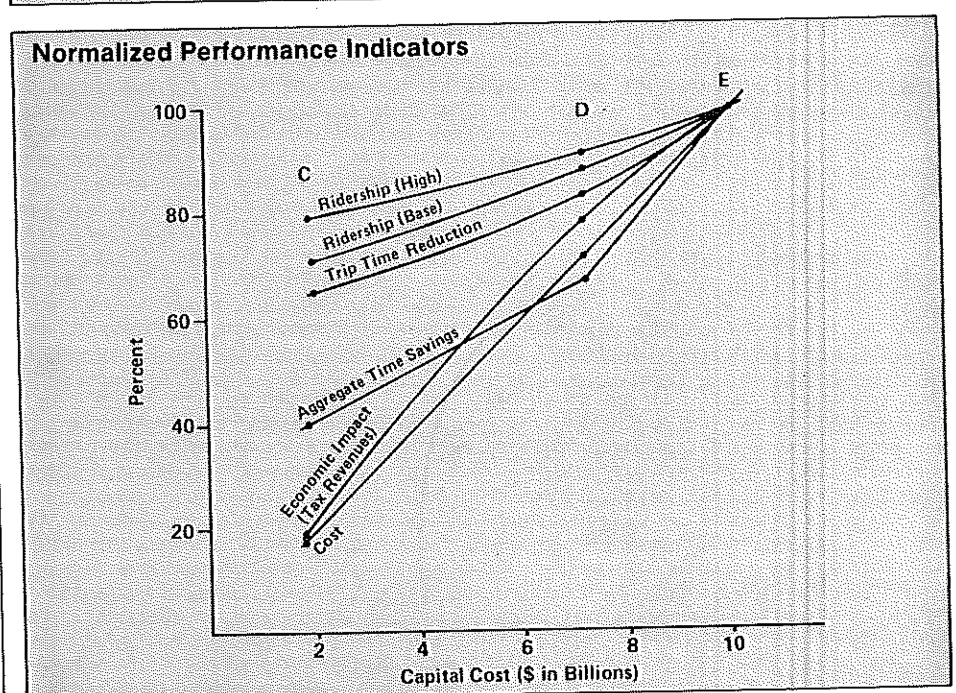
The alternatives so far considered are only first approaches. Later stages of the study will modify them, perhaps gaining important financial advantages. It is likely that vendors of equipment would offer support through loan guarantees as a way of penetrating a new market and gaining a showcase for their equipment. Adding State College to the route could raise ridership; innovative financing can also be explored, including such approaches as Florida's plan for financing transportation by allowing private investors to share in the profits of land development spurred by the new travel corridor.

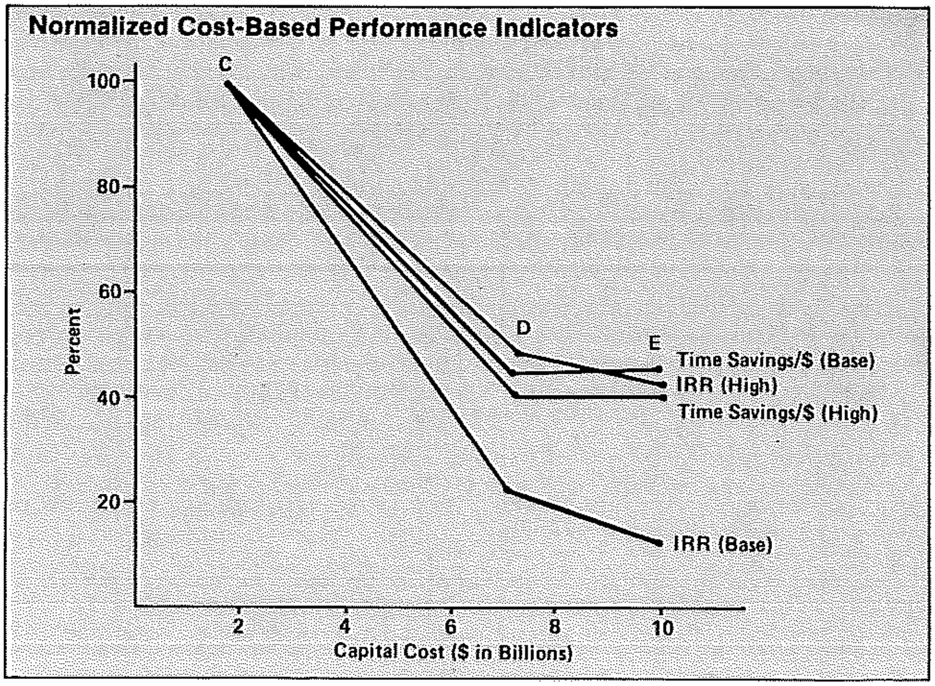
ENVIRONMENTAL IMPACT

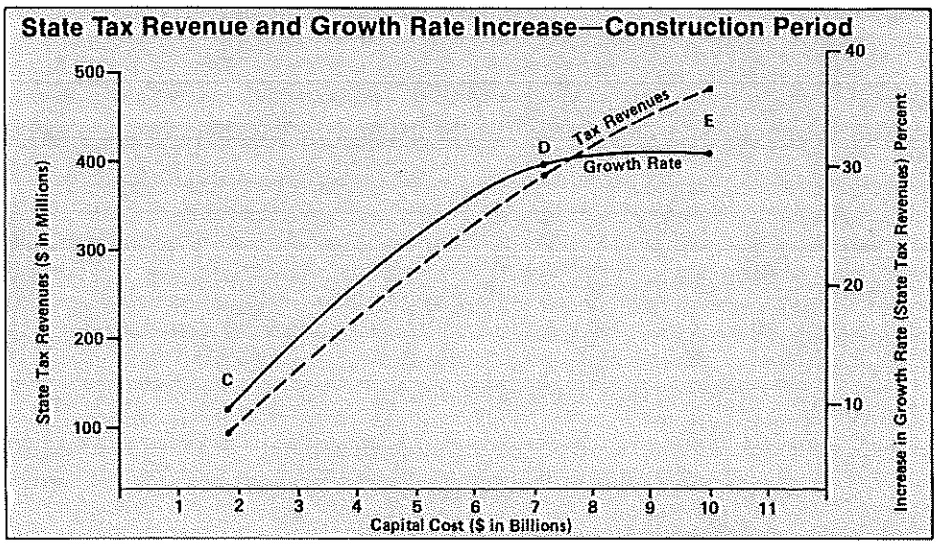
HSR will be a good neighbor. Rail in general requires only a thin strip of land to provide efficient transportation on a large scale. In virtually all categories—land required, energy consumption, noise, vibration, air pollution, and aesthetic intrusion—railroads are recognized as potentially less damaging to the environment than freeways or airports.

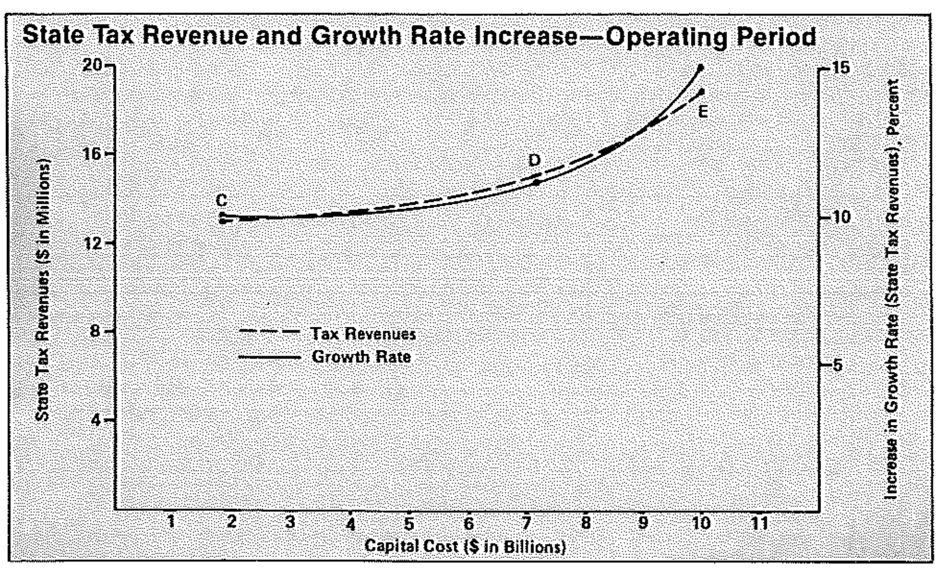
Land Use. For the Pennsylvania HSR line, major wetlands and state parks seem, in this preliminary overview, little affected by the planned route, except that Alternative E crosses one corner of Marsh Creek State Park in Chester County. Much of any new right-of-way will necessarily cross tracts of farm and forest that will need sensitive treatment,









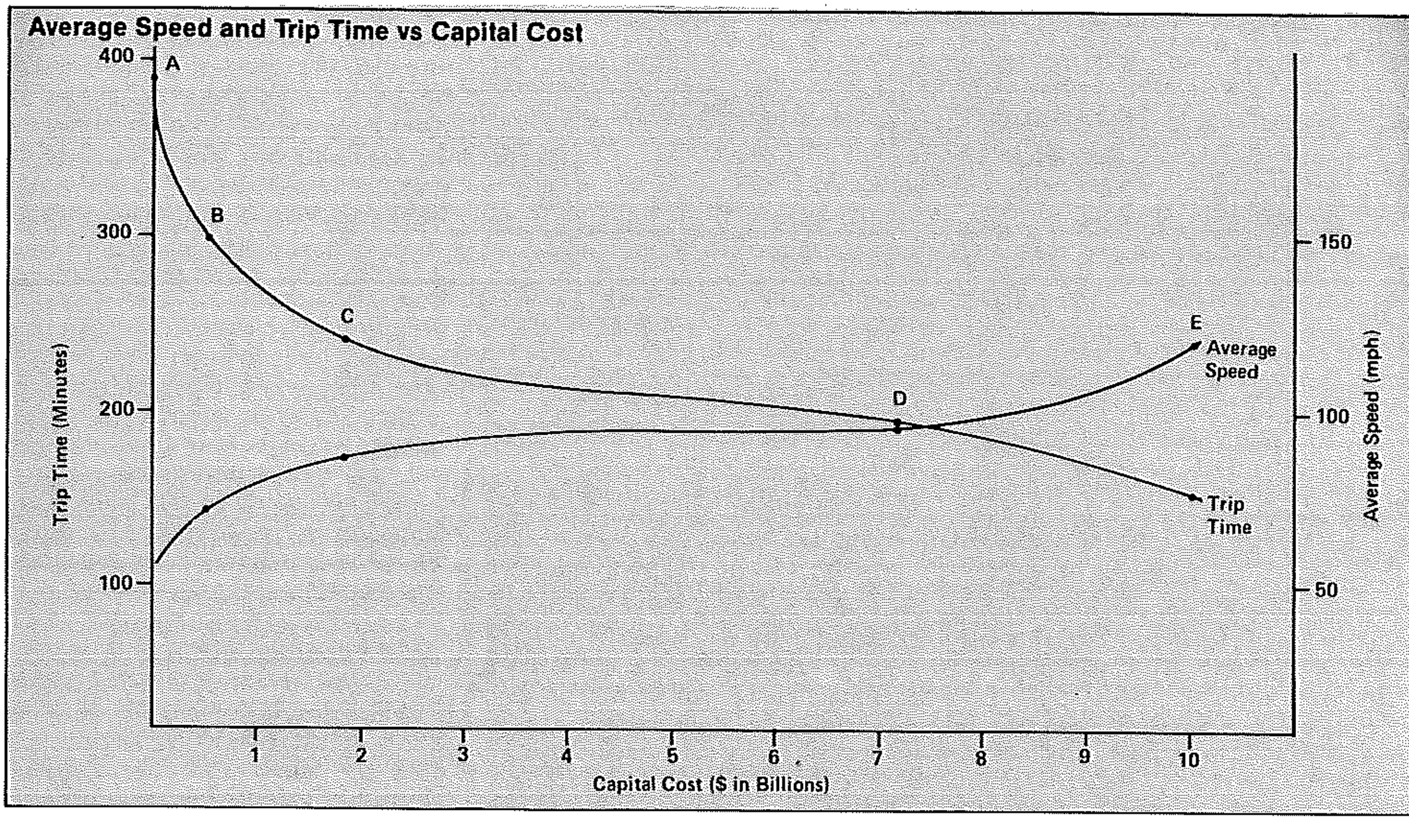


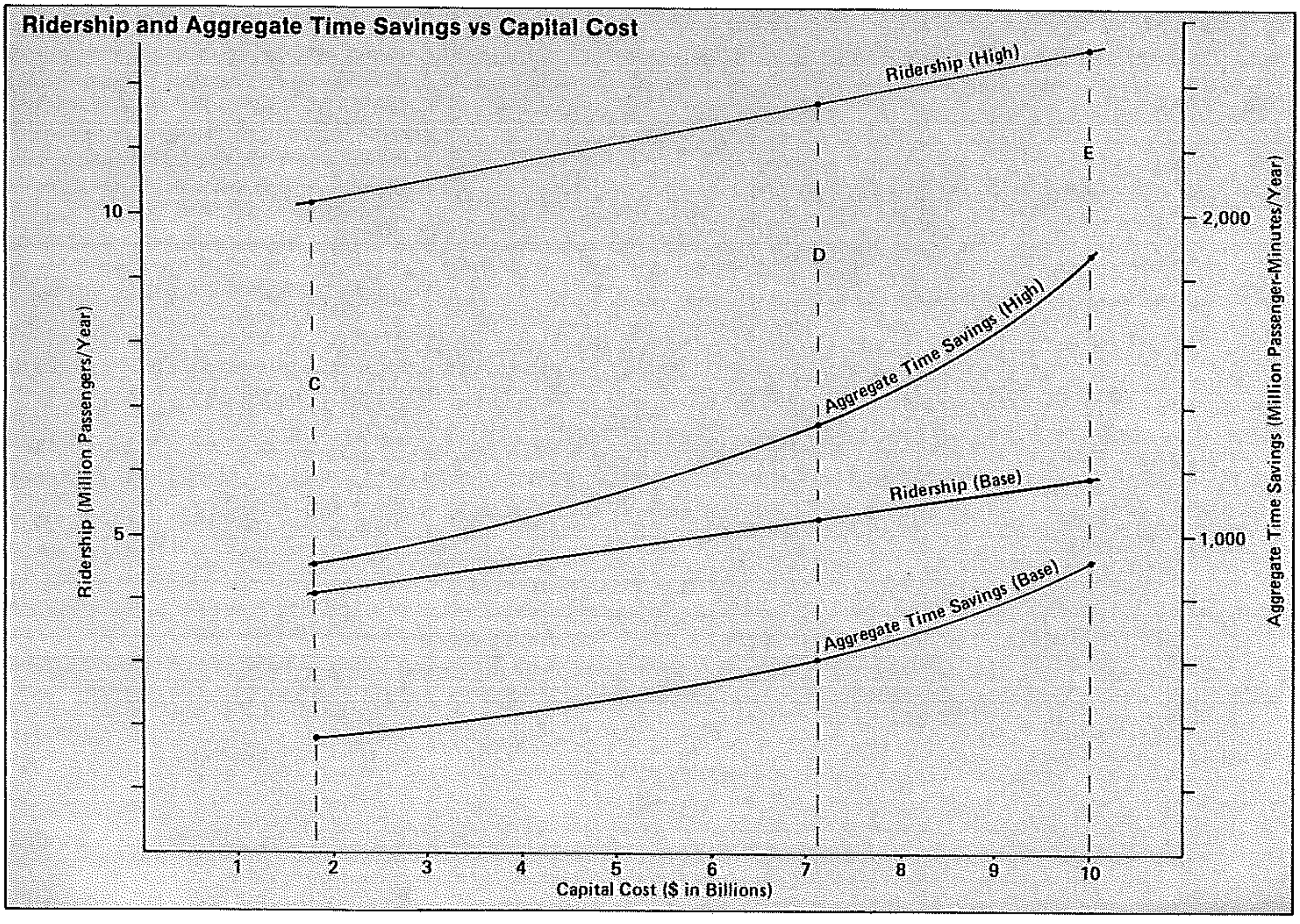
perhaps including elevated sections to allow agriculture on prime lands to continue uninterrupted. Historical sites near or within the rail system itself—such as Rockville Bridge, Horseshoe Curve, and certain stations, will require particular care.

Noise. Steel-wheel HSR trains are free from much of the noise of ordinary rail because of smoother track and electric propulsion. Maglev creates no wheel/track noise or vibration once it attains its lift-off speed. At high speed, all designs produce aerodynamic sounds that sometimes require noise control, as has been routinely provided in Japan wherever the Shinkansen traverses residential areas.

Health and Safety. The maglev alternative will need special study to determine whether magnetic fields pose any problems to riders or to people living nearby—if so, shielding can be provided. Both the German and Japanese test programs are investigating this issue. As for safety, well-maintained and -operated rail systems have excellent safety records (a tenth the fatality rate of automobiles), and Japan's Shinkansen shows that high speed rail can be astoundingly safe—20 years without a fatality or serious injury to passengers.

Environmental Program. While the environmental impact of any HSR alternative is not expected to be severe, Alternative C, which requires building only 50 miles of new route, would likely cause less environmental disruption than D (154 miles of new route) or E (238 miles). Any project stretching from one end of the state to the other will have substantial effects and will require early incorporation of mitigation measures into the project design. Similar problems at several sites can be handled collectively without expensive site-by-site solutions. In this process, all appropriate agencies and groups would be consulted. Developing a single programmatic environmental impact statement, supplemented by site studies as required, can simplify the gaining of environmental approvals, as compared to attempting numerous studies of individual


Average Speed and Trip Time vs Capital Cost
400
300
200
100
A
B
C
D
E
Average Speed
Trip Time
150
100
50
Trip Time (Minutes)
Average Speed (mph)
1 2 3 4 5 6 7 8 9 10
Capital Cost ($ in Billions)


Ridership and Aggregate Time Savings vs Capital Cost
10
5
2,000
1,000
Ridership (High)
Aggregate Time Savings (High)
Ridership (Base)
Aggregate Time Savings (Base)
C
D
E
Ridership (Million Passengers/Year)
Aggregate Time Savings (Million Passenger-Minutes/Year)
1 2 3 4 5 6 7 8 9 10
Capital Cost ($ in Billions)

aspects of the system. Financing the project without federal support would mean that for the most part, only state agencies would have to approve the project, which could save approval time.

JAPAN AND FRANCE—TWO SUCCESS STORIES

Japan and France both run HSR lines at a profit. Both have extended their systems to new lines without any guarantee of achieving the financial successes of the first—France in pursuit of a public policy that insists on a vigorous passenger rail network, Japan as part of a decentralization policy to check the steady gravitation of population to a few main cities. Japan initiated its first line in the densely populated Tokyo-Osaka corridor (2,600 persons per square mile), where rail demand already exceeded the capacity of the existing system, but then extended it to much less densely populated corridors. France succeeded without such a dense population in the Paris-Lyon corridor (500 persons per square mile), and is now extending service to even less dense corridors.

The HSR concept has succeeded: the initial line of the Japanese system has operated profitably and fatality-free for more than 20 years. Pennsylvania can learn from these systems that success is possible, but must develop its own specific formula to achieve this goal.

ACTION

The fundamental questions raised at this stage of the study and for which guidance of the Commission is required to undertake the next phase are:

- Which technology should be given further study for potential application in Pennsylvania—the various steel-wheel high speed rail technologies, or magnetic levitation?
- If steel-wheel technology is selected for further study, should the focus be on essentially existing rail rights-of-way (Alternative C and C—Electric) or on a largely new right-of-way such as Alternative D?

Whatever decisions are made will affect the Commonwealth for many generations to come, as have previous choices such as the decision to build the Pennsylvania Turnpike—a real success story.

Alternative Evaluation Summary

	C	D	E
Name of Alternative	Improved existing	HSR	Maglev
Equipment type	Tilt body	Electric HSR	Maglev
Route Length (miles)	340.1	314.3	313
Miles of New Route	50	154	238
Percent at grade	90	73	67
Percent elevated	9	23	30
Percent tunnel	1	4	3
Trip time (hours:min)	3:58	3:16	2:36
Ridership (millions/year)			
Base Demand	4.18	5.15	5.87
High Demand	10.26	11.68	12.66
Capital Cost ($ in billions)			
Base Demand	1.84	7.17	10.0
High Demand	1.88	7.21	10.1
Internal Rate of Return (%) (Public Sector)			
Base Demand	4.7	1.0	0.5
High Demand	14.7	7.1	6.2
Employment Impact			
Construction Period (person-years)	18,000	75,000	97,000
Operating Period Jobs	8,300	9,600	12,500
Increase in Pa. Growth Rate (%)	23	27	35
State Tax Revenues ($ in millions)			
Construction Period, Total	95	385	490
Operating Period, Annual	13	15	19
Environmental Impact	Probably not significant	Significant but can be mitigated	Significant but can be mitigated
Implementation Risk	Lowest	Medium	Highest
Compatible (with potential through service)	Yes	Yes	No

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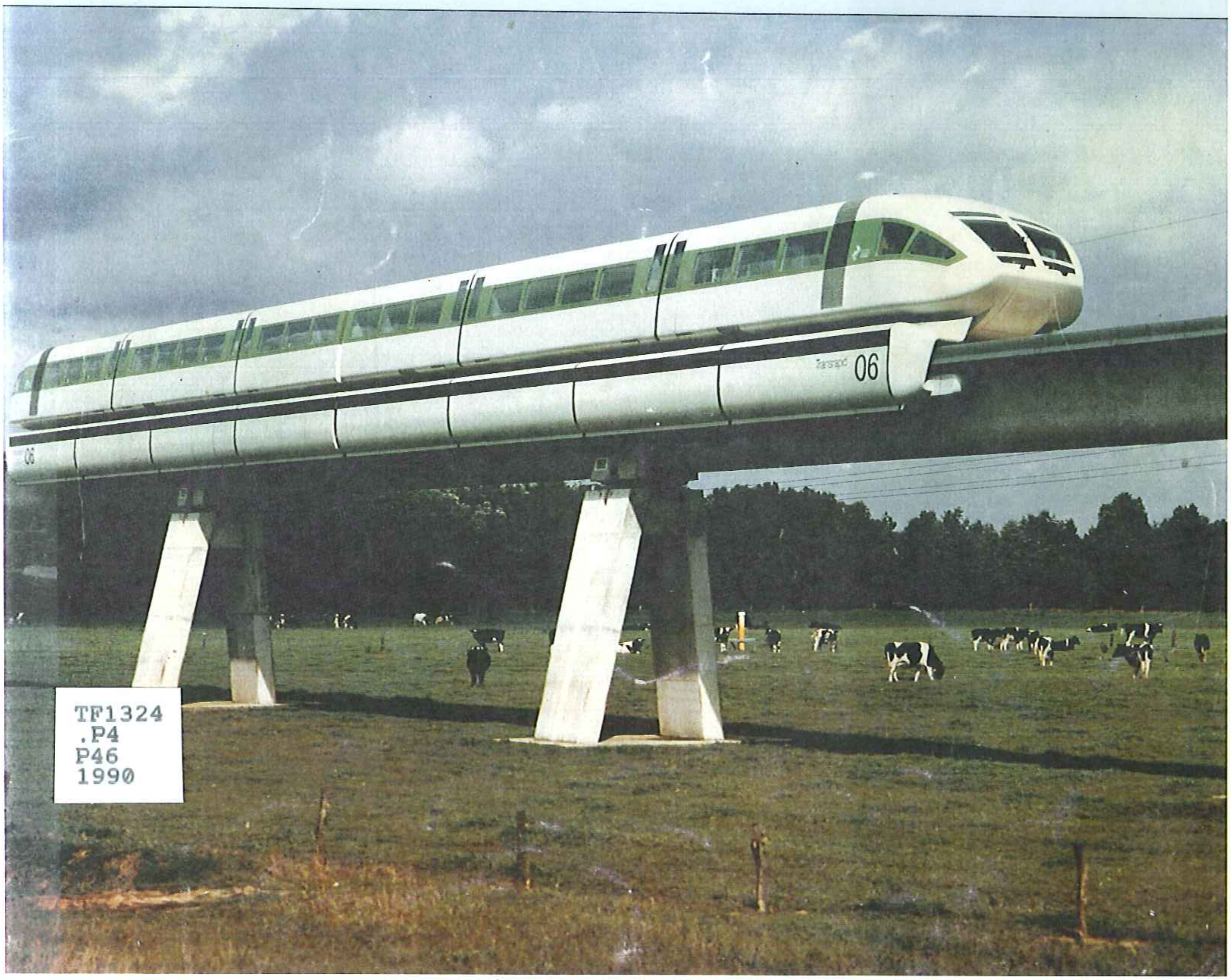
New York, NY 10119

Attachment B

Pennsylvania High Speed Intercity Rail Passenger Commission Final Report

Executive Summary



Pennsylvania High Speed Intercity Rail Passenger Commission

(Established 1983, Expired Dec. 31, 1987)

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Vice Chairman
Senator J. Barry Stout (D) Bentleyville

Secretary
Representative Amos K. Hutchinson (D) Greensburg

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Robert A. Patterson, Pennsylvania State University, State College
Kant Rao. Deputy Secretary for Budget, Harrisburg
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Executive Editor
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Assistant Director
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Dottie Ketner

General Engineering Consultant to the Commission

Parsons Brinckerhoff/Gannett Fleming

with

John Bachman — vehicle technology
The Budd Co. — magnetic levitation technology
Dechert, Price & Rhoads — legal and institutional issues, ownership, operations and local coordination
Ernst & Whinney — economic impact policy and investment and financing
Gibbs & Hill, Inc. — power system, signal and communications systems
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Prudential-Bache Securities — public and private financing options
Sofrerail — vehicle technology
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Daniel, Mann, Johnson & Mendenhall

Published by the High Speed Rail Foundation
Hon. Richard A. Geist, Chairman
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This report was prepared by the High Speed Rail Foundation to summarize and update the Final Report of the Pennsylvania High Speed Intercity Rail Passenger Commission. It was edited by Robert J. Casey and reviewed by the following persons: Dan Cupper, who was executive editor of the commission, William Dickhart, consultant to Transrapid International, Hon. Rick Geist, who was chairman, Dottie Ketner, former executive secretary of the Commission, Paul H. Reistrup, who was a member of the Oversight Consultant team, Richard C. Sullivan, who was a member of the Commission, and Joseph Vranich, a consultant who was not part of the Commission or study.

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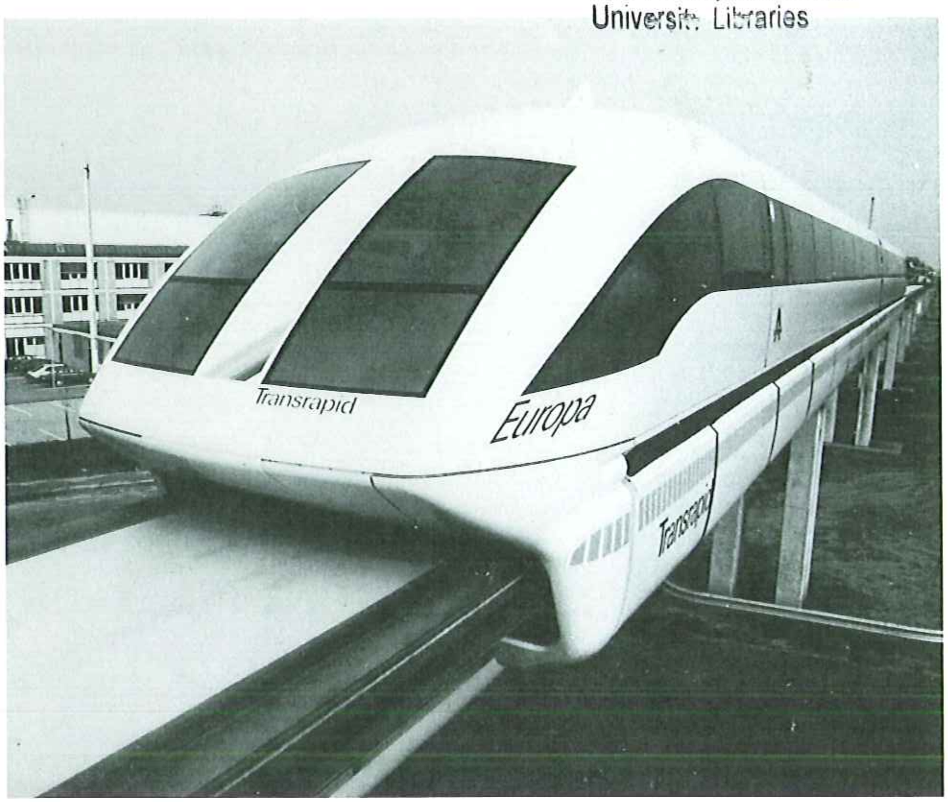
Published in January, 1990



EUROPA, the latest version of the Transrapid International maglev, was introduced in 1989.

RECOMMENDATIONS

1. Magnetic levitation should be the technology of choice for a cross-Pennsylvania high-speed rail system. Advanced steel-wheel technology should be considered an alternative strategy.

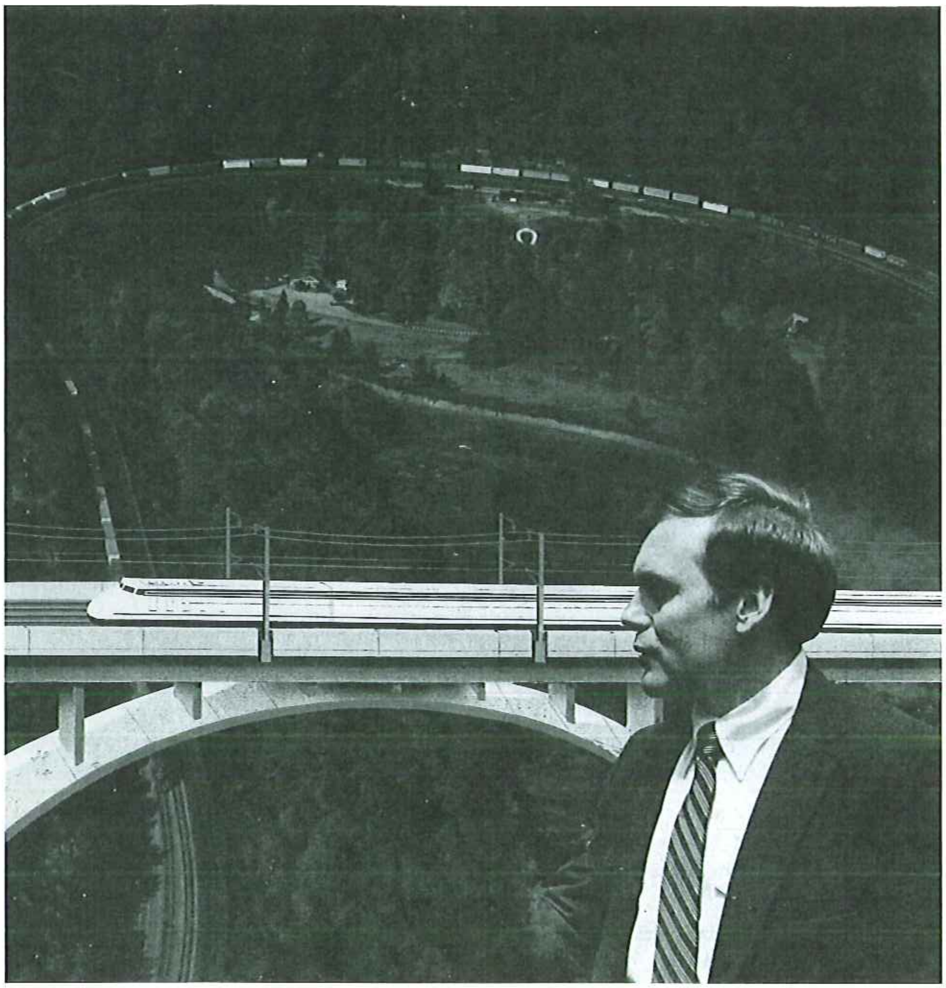
2. The General Assembly should authorize the first steps toward implementation of high-speed rail. (A sample of the consultants' suggested legislative language is included in the final report, but not in this summary.)

3. The Commonwealth should authorize negotiations with the West German consortium, Transrapid International, concerning financial assistance, to determine the nature and extent of that financing and under what conditions it may be extended. This investigation should determine what the actual cost of the construction likely will be; what proportion of that cost likely will be covered, or whether all of it will be covered, by the proposed offshore financial assistance; and what sources are available to make up the difference, if any.

4. At the same time, issues that could not be covered in this commission's final phase of feasibility work should be addressed. Specifically, these include a more cost-effective alignment; a financing plan, including determination of details of the Transrapid proposal; an engineering analysis of the Transrapid proposal; and a final economic impact assessment.

5. If financial assistance fails to materialize to permit implementation of state-of-the-art technology, the Commonwealth should consider alternative strategies, such as building the system in stages or accepting a lower-cost (with correspondingly lower performance and less dramatic economic benefit) technology.*

** While not a formal recommendation of the full commission, this opinion is held by a substantial minority of its members, and it reflects one implementation strategy proposed by the general engineering consultant. Although the commission consistently has favored higher technologies, it has never ruled out pursuit of cost-effective alternatives.*



Rep. Geist at Pennsylvania's famous Horseshoe Curve, with an artist's rendition of a high speed train.

CHAIRMAN'S REPORT

By Representative Rick Geist

Magnetic levitation, the first choice of the Pennsylvania High Speed Intercity Rail Passenger Commission, is "flying without wings."

In the 1950s, the Interstate Highway System was in the center of all transportation planning. The following decade brought the building of airports to a fine art. During the 1970s, subways and local transportation systems began to get the spotlight of public attention.

Now, with the population in urban corridors booming, with increasing air and highway gridlock and environmental problems, and with safety problems in both modes, many states are considering creation of high speed rail systems. These range from upgraded Amtrak service, tilting trains and ones similiar to the Japanese Bullet train and the French TGV all the way to 300 mph magnetic levitation systems.

The Pennsylvania High Speed Intercity Rail Passenger Commission in one of its last official acts voted for magnetic levitation (maglev) as its first choice.

Magnetic levitation vehicles are lifted and propelled along and above a guideway by a wave of magnetic energy. They actually are flying, but because they surround the guideway, they cannot "derail." On December 21, 1979, an unmanned Japanese maglev vehicle reached 321 mph, and on January 22, 1988, a German maglev with passengers on board reached 258 mph. This was the same vehicle that members of the Pennsylvania commission rode two years earlier. High speed rail systems, including maglev, are the safest form of transportation in the world; they are smooth, comfortable, reliable and fast. And speed sells.

The Japanese were the first to prove this. When they built the Shinkansen (New Trunk Line) in 1964, it was the equivalent of the Pennsylvania Turnpike's pioneering highway in its time. With trains traveling at 130 mph, the Japanese "Bullet" proved to be popular and profitable.

Other countries entered the high speed rail field and by 1984, the French TGV (Very High Speed) train was traveling between Paris and Lyons at 170 mph.

Today, new speed records are being established almost every month. But there is another "race." It is a competition among a dozen American states to determine which will be first to have a high speed rail system. The winner undoubtedly will reap many economic benefits, but the others will also gain great economic rewards.

This Executive Summary and the full Final Report of the Commission show without a doubt that a high speed rail system would provide vast economic benefits to our state, as well as a fantastic new transportation system to bring together our two largest cities, the state capitol and a number of other cities.

This report is based on a $4 million four-year effort by the Commission and its study team. It is probably the finest and most accurate such study ever accomplished in the United States.

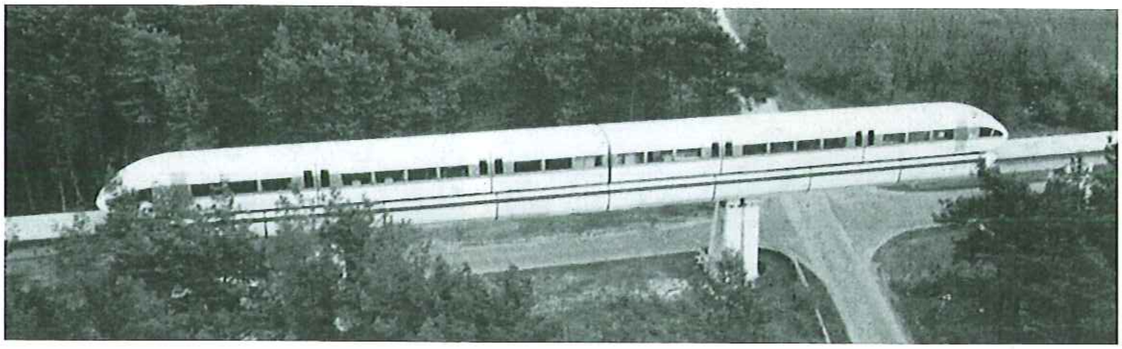
The Pennsylvania ridership study, a major and central part of the project, has been called "the most rigorous and accurate ridership projection so far" by Planning Magazine.

The ridership study was performed by the general contractor, Parsons Brinckerhoff Gannett Fleming. It is interesting to note that the Parsons firm also made the study for the Pennsylvania Turnpike that predicted 1.3 million vehicles the first year. The actual count for that first year was 2.4 million vehicles. We believe the firm was just as conservative in their projection for Pennsylvania High Speed Rail.

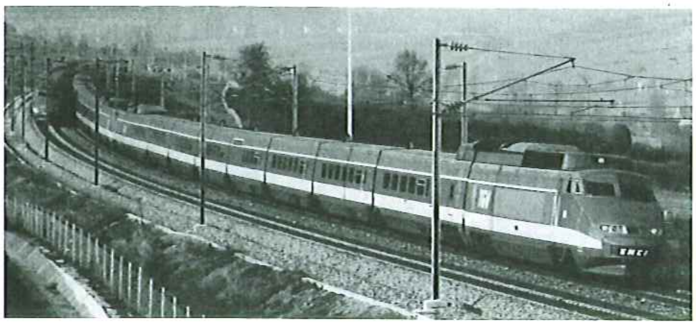
The most pressing need at this time is for a state-authorized ridership study which will update and relate the Commission's 1986 Ridership Survey to the magnetic levitation proposal of Transrapid International.

The Commonwealth should act now to form a public-private partnership authorized to work with Transrapid International (or other consortium) in order to assure a 21st Century cross-state transportation system. It will benefit the environment, the economy, travel safety, tourism and it will combat gridlock.

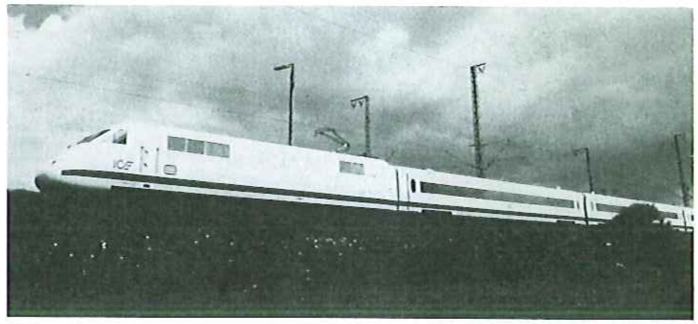
Richard A. Geist



The Transrapid maglev crosses a highway intersection.



Two French TGV trains pass on the Paris-Lyons route. Newer versions of the TGV travel at 186 mph.



The German ICE train, a product of the German National Railway, operates between Hannover and Wurzburg. It has reached 252 mph in trial runs.

EXECUTIVE SUMMARY

The Pennsylvania High Speed Intercity Rail Passenger Commission was created by Act 144 of 1981 to study the prospects for bringing high-speed rail service to the Philadelphia-Harrisburg-Pittsburgh corridor, and intermediate stations. The commission was given responsibility to assess the need and demand for high-speed rail passenger service; construction costs and available technologies; possible location and extent of specific routes to be served; economic impacts of construction and operation; financing options; and local issues.

Parsons Brinckerhoff Quade & Douglas of Philadelphia and New York City and Gannett Fleming Transportation Engineers of Camp Hill, Pa., formed a joint venture (Parsons Brinckerhoff/ Gannett Fleming, or PBGF) to conduct the feasibility study. STV Engineers of Pottstown, Pa., and New York City served as oversight consultant to cross-check PBGF's assumptions and analyses. Nearly $4.2 million in state, federal and West German grant funding was spent on the study. This report summarizes the work of PBGF and STV as well as the contributions of French and West German engineers and suppliers.

DEFINITION OF HIGH-SPEED RAIL

High speed rail passenger service as discussed in the study means:

- Passenger trains operating at between 125 mph and 250 mph or more.
- Right-of-way dedicated exclusively to high-speed passenger service.
- The right-of-way would be free of highway grade crossings.
- Frequent departures — approximately hourly throughout the day.
- Business-class on-board services and amenities.
- Clean, appealing, centrally located stations with adequate parking.
- A commitment to reliability and performance.

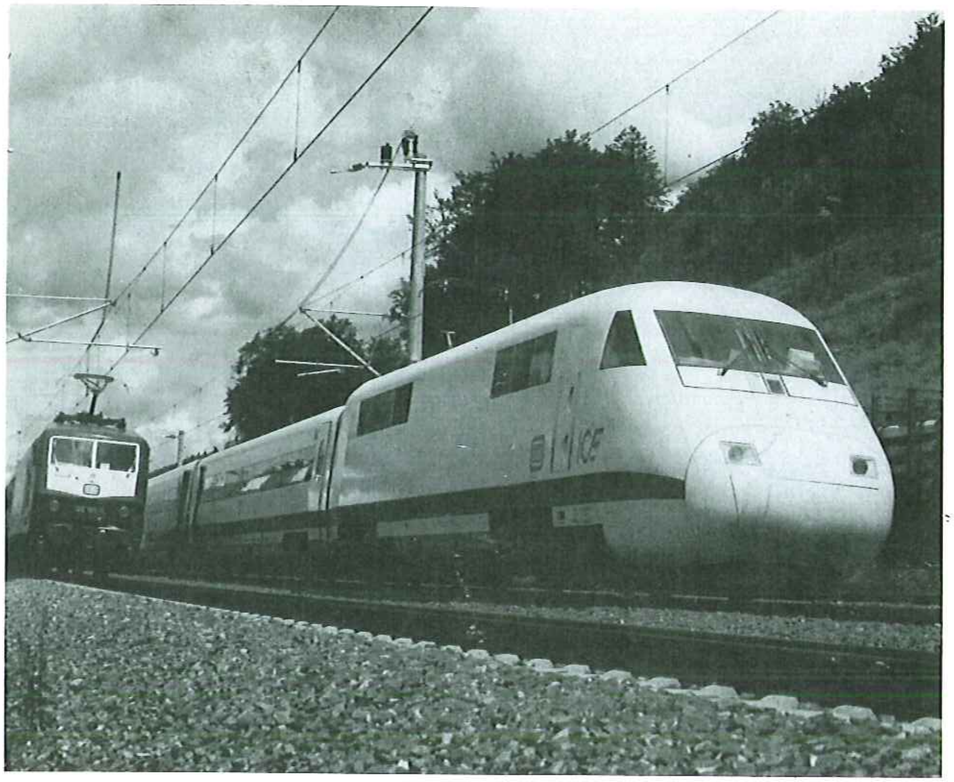
For travelers, high-speed rail offers safety, speed, convenience, frequent departures, reliability and all-weather service. For the state's economy, high speed rail offers construction employment, expansion of the tax base, real-estate development near stations, creation of a new industry and support for the state's mature railroad-supply industry. In addition, high speed rail brings broader benefits, such as environmental protection, sound land-use policies, improved mobility, and a measurable boost in the state's image as a place in which to live and do business. Some of the benefits high speed rail can bring to Pennsylvania are:

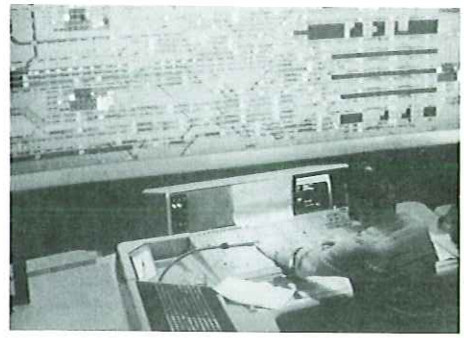
- Cross-state travel time of two to three hours.
- As many as 25,000 jobs during construction, and half that many in the long run.
- Revitalization of downtown areas. Creation of a state-of-the-art, environmentally sound mode of transportation.

HIGH-SPEED RAIL FOR PENNSYLVANIA

Pennsylvania is a candidate for high-speed rail because it has two large cities about 300 miles apart, the larger of which is anchored into the heavily traveled Northeast Corridor. In between are a capital city and several significant smaller cities. The corridor length is ideal for high-speed rail. High-speed rail can successfully compete on a cost and time basis. The commission's ridership demand studies show that a passenger market exists to support high-speed rail. Several proposed routes were examined; all would service the following intermediate stations: Great Valley/Paoli, Lancaster, Harrisburg, State College and/or Lewistown, Altoona, Johnstown and Greensburg. The eastern terminus would be at Amtrak's 30th Street Station in Philadelphia, which offers connections to Amtrak's Northeast Corridor and new Atlantic City service, and local suburban service, including trains to Philadelphia International Airport. The western terminus would be a new station at Pittsburgh's Station Square, connecting with local transit systems.

High-speed rail can overcome the weather-related difficulties of traveling over the Allegheny Mountains in winter. Further, it offers a way for travel to expand, which is not possible at traffic-clogged airports in Pittsburgh and Philadelphia. Federal studies show that demand for transportation is increasing, while the





SAFETY: High speed rail, in more than 25 years of operation, is the only transportation mode with a clean safety record, i.e., no passengers injured, no passengers killed. At the heart of the safety system is the computer automatic train control.

The German ICE passing an older electrified train. It is scheduled to go into full operation in 1991.

options for meeting that demand are growing increasingly restricted. Automobile fuel is readily available at a moderate price, but disruptions in Mideast supplies could change overnight. High-speed rail would help preserve mobility.

FOREIGN INVESTMENT POTENTIAL

During the course of the feasibility study, high-speed technology suppliers, particularly the West German magnetic levitation consortium Transrapid International, became so sure of the market for passenger travel in Pennsylvania that they made overtures regarding foreign financing for a system here. Leadership and a political consensus are needed to pursue this and other possible avenues of funding. Such a consensus is succeeding in other states; California-Nevada, Florida, Ohio and Texas are moving ahead with plans for high-speed rail systems.

WHAT THIS REPORT DOES NOT COVER

The feasibility study was nearly completed when the staff was terminated by the governor's financial aide four months prior to the "sunset" date. This curtailed the work. Many of the findings are favorable to high-speed rail. However, particularly on the issues of financing and optimum alignment, the study was incomplete, and additional essential work was left undone. A fair reading of the proposal's ultimate feasibility cannot be gained until those issues are resolved.

Among the tasks remaining are a final assessment of economic impact; a detailed financing plan; an engineering plan and computer runs to verify projections for a modest-performance alternative (Option 3) suggested by a financial consultant; revisions to right-of-way alignment to reflect cost reductions and improvements; an independent engineering assessment of the proposed Transrapid International plan for building and helping to finance a magnetic levitation line between Harrisburg and Pittsburgh; and determination of the nature of Transrapid's offer to assist in procuring financing.

FINDINGS

The Commission finds that:

1. High speed rail technology is available today.

2. A sufficient market exists in east-west travel to warrant further pursuit of high speed rail for Pennsylvania.

3. High speed rail will introduce beneficial short- and long-term economic effects to the Commonwealth.

4. The greatest such effect would be on new and developmental business, the construction industry and rejuvenation of railroad-related industry.

5. The greatest benefits would come from the most innovative system, i.e., magnetic levitation, closely followed by a high-performance steel-wheel system such as the French TGV or West German ICE.

6. A modest upgrading of Amtrak service would offer significant travel-time improvements and may be least expensive, but it provides the least economic benefit among options studied.

7. Under the conditions existent in 1987, the project would require substantial initial investment, with the long-term benefits directly proportional to the size of the initial investment.

8. Both West German and French suppliers have offered to help secure offshore financial assistance — grants and/or loans — to construct their high speed rail systems in Pennsylvania.

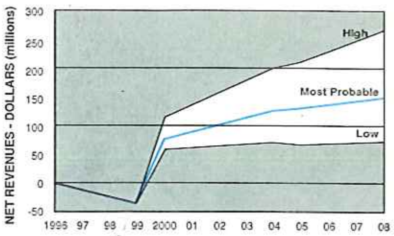
9. With such offshore help, the best-case scenarios (steel-wheel system at 180 mph or maglev at 250 mph) may be financially feasible now, based on the record of public and private financing of high-speed rail worldwide.

Editor's Note: The passage of federal legislation in late 1988 authorizes high speed rail tax-free bonding authority.

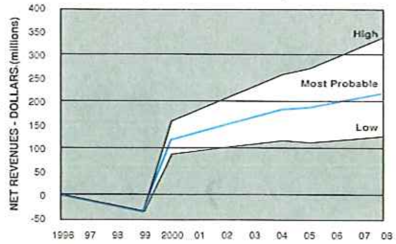
TECHNOLOGY AND OPERATIONS

This study considered high-speed trains that are operating in daily commercial service, as well as experimental test designs. The choice of technology will govern the quality of service, capital cost, the extent of the Commonwealth's

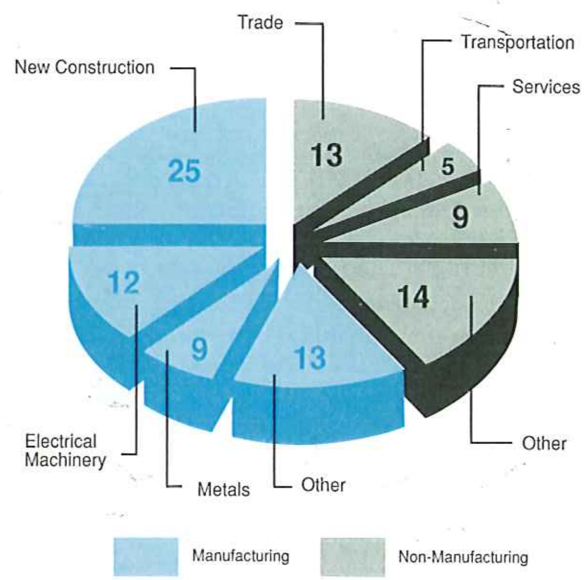
Advanced Steel Wheel System Net Revenues



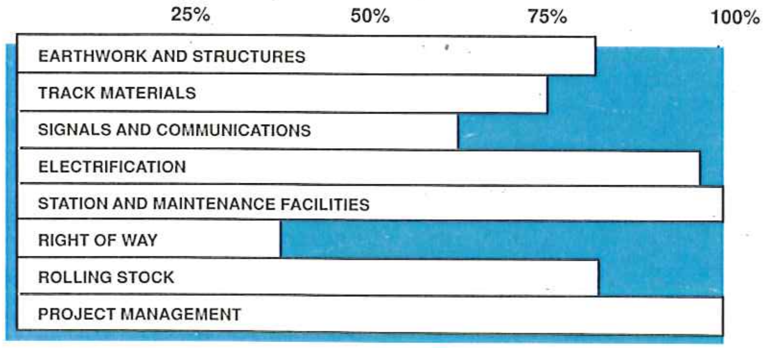
Maglev Net Revenues



Distribution of Construction Period Impacts by Industry Sector



Pennsylvania's Estimated Share of Construction Expenditures



financial support required and the relative risk and payback. It also will determine how much economic development occurs. The faster the trains, the greater the patronage, and the greater the impact on the state's economy.

The High-Speed Rail System Concept

The high-speed rail operating concept envisions a complete service to the traveler: Ample parking, access to public transportation, checked baggage, seat reservations, snack and beverage service, hourly departures. Depending on technology, the cross-state trip time could take from about two hours to 3 hours 43 minutes, with improved ride quality, compared with seven hours today. Passenger-train-only trackage enhances safety, speed and on-time reliability. As in France and Japan, this approach eliminates dangerous highway grade crossings, and eliminates dispatching interference with slow freight trains and start-and-stop commuter trains. This makes track maintenance easier and provides a safety margin by reducing the chance for collisions or derailments. It also allows steeper grades, reducing the need for costly tunnel excavation. Indeed, the Transrapid International proposal has no tunnels at all.

Steel-Wheel-on-Steel-Rail Technology

The French TGV (tres grande vitesse, or very great speed) fleet is the world leader in existing commercial technology. Since 1983, 87 electrified trains have operated between Paris and Lyons at 168 mph. The system yields a 17 percent return on equity after debt service. A fleet of second-generation TGV's will run at 186.4 mph on a new route from Paris to the west of France and north to Brussels and the English Channel Tunnel.

Under construction is a fleet of similar West German ICE (Inter-City Express) trains. A prototype has been tested at 252 mph and the German railroad has placed an order for production (41 trainsets of two locomotives and 11 cars) to service new high-speed routes at 155 mph.

The Japanese Shinkansen, or Bullet Train, is the world's first true high-speed rail system, having gone into operation on October 1, 1964, at a commercial speed of 130 mph; some routes now operate at 150 mph. The fleet has carried almost 3 billion passengers without a single fatality or injury.

Other high-speed electric train types planned for 140 mph operation or more are two Italian designs (ETR 450 and ETR 500) and the British "Electra". Trains operating or planned to operate at 125 mph include the British diesel Inter-City 125, the Spanish Talgo, a pendular "passive" tilting-coach system; Amtrak's AEM-7 locomotive-hauled Metroliner in the Northeast Corridor; and the Swedish X2, an "active" tilting-body train.

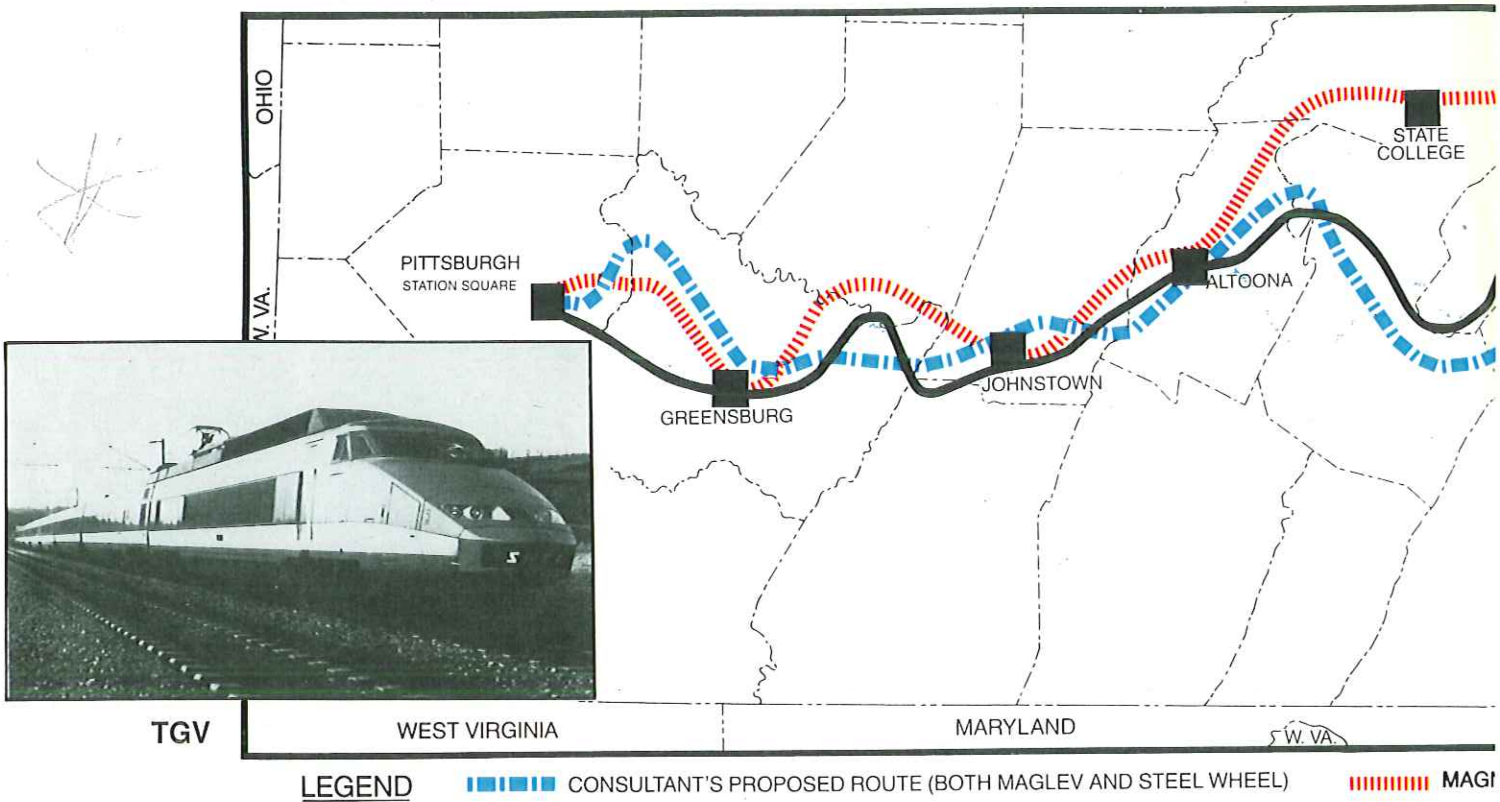
Banking Mechanisms

Several of these systems use tilting-body coaches, in which the cars are mechanically banked through curves, reducing the discomforting effect of centrifugal force on passengers. Thus, roughly one-third higher speeds can be maintained through curves without costly track realignment. Reliability has been erratic for "active" banking systems, in which motors tilt the car bodies. The Spanish Talgo system uses gravity to achieve a "passive" tilting effect, which has been in use in Spain and on international routes for nearly 20 years.

Magnetic Levitation Technology

This technology uses no wheels or rails, but a concrete or steel guideway, above which the vehicle is magnetically suspended and centered, and along which it is propelled by a wave of magnetic energy. With no wheel-to-rail contact, the "maglev" vehicle actually flies along the guideway, so there is potential for greater speeds — 250 to 300 mph. No maglevs are operating in revenue service, but tests in West Germany and Japan have yielded performances at more than 300 mph. And the implementation of a first maglev line in Germany has been recommended to the Government by the Parliament (alternatively Hamburg - Hanover or Essen - Bonn).

At the 20-mile Transrapid International test track at Emsland, West Germany, a two-car TR-06 vehicle has tested at 258 mph. This system uses a T-shaped guideway around which a part of the vehicle wraps,



TGV

eliminating the possibility of derailment. Electromagnets energized in the lower portion of the wraparound segment give the train its levitation by pulling up toward the longstator mounted on the underside of the guideway. Additional magnets provide lateral guidance, or centering. A longstator electric motor, with windings mounted on both sides of the guideway, reacts with electromagnets mounted beneath the main body of the vehicle. The rapid changing of polarities induces a pushing and pulling force, creating propulsion. Japanese Railways has tested the MLU-001 magnetic vehicle at 250 mph on a 4.2-mile track at Miyazaki, Japan. (An unmanned vehicle achieved 321 mph in 1979). This system uses a U-shaped guideway; the vehicle is lifted from the bottom of the guideway and repelled from its sides by the use of electromagnets. Forward motion is generated in the same manner as with the attractive system. Other vehicles, such as the Japan Air Lines HSST-03, have operated reliably in low-speed shuttle service, and have been tested at 191 mph.

Applicability to Pennsylvania

Most of the technologies listed are suitable for use in the Philadelphia-Harrisburg-Pittsburgh corridor. All maglev systems would require construction of a new guideway for the entire length of the route.

Benefits of Maglev

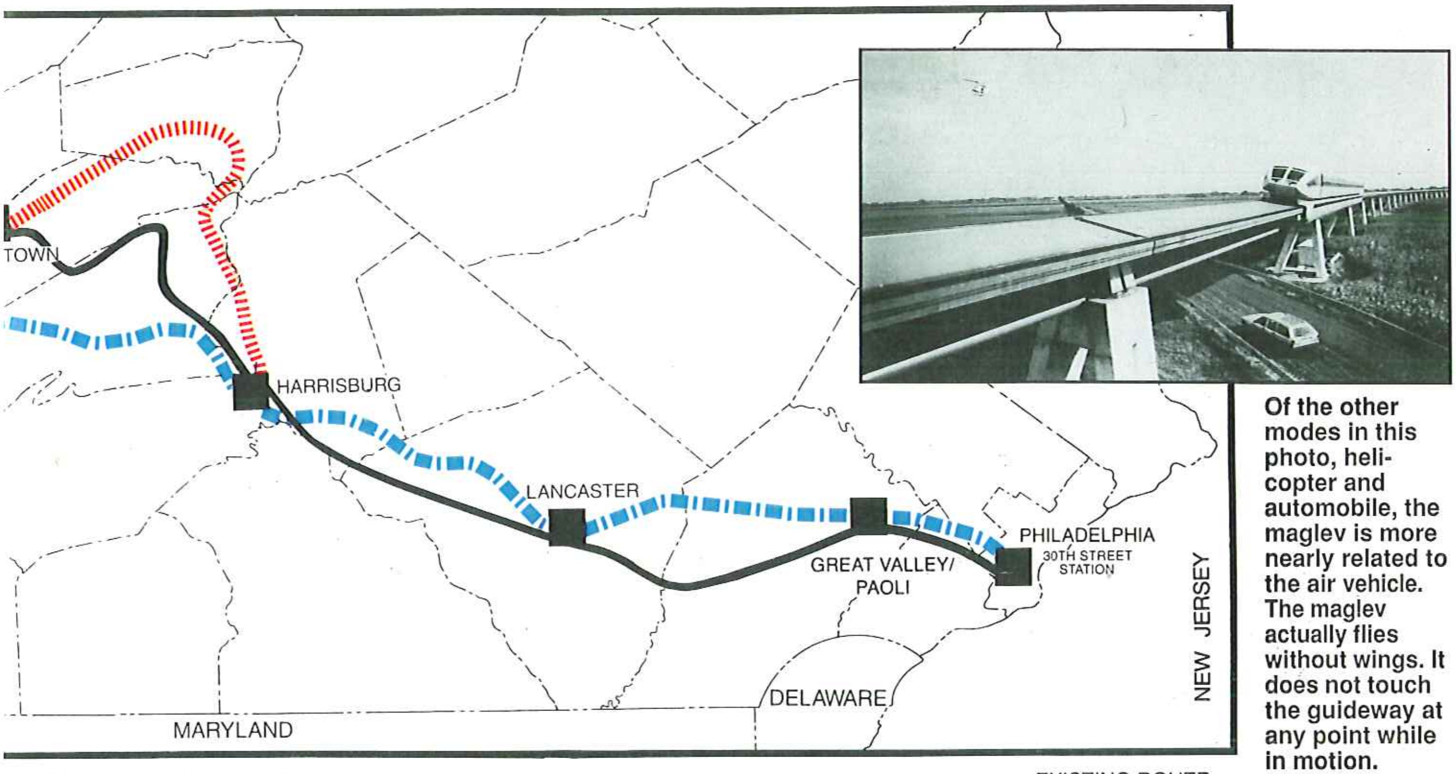
- Greater economic impact than steel-wheel system, more jobs during construction; heavier passenger usage upon completion.
- Establishment of state-of-the-art transportation in Pennsylvania and the United States, and establishment of an entirely new technology as a new industry in Pennsylvania.
- Would allow export of specialized maglev technology to other states, creating more jobs and economic growth.
- Higher train speeds (250-300 mph rather than 150-180 mph) which would induce additional ridership.
- Potentially lower operating and maintenance cost than steel-wheel-on-steel-rail designs.
- The alignment and the construction of the guideway can more exactly adopt to the terrain compared with steel wheel.
- Environmentally superior to highways as a means of handling transportation growth in Pennsylvania.
- The innovative concept could attract new-technology financing.
- The Transrapid International group has offered financing for this option.

Disadvantages of Maglev

- Operation under Pennsylvania weather conditions not yet tested.
- No revenue service system experience.
- Neighboring states and Northeast Corridor not considering maglev as an alternative; thus, through service is precluded on trips such as Pittsburgh-New York or Harrisburg-Atlantic City, NJ.
- Risks associated with new technology may pose financing problems in the traditional marketplace.

Benefits of Steel-Wheel

- Broad-based proven service experience of steel-wheel on steel-rail mode reduces implementation risk and financing risk.
- Would allow export of high-speed technology to other states, creating more jobs and heightening economic impact in Pennsylvania.
- Supports state's existing railroad manufacturing and supply industry.
- Compatible with existing Northeast rail system; allows through service to New York, Washington, Atlantic City; also compatible with high-speed rail plans of Ohio, New York, and other states.
- Makes maximum use of existing rail rights-of-way in Pennsylvania; service could begin as an upgrading of conventional service now offered between Philadelphia and Harrisburg.
- Environmentally superior to highways as



Of the other modes in this photo, helicopter and automobile, the maglev is more nearly related to the air vehicle. The maglev actually flies without wings. It does not touch the guideway at any point while in motion.

'ITATION ROUTE (TRANSRAPID INTERNATIONAL) (NOTE: TGV has proposed to use a similar no-tunnels route)

EXISTING ROUTE

a means of handling transportation growth in Pennsylvania.

- Potential to achieve full electrification, full separation of freight and passenger services, full elimination of grade crossings.

Disadvantages of Steel-Wheel

- Some of investment may be lost if system subsequently is upgraded to maglev.
- Overall economic impact likely not as great as with maglev.
- Unlikely to match maglev in speed.
- Prospects less certain for establishing state-of-the-art American high-speed rail industry in Pennsylvania.

OPTIONS FOR PENNSYLVANIA

From technical, financial and operating standpoints, three types of systems were studied as candidates for implementation in Pennsylvania. Based on the consultants' work in Phase 1 and Phase 2 of the feasibility study, the commission voted to pursue the most technologically advanced systems -- a 250 mph maglev system and a 180 mph high-performance steel-wheel system similar to the French TGV or West German ICE.

Option 1: Maglev Service

The commission's initial maglev investigation produced a cost estimate of $10 billion for a double-guideway system. At a top speed of 250 mph, this system would have allowed cross-state trip times of about two hours. It would attract the most passengers and create the greatest economic impact. The high cost estimate and difficulty of financing almost immediately ruled out this approach, even though maglev proponents claimed that the engineers' estimates were far too conservative (high), and that realistic costs based upon actual construction experience should be far lower. Methods of economizing on the initial capital cost estimates were unable to be pursued due to the abrupt termination of funding.

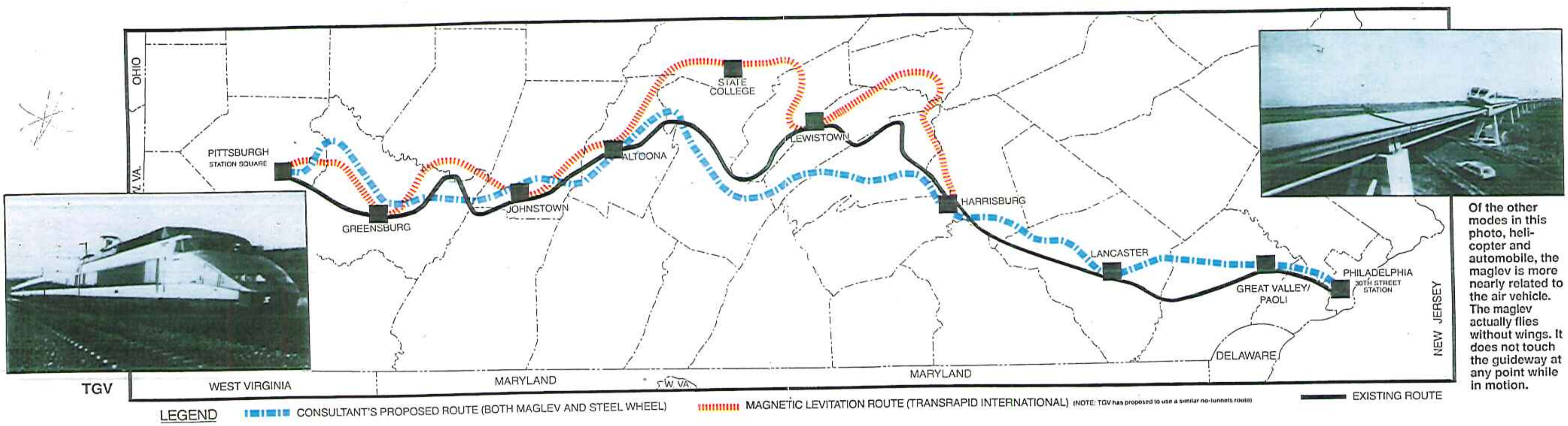
As a result, the West German maglev consortium Transrapid International proposed an incremental, staged plan, starting with partial maglev service and expanding its scope after gaining operating experience and achieving a financial performance level. Because of funding limitations, the commission's consultants were unable to provide an independent assessment of this proposal. The Transrapid proposal would implement a $3 billion, 250 mph maglev system between Harrisburg and Pittsburgh, with initial upgrading of steel-wheel service between Philadelphia and Harrisburg. This plan contains a single-guideway track with two 25-mile passing double tracks and no tunnels. Transrapid officials further have stated that they would assist in procuring offshore public and/or private financing to build such a system in Pennsylvania. Running time for the Harrisburg-Pittsburgh maglev section would be 1 hour 29 minutes, making five stops.

The commission's consultants estimated costs, revenues, performance standards and ridership based on full use of each technology from Philadelphia to Pittsburgh. However, both the commission's engineering consultants and engineers representing maglev and high-speed steel-wheel systems have suggested a staged approach, blending travel on old and new while new construction is completed. This approach offers an immediate improvement to existing service, over what is now the slowest segment, while containing a state-of-the-art component as well. A disadvantage is that it requires passengers to make a cross-platform transfer at Harrisburg until the entire cross-state system is built.

Cost of the incremental system would begin with the Transrapid estimate of $3 billion, plus the cost of upgrading steel-wheel service between Philadelphia and Harrisburg, which must be investigated.

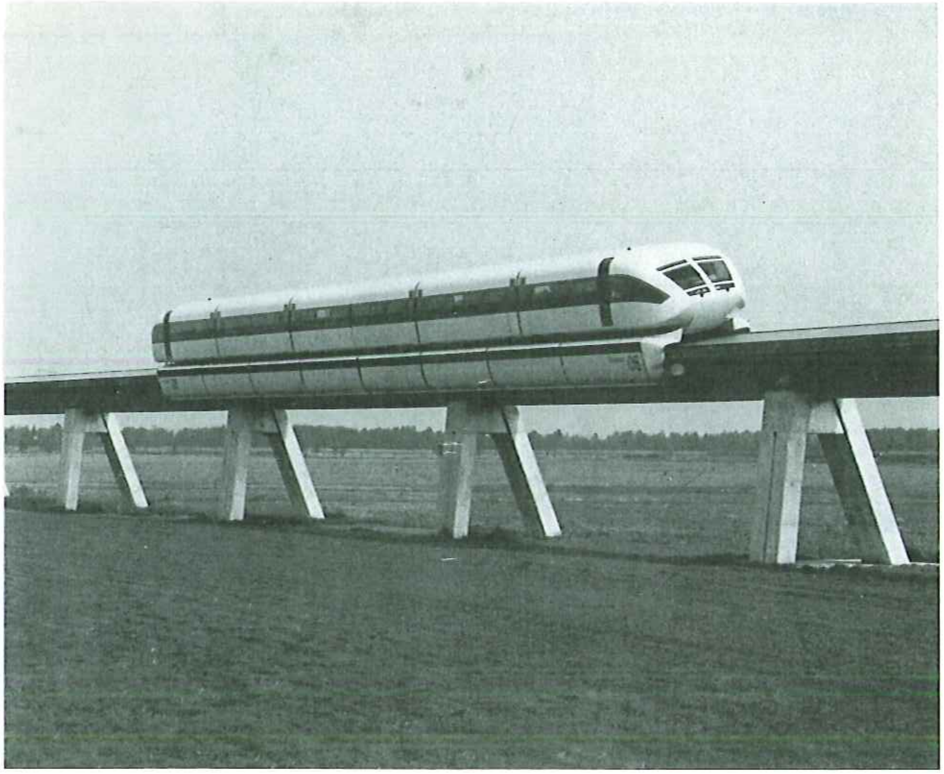
Option 2: High-Speed Steel-Wheel Service

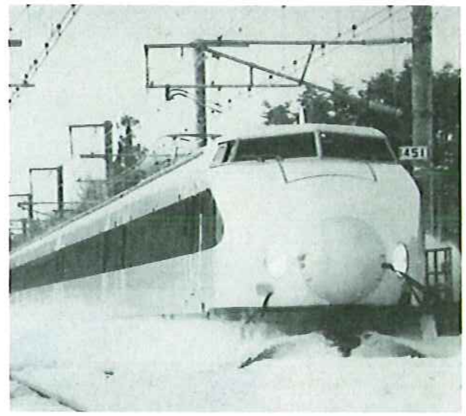
This service proposal resembles the French TGV operation, with trains running at 160-185 mph and taking about 2 hours 41 minutes to make the cross-state run. The commission consultant's initial work produced a capital cost estimate of $7 billion. This initial Phase 1 steel-wheel cost estimate has been called unrealistic in



TGV

Of the other modes in this photo, heli-copter and automobile, the maglev is more nearly related to the air vehicle. The maglev actually flies without wings. It does not touch the guideway at any point while in motion.





The world's first high speed train, the Japanese Shinkansen or "Bullet Train," started operation 25 years ago (August 25, 1964). It has a perfect safety record and is a major financial success.

The Transrapid guideway is banked at curves, for passenger comfort.

that it was based on alignment assumptions that used moderate grade-climbing ability and involved extensive tunneling. It has been criticized as conservative (too high) by suppliers, who have a first-hand acquaintance with actual costs of construction. In addition, the estimate has been called extremely conservative — perhaps 25 or 30 percent higher than it need be — by the commission's oversight consultants, who suggest that the capital cost ought to be closer to $5 billion. The TGV Company has offered to provide train-performance data, as well as assistance on costs and revenues, and sources of financing.

Representatives of the French rolling-stock manufacturers stated that they are prepared to make a proposal for such service, and stand ready to assist in procuring financing much in the same manner as the West German consortium.

Option 3: Moderate-Speed Steel-Wheel Service

A modest high speed rail steel-wheel-on-steel-rail electrified system could be built for $2.55 billion. Operating at 125 mph with 150 mph running on some stretches, this system could cut the seven-hour Philadelphia-Pittsburgh travel time to 3 hours 43 minutes. A low-cost alignment design would provide passenger-dedicated track in the existing Amtrak-Conrail corridor with only 50 miles of realignment into new right-of-way. This plan would create a 340-mile route that would enjoy the advantage of a lower capital cost and a much shorter design and construction period. Cash inflow, as a result, would begin in a much shorter time. While not as dramatic as the first two options, this concept would roughly halve the current Philadelphia-Pittsburgh rail travel time of seven hours.

The commission did not have the opportunity to have its engineering consultants thoroughly examine this proposal. The option poses safety concerns, especially with so much of its track location adjacent to existing freight tracks. For a relatively modest cost, it would produce immediate improvements, while allowing for higher performance standards by future straightening of alignment. This approach is not unlike that taken in improving the Pennsylvania Turnpike. However, this option lacks the economic-development potential of the faster systems. Another long-term advantage is that the operating margin would exceed the debt service requirement in the year 2006, the estimated 13th year of operation. Cumulative positive cash flow after debt service would be $14 billion by the year 2027, when the bonds would be retired.

ECONOMIC DEVELOPMENT

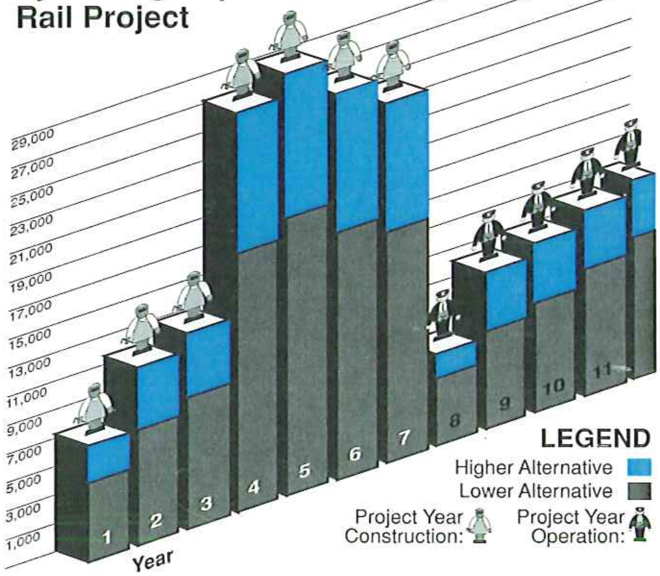
High-speed rail would be a catalyst for economic growth — growth that would help the state overcome years of declining investments, jobs, and population; and growth that would help reduce unemployment to a more desirable level, and provide substantial tax income for the Commonwealth.

Construction Benefits

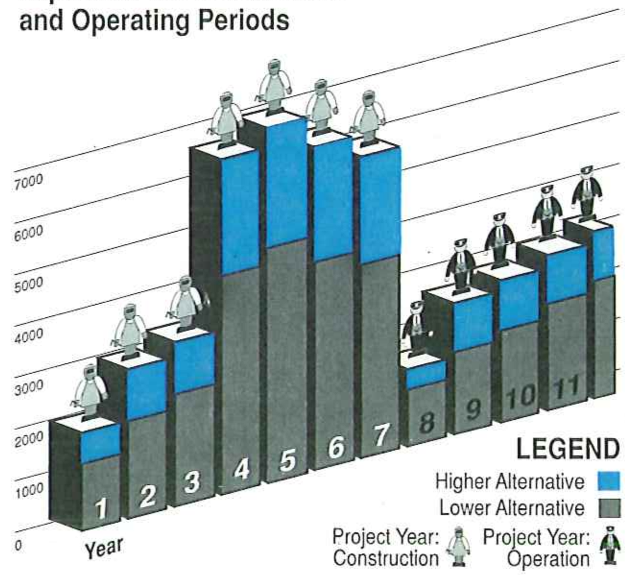
At least two-thirds of the expenditures for construction can be gained by Pennsylvania firms. Direct expenditures would stimulate further economic activity through the multiplier effect. For a $2.55 billion steel-wheel system (Option 3), the result is a $6 billion increase in total expenditures during the six-year construction period. For the high-speed steel-wheel system, Option 2, the $7 billion capital expenditure brings an estimated $16 billion in total construction. The maglev system, Option 1, produces $22 billion in construction-period benefits in return for the $10 billion capital cost estimate.

New expenditures mean new construction jobs — as many as 25,000 annually for maglev, or Option 1; 22,000 annually for Option 2; and 13,000 annually for Option 3. This will raise personal income by at least $1.39 billion during construction or $5.34 billion total over the operating life, for the most modest system. Advanced technologies produce $8 billion in personal income (Option 2), or $9.4 billion for Option 1. State government revenues would increase by $492 million (Option 3) to $755 million (Option 2) to $882 million (Option 1) over the construction and operating life of the system. These revenues would be derived through increased income, sales and other tax receipts.

Potential Range of Employment Generated by the High Speed Rail Project



Typical Distribution of Urban Area Employment Impact for the Construction and Operating Periods



Because of the role railroading has played in the state's economy, Pennsylvania already has dozens of railroad-supply firms that manufacture everything from track spikes to locomotives. Roadbuilding contractors could benefit from contracts for right-of-way grading and bridge and tunnel construction.

Operations Benefits

It would cost $98 million annually to operate and maintain a system under the least advanced approach, Option 3. The cost is estimated to be $105 million for Option 2 and $104 million for Option 1, maglev. Some 85 percent of these expenditures would benefit Pennsylvania firms and labor. The result, accounting for the multiplier effect, would be some $460 million annually, under the best case, in new expenditures after operations begin.

These expenditures translate into:

- A total, in direct and indirect employment, of 7,600 to 12,500 jobs.
- Annual personal income of $160 million to $205 million.
- State tax revenues of $15 million to $19 million annually.

Downtown Development

High-speed rail can revitalize downtown areas by stimulating the development of real estate near stations. Construction of retail, hotel, restaurant and office buildings will accompany the introduction of modern, efficient transportation in the downtowns of cities served. This phenomenon already can be observed in Lyons, France, adjacent to the high-speed TGV station there, and is a major component of the Florida high-speed rail system proposal. Harnessing the rising value of real estate is one way to help pay for high-speed rail capital costs.

Structural Benefits

High-speed rail can enhance the ability of a state or region to compete with others for new investment and economic activity. Feasibility studies leading to implementation in other states are taking this into account: Florida (Miami-Orlando-Tampa), Ohio (Cleveland-Columbus-Cincinnati), Texas (Dallas- Houston), Nevada/California (Las Vegas-Los Angeles) and Michigan, Indiana and Illinois (Chicago-Detroit). Regardless of where the first system in America is built, high-speed rail will be a multi-billion-dollar industry. The states that are first to create such a system will be in the best position to export their goods, services and expertise to others.

Travel and Tourism

In France, it is estimated that 20 percent of the travel on the TGV is induced travel, or travel that would not occur were it not for high-speed rail. Such a system could improve access to the recreational areas of Central Pennsylvania, Pittsburgh's sporting events, and the historic sites of Philadelphia. Further, it would foster trade, communication and cultural links between Philadelphia, with its Northeast Corridor orientation and financial centers, and Pittsburgh, with its status as one of the largest corporate-headquarters centers in America.

Pennsylvania's Image

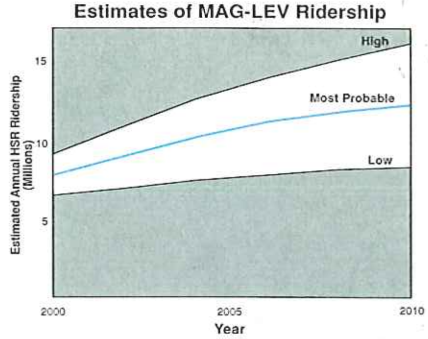
Another area is the promotion of Pennsylvania's image as a desirable place in which to do business. This is the most elusive economic benefit to measure, but it is generally recognized that attitude has a great deal to do with industrial development decisions.

An investment in high-speed rail that is soundly financed and well-operated can demonstrate that a state can do something progressive, positive, imaginative and on a large scale to support its economy. This would make a great difference to businesses trying to decide whether to locate in Pennsylvania.

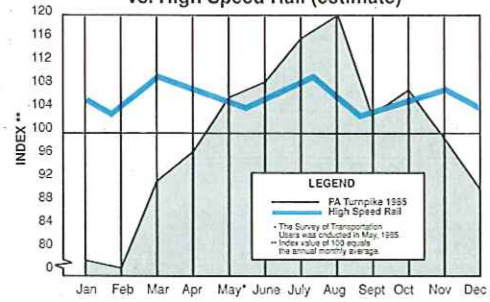
Accessibility

Historically, transportation is at the core of economic development, as can be seen in our highway system, ports and airports, along rapid transit lines and along rail freight corridors. High-speed rail also has the potential to be this kind of economic development catalyst.

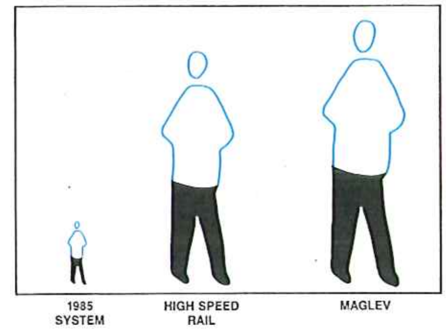
Estimates of MAG-LEV Ridership



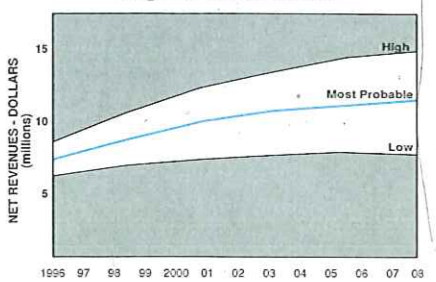
Monthly Traffic Variation For Pennsylvania Turnpike vs. High Speed Rail (estimate)

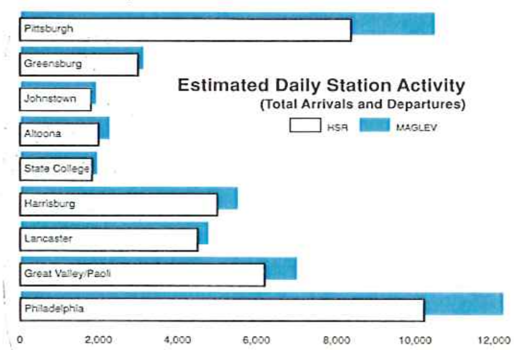


Daily Rail Person-Trips By Rail Type

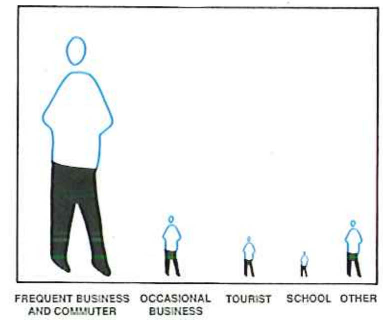


Mag-Lev Net Revenues





Total Daily Trips By Trip Purpose



Other Benefits

Other benefits associated with high-speed service:

- Lower unemployment and reduced associated costs of public support of jobless workers.
- Opportunities for young skilled workers to remain in Pennsylvania rather than having to move elsewhere to find employment.
- More productive use of time. High-speed rail avoids much of the wasted time associated with traveling to outlying airports, and canceled or delayed flights caused by weather or equipment problems. Most seasoned travelers have learned to allow extra time to account for such delays.
- Improved safety, compared to highway, air and conventional rail travel. The Japanese Bullet Train fleet has operated for 25 years and carried 3 billion passengers, all **without a single fatality.** Well-planned and precisely operated systems running over "dedicated" (to one kind of traffic — high-speed passenger rail) rights-of-way offer the safest transportation known to mankind. The French TGV system, in full operation since 1983, has demonstrated a similar perfect record of safety.

MARKET DEMAND

An extensive ridership survey conducted in May and June of 1985 indicated that by the year 2000, high-speed rail could attract 5.5 million to 8.8 million passengers a year. The analysis surveyed existing travel patterns in the Philadelphia-Pittsburgh corridor and established a formula for ridership projection. The 5.5-million-passenger estimate represents the least-optimistic projection for 180 mph steel-wheel service and the 8.8-million-traveler figure represents 250 mph maglev service under favorable economic and population conditions. To avoid overoptimistic projections, the survey was conducted according to recommendations of the High Speed Rail Association's Standard Guidelines for Revenue and Ridership Forecasting.

One of the key findings of the study was that most travel in Pennsylvania takes place at an elapsed time of two hours or less. The significance of this is that bringing the eastern and western reaches of the state to within roughly two hours of each other will greatly stimulate the volume of intercity travel.

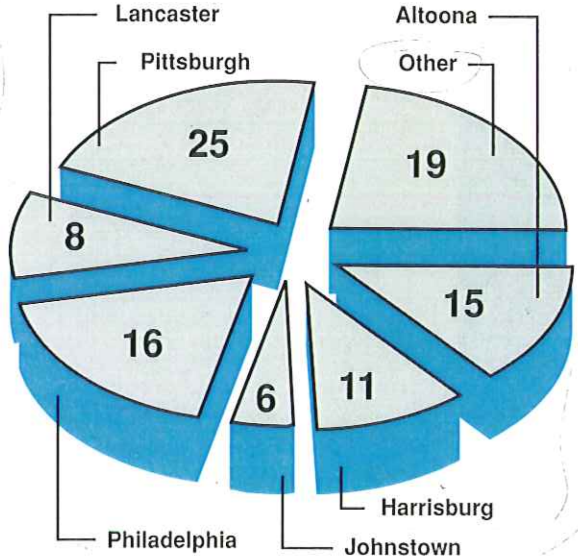
Frequent business travelers, including some commuters, would constitute the largest subgroup of travelers — about 9,500 to 10,500 trips per weekday, or 57 percent of a total weekday ridership of 16,600 to 18,700 passengers. Occasional business travelers would add another 4,600 to 5,500 passengers each weekday, for 28 percent. Tourists would account for 1,500 to 1,600 riders a weekday, or 9 percent. School trips represent about 500 trips a day.

Fares were assumed to range from 16 to 28 cents a mile, with the average being 22 cents a mile. Higher fares would be charged for business travel that is less price-sensitive than other market segments, lower fares for off-peak and incentive travel.

In May and June of 1985, 25,538 questionnaires were handed out to passengers aboard Amtrak trains, to Turnpike motorists and to airline passengers. Of those, 8,853 forms were returned in person or by postpaid mail, for a 34.6 percent response rate. Questionnaires were intended to find out who is traveling in the corridor, how often, why and by what means; what time of day they travel; how long it took to make the total trip; origin and destination; and who is paying for the travel. In August 1985, commission consultants conducted a series of subjective market research surveys in Philadelphia, Harrisburg, and Pittsburgh, using 215 randomly recruited volunteers. They were tested in a focus-group setting to determine the criteria they use in choosing how they travel, specifically, how much weight they placed on such important but difficult-to-quantify aspects as comfort, convenience, amenities, reliability, security and perceived safety.

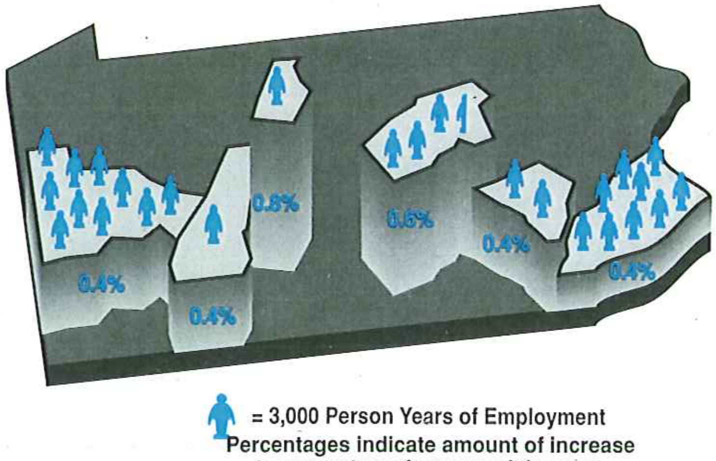
The most important factors, the survey found, were schedule reliability, cost, frequency and average speed or travel time. The most important characteristics for frequent business travelers were cost,

Benefits by Region Operations Period



Distribution of Employment Impacts Among Urban Areas During Construction

(Average of Lower and Higher Alternatives)



= 3,000 Person Years of Employment

Percentages indicate amount of increase to present employment of the area.

reliability and frequency. Weather vulnerability also played an important role. Those who travel for other trip purposes (tourist, school, "other") judged trip time, cost, reliability and frequency to be the most important factors.

FINANCING

Editor's Note: Preliminary financing studies were initiated by the commission's consultants. Before a detailed study could be accomplished, funding was discontinued. In the meantime, there have been new technology developments and new Federal legislation, which provides for tax-free bonding for high speed rail projects. These developments have completely altered the bottom line. Consequently, no valid financial package exists for the options considered in the study. A financial plan should be developed.

The information that follows is based on preliminary financing studies conducted by the consultants in 1987 and earlier, and should be considered only in that context. Computations were made on the basis of 1986 dollars.

A synopsis of the financing work performed for the commission follows; it is derived from data provided to the commission by the general engineering consultant and computer spread-sheets provided by the financial subconsultant in March 1987. As noted in the introduction to this report and in the recommendations, it does not address some avenues of capital funding that are now being pursued in other states.

The preliminary financing analysis performed for the commission draws the conclusion that the only affordable high-speed rail system is that which uses the least advanced technology and costs about $2.55 billion. This automatically ruled out any consideration of maglev (Option 1) or the high speed steel-wheel technology (Option 2), without further study as to how cost estimates could be reduced or how construction could be advanced in stages. Conservative in nature, this approach was based on a premise that no federal assistance, of any kind, is available and that no foreign financing can be found. Further, it did not take into account methods by which the presumed lid on capital costs might be overcome. These means include considering the cash contribution available from real estate value-capture programs, which would turn revenue derived from the retail, hotel and office development in the vicinity of stations back to the high-speed rail system.

Excluding these potential revenue-producers resulted in an assumption that the only source of capital funding is the Commonwealth itself, on a full faith-and-credit basis. However, representatives of foreign suppliers have offered to help locate sources of foreign financing to build high-speed rail in the United States and specifically, Pennsylvania. And, by requesting that the general engineering consultant produce a station development report, the commission clearly indicated its intent to harness real estate values to make the system more financially self-sustaining. The federal political climate and deficit-reduction sentiment at the national level suggest that direct federal grants to build such a project are not in the offing. However, federal assistance in a form other than direct capital outlay could substantially aid the project, specifically in the form of tax-free status for revenue bonds. (This status was achieved in 1988 with the addition of high speed rail to the list of transportation modes eligible under the federal tax laws.)

The results of the commission's financing analysis are accurate in preliminary fashion, within the narrow context in which they were conducted, but incomplete. It is these additional areas of financing details that were to have been addressed during the final phase of the commission's work, and which should be studied in any further consideration toward implementation of high-speed rail. A re-evaluation of the financial assessment would be necessary in any event in view of the significant tax-law changes that have ensued. Further, Phase 1 capital costs were extremely conservative; lower costs resulting from optimized alignment work were not developed, and reviewing this issue also will be necessary for any subsequent reexamination of the proposal. No discussion of financing high-

Workers in the vineyards of France don't even glance at the quiet TGV as it streaks by en route to Lyons.

speed rail in Pennsylvania can be complete without reference to the West German consortium of Transrapid International. Transrapid proposed in the spring of 1987 to design and build a maglev system between Harrisburg and Pittsburgh at a cost not exceeding $3 billion, and pledged its assistance in locating offshore capital financing. This engineering proposal is contained in an addendum to the full final report. A representative of the TGV Co., suppliers of the French steel-wheel high-speed train, subsequently made a similar offer.

The financial consultants assumed that the only source of funding for capital expenditures would be the Commonwealth and concluded that both the early $7 billion high-speed (180 mph) steel-wheel plan and the early $10 billion maglev plan contained considerable investment risk and were not financeable. Using the same premise, these consultants said a lower-performance (125 mph, with a few stretches of 150 mph operation) system costing $2.55 billion could be financed.

The commission believes that the financing analysis is accurate but it overlooks significant instruments by which a plan could be implemented, thus missing the point of the feasibility study. Detailed and realistic financing analysis are requisite before high-speed rail can be implemented.

The commission's consultants have studied the benefits and drawbacks of structuring the system as a public, private or joint public-private entity, but no conclusions were reached.

Without a detailed project proposal, no firm conclusion can be drawn, but a public body would be an appropriate means by which to begin the project.

ENVIRONMENT

The ecological effects associated with a high speed rail system would be much less severe than those associated with building new interstates or airports. In virtually all categories — land required, energy consumption, noise, vibration, air pollution and aesthetic intrusion — railroads are potentially less damaging to the environment than airports or freeways.

Land Use and Aesthetic Intrusion

In areas where all-new right-of-way is needed, some landowners may object to intrusion. The intrusions can be minimized by careful site selection — e.g., by paralleling interstate highways or existing rail lines, by using shock-absorbing elements, or by locating the track on an elevated structure or under ground. However, tunneling can cost many times more than at-grade construction, and may be unavailable near urban freeways.

On the other hand, the amount of right-of-way needed for a double-track railroad is comparatively small. The entire 265-mile double-track route of the Paris-Lyons Line occupies less land than the DeGaulle Airport in Paris.

A promising mitigation measure is to elevate the system (particularly with maglev technology) so that only an easement, rather than outright property acquisition, would be required. This would be particularly advantageous through agricultural areas where the high speed system need not halt present land use.

Noise, Vibration and Air Quality

All the systems studied use high technology equipment that is inherently quieter than existing rail systems. Electrically powered trains minimize propulsion noise, and such devices as continuous welded rail, elastomeric track pads, floating slabs and acoustical barriers can reduce noise and vibration. Maglev systems are potentially attractive, because there is no contact between vehicle and guideway. A relatively low frequency — hourly services in each direction as assumed throughout the study — means that noise impact would be low.

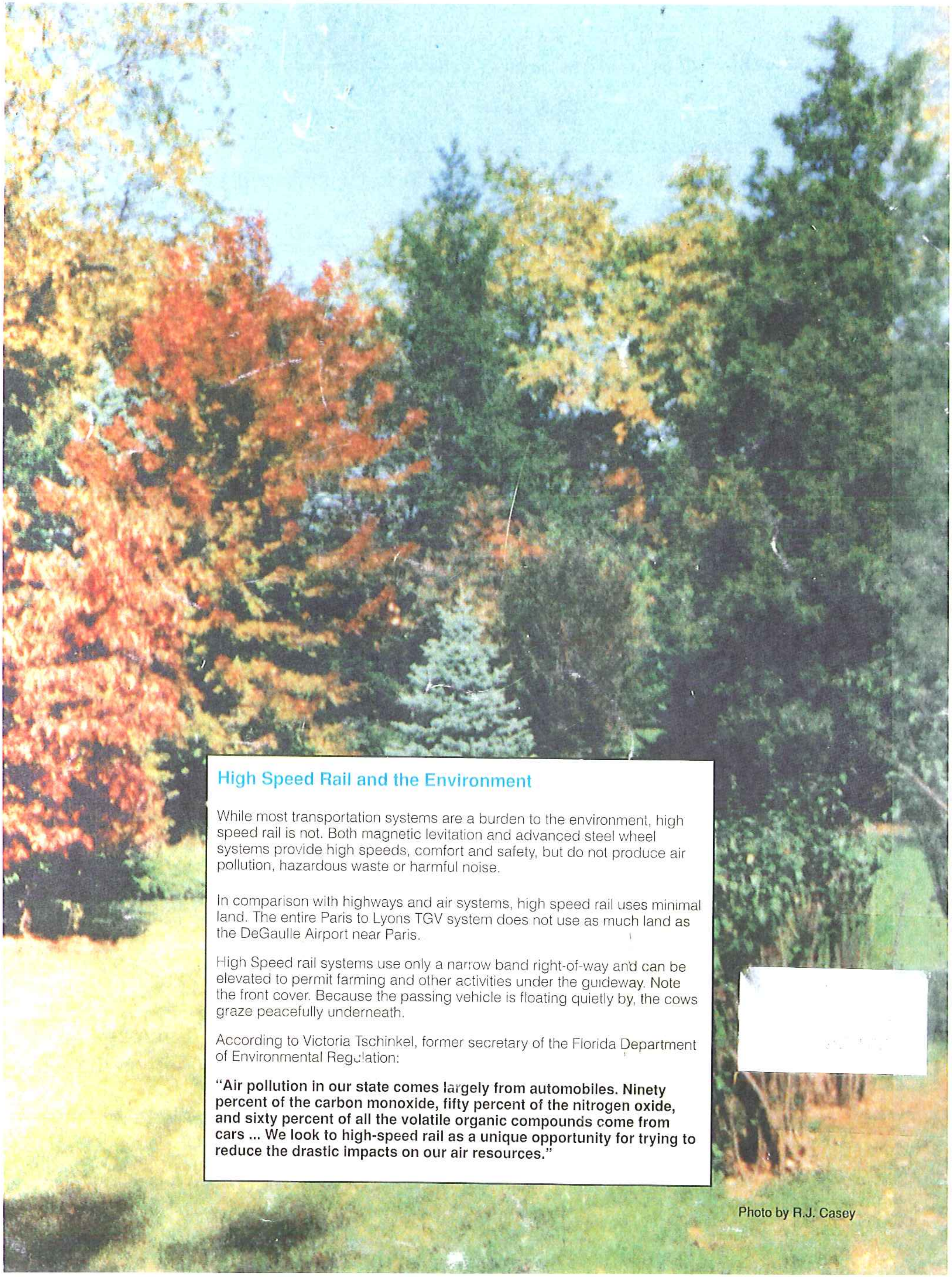
Air pollution from railroads is minimal, especially in electrified operations, where emissions from burning fuel are confined to power plants. The level of pollutants emitted by power rail passenger vehicles is miniscule, compared to emissions from other transportation modes, notably highway vehicles and aircraft. Electric utilities along the proposed system have enough reserve capacity to supply high speed rail without requiring construction of new generating stations.

FOR THE RECORD

The four-year, $4 million Pennsylvania high speed rail study was halted by the administration of Gov. Robert Patrick Casey just before it was completed. The Commission obtained a $44,000 grant from the Federal Railroad Administration for publication of a Final Report. The Report was prepared by several ex-commissioners and ex-staff members. At first, the governor's people refused to accept the grant and refused to publish the Report. After considerable urging by the public, the grant was accepted and the Report was published two years after the study was terminated (only 700 copies were printed).

However, the Report was in "words only" without benefit of maps, charts, graphs and photos. This was because a representative of the governor refused to allocate any of the Federal grant to provide illustrations. Now, however, due to a grant to the High Speed Rail Foundation from Transrapid International, some illustrations were made possible for this Executive Summary.

The Commission: Front, Mrs. Dottie Ketner, (executive secretary); front row, Richard C. Sullivan, Dan Cupper (executive editor); guest John Riley, (Federal Railroad Administrator); Robert A. Gleason, Representative Amos K. Hutchinson, Scott Casper (executive director of the House Transportation Committee); and Eric Bugaile (executive assistant); back row, Robert A. Patterson, Robert J. Casey (executive director of the Commission); Kant Rao, Everett W. Croyle, Representative Rick Geist, Lowell Witmer (representing Senator J. Doyle Corman) and Senator J. Barry Stout.



High Speed Rail and the Environment

While most transportation systems are a burden to the environment, high speed rail is not. Both magnetic levitation and advanced steel wheel systems provide high speeds, comfort and safety, but do not produce air pollution, hazardous waste or harmful noise.

In comparison with highways and air systems, high speed rail uses minimal land. The entire Paris to Lyons TGV system does not use as much land as the DeGaulle Airport near Paris.

High Speed rail systems use only a narrow band right-of-way and can be elevated to permit farming and other activities under the guideway. Note the front cover. Because the passing vehicle is floating quietly by, the cows graze peacefully underneath.

According to Victoria Tschinkel, former secretary of the Florida Department of Environmental Regulation:

"Air pollution in our state comes largely from automobiles. Ninety percent of the carbon monoxide, fifty percent of the nitrogen oxide, and sixty percent of all the volatile organic compounds come from cars ... We look to high-speed rail as a unique opportunity for trying to reduce the drastic impacts on our air resources."

Photo by R.J. Casey

Attachment C

Penn State: Giving back

PENNSTATE

Penn State is an economic powerhouse in the Commonwealth, directly or indirectly affecting every resident of the state. **It generates more than $17 billion annually in overall economic impact.**

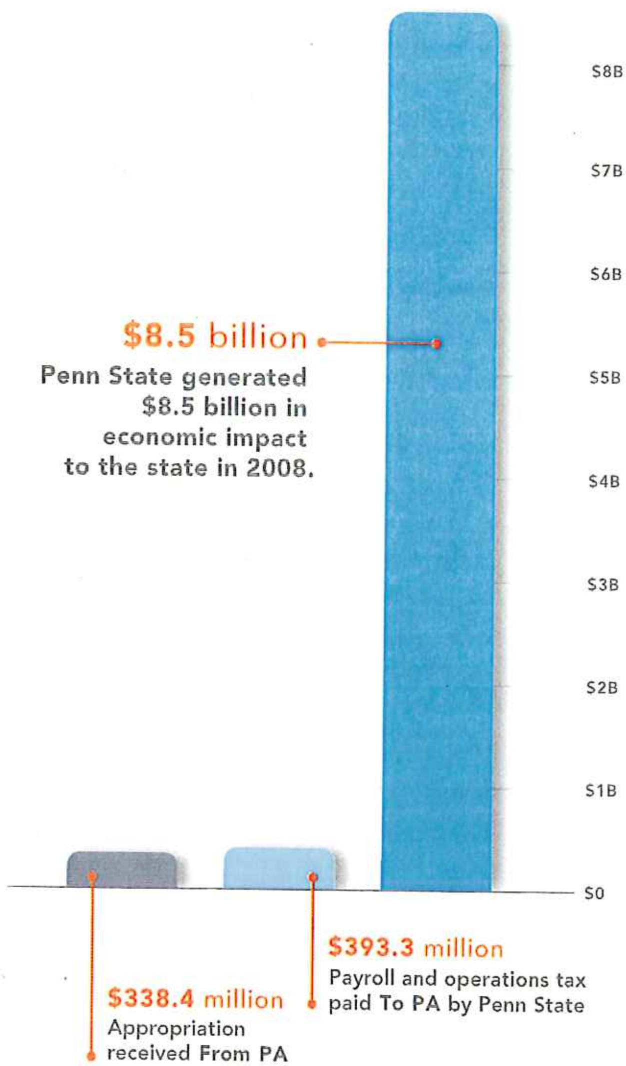
—TRIPP UMBACH & ASSOCIATES, 2008 ECONOMIC IMPACT STATEMENT

Penn State contributes more to the state's economy annually than any other industry. In 2008, the University generated **$8.5 billion** in direct and indirect economic impact and an additional **$8.7 billion** through business services, research commercialization, and the activities of alumni, for a total of more than **$17 billion.**

- For every dollar invested in 2008 by the Commonwealth to support the operations of Penn State, the University returned **$25.06** in total economic impact to Pennsylvania.
- Penn State generated **$647 million** in tax revenue for the Commonwealth in 2008. In other words, the University returned **$1.91** in tax revenue for every **$1** it received in appropriation.

ECONOMIC IMPACT, 2008

(Does not include $8.7 billion additional induced impact.)



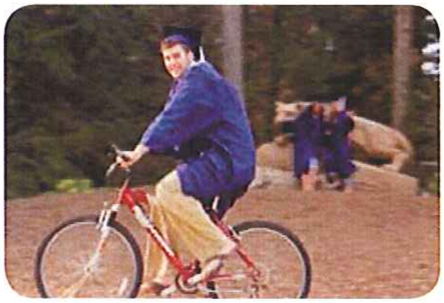
Running on Penn State power

In 2008, Penn State commissioned an independent study by the Pittsburgh-based Tripp Umbach & Associates to gauge the value of the University to the Commonwealth. Key findings in the 2008 Tripp Umbach report include the following:

- Penn State generated more than **2 percent** of the state's business volume or more than **$1 out of every $50** in the state's total economy.
- The University annually expends more than **$700 million** through its research activities. Research at Penn State supports more than **18,000** additional jobs in Pennsylvania, which generates more than **$1.9 billion** in additional economic impact and more than **$61 million** in additional revenue for the Commonwealth annually.
- The University is the largest creator of total employment among nongovernmental entities. Penn State has **44,000** employees, nearly **30,000** of them full-time. The total payroll from Penn State annually generates **$805 million** in direct impact through faculty, staff, and technical service employees' spending.
- The University currently generates more annual economic impact than the combined total impact of all of the state's airport hubs, professional sports teams, and arts and cultural organizations, by attracting nearly **1 million visitors** and generating **$1.73 billion** annually.
- Student spending amounts to **$932 million** in the state's economy.
- In 2008, out-of-state visitors to Penn State generated nearly **$777 million** in the Pennsylvania economy.
- The more than **250,000 alumni** who live in Pennsylvania generate **$1.9 billion** annually in additional economic impact, and produce **$59 million** in additional government revenue for the state.
- More than **17,000 Penn State alumni** own businesses in Pennsylvania, which directly employ more than **475,000 residents**. The average wage of employees at companies owned by Penn State graduates is **$9,800** higher than the average wage earner in Pennsylvania. This translates into more than **$4.1 billion** in additional expansion of the state's economy and more than **$125 million** in additional government revenue for the Commonwealth annually.
- Penn State employees donate more than **$130 million** annually in charitable donations and volunteer services within the Commonwealth.
- The total direct and indirect economic impact of Penn State is projected to grow over the next five years, from **$8.5 billion to $9.5 billion** in 2013.

This publication is available in alternative media upon request.
Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce.
Produced by the Penn State Department of University Publications U.Ed. PUBS 09-49

The total impact of the University goes beyond the operation of 24 campuses located throughout the Commonwealth and the education of more than 92,000 students.



CHECK IT OUT

To view the Tripp Umbach economic report, visit **psu.edu/ur/econimpact09**

For more about Penn State, visit **psu.edu**

Attachment D

Letters for the Record

centre region council of governments

Centre Region Council of Governments
OFFICE OF ADMINISTRATION

2643 Gateway Drive, Suite 3 • State College, PA 16801-3885
Phone: (814) 231-3077 • Fax: (814) 231-3083 • www.crcog.net

June 17, 2009

Mr. Daniel Sieminski
Assistant Vice President for Business and Finance
The Pennsylvania State University
208 Old Main
University Park, PA. 16802

Dear Dan:

This communication is written on behalf of the Executive Committee of the Centre Region Council of Governments that consists of elected officials from State College Borough and College, Ferguson, Halfmoon, Harris, and Patton Townships.

During its June 16, 2009 meeting, the Executive Committee discussed the concept of constructing a high speed rail connection from the City of Philadelphia to the City of Pittsburgh. In this regard, the Committee unanimously approved the following motion:

"The Centre Region COG endorses the concept of high-speed rail in Pennsylvania. The COG is interested in the project, and will need to assess the implications for the community."

This assessment is being conducted by the COG's Transportation and Land Use Committee. It should be presented to the General Forum, the COG's governing body, during its July 27, 2009 meeting.

Thank you for giving us the opportunity to comment on this important public transportation proposal.

Sincerely,

James C. Steff
COG Executive Director

JCS/cmp

cc: Executive Committee
Jim May, CRPA Director
Tom Zilla, CCMPO

CBICC
CHAMBER OF BUSINESS & INDUSTRY CENTRE COUNTY
Success stories start here.

200 Innovation Boulevard
State College, PA 16803
Tel: 814-234-1829
Fax: 814-234-5869
Email: cbicc@cbicc.org
www.cbicc.org

June 17, 2009

Dan Sieminski
The Pennsylvania State University
208 Old Main
University Park, PA 16803

Re: PA High Speed Rail

Dear Mr. Sieminski:

The Chamber of Business and Industry of Centre County (CBICC) is pleased to learn that the Pennsylvania State University will testify in support of a high-speed rail line that would greatly enhance east-west travel across Pennsylvania. It is a large but extremely worthy investment of federal funds.

It is our understanding that the project, if funded, would ultimately connect Pittsburgh and Philadelphia with stops in major Metropolitan Service Areas, including State College. The planned rail system would truly be a boon to the University and Central Pennsylvania. It would spur economic development, create new jobs, reduce energy use, and limit harmful emissions.

Unfortunately, airline companies have been unable to justify direct air service between State College and Pittsburgh. A connecting high-speed rail line would provide a viable alternative to air travel between these locations.

Given the growing need for infrastructure improvements in Centre and surrounding Counties, we commend and support your efforts to address an alternative to critical infrastructure projects currently on indefinite "hold", mainly due to fiscal constraints. These include: the I-80/I-99 high-speed and local access interchanges; the I-99 connector road to the University Park Airport; and the replacement of the outdated and unsafe Route 322 (SCCCTS) highway between State College and Lewistown.

Because it would be detrimental to the Central PA economy, the CBICC is opposed to the tolling of I-80. An east-west high-speed rail system would reduce traffic on I-80 and quite possibly provide enough revenue to offset the envisioned toll collections. It would also reduce maintenance and upgrade costs for the interstate and its connecting roadways.

With the completion if I-99, the Rt. 322 Lewistown " narrows", and considerable new Rt. 22 highway between Altoona and Pittsburgh, there exists many new public rights-of-way which might accommodate high-speed rail where existing rail corridors are either unsuitable, or reserved for heavy freight.

On behalf of the CBICC, I wish you success in your efforts to secure the necessary funding for this forward thinking project. If we can be of further assistance please contact me at your convenience.

Sincerely,

John F. Coleman, Jr.
President/CEO

Cc: Betsy Howell, CPCVB

Central Pennsylvania
CONVENTION & VISITORS BUREAU
Tour. Roar. Explore...more!

June 17, 2009

Daniel W. Sieminski
Associate Vice President for
Finance and Business
208 Old Main
University Park, PA. 16802

Dear Mr. Sieminski:

This letter serves as the Central Pennsylvania Convention and Visitors Bureau's vote of support for the proposal to develop a high-speed rail system in Pennsylvania, including through Centre County. We respectfully request that you include it as part of your testimony to the U. S. House of Representatives Committee on Transportation and Infrastructure.

Our location in the center of Commonwealth of Pennsylvania and our assets, such as The Pennsylvania State University, make the area a natural location for connection to the rail system between Pittsburgh, Harrisburg and Philadelphia.

More importantly, the addition of rail service would provide locals, visitors and PSU students' easy access to and from other major Pennsylvania metropolitan areas thereby having a positive economic impact while at the same time having the potential to decrease pollution from automobile travel along with the cost of maintenance of highways such as I-80 and Rt. 322.

We commend you for your efforts and if there is anything else we can provide please contact me at 814-231-1401.

Sincerely,

Betsey Howell

Betsey Howell,
Executive Director

800 East Park Avenue, State College, PA 16803 1.800.358.5466 814.231.1401 Fax 814.231.8123 www.centralpacvb.org

CATA
Centre Area Transportation Authority

2081 W. Whitehall Rd.
State College, PA 16801
814-238-CATA (2282)
FAX: 814-238-7643
www.catabus.com

Centre Line
Centre Ride
Centre Commute
LOOP/LINK

The Honorable James L. Oberstar
Chairman
Committee on Transportation
& Infrastructure
2165 Rayburn House Office Building
Washington, DC 20515

The Honorable John L. Mica
Ranking Member
Committee on Transportation
& Infrastructure
2163 Rayburn House Office Building
Washington, DC 20515

June 16, 2009

Re: The Keystone Corridor – High Speed Rail Across Pennsylvania

Dear Chairman Oberstar and Ranking Member Mica:

We are writing on behalf of the Centre Area Transportation Authority (CATA), the public transportation system that serves the State College, Pennsylvania urbanized area, home of the Pennsylvania State University. According to the National Transit Database, CATA is the third largest transit system in the state, in terms of passengers carried, ranking behind only SEPTA in Philadelphia and the Port Authority Transit in Pittsburgh.

CATA strongly supports the creation of high-speed rail across Pennsylvania, connecting Pittsburgh with Philadelphia and allowing passengers to directly access the Northeast Corridor. Such service would presumably include intermediate stops to serve the larger communities in the central part of the state. Due to the presence of the Pennsylvania State University, State College is arguably the most significant destination west of Harrisburg. High speed rail service would provide a viable alternative to air travel, intercity bus and even the private automobile for the hundreds of thousands of people who travel annually from the major metropolitan areas of the Northeast to State College.

The Keystone Corridor is important in several ways. First, the State College area will benefit. Many students bring a car to campus not because they need it while they are here, but simply for transportation to and from State College. High-speed rail will encourage students to leave their cars at home, which will help alleviate traffic and parking problems on campus and in the community. Second, CATA will benefit. Individuals who come to State College without a private automobile typically become regular users of public transportation. Not only does the use of transit immediately support several important national goals, including energy independence, but the positive experience that students have riding CATA buses should translate to greater utilization of public transportation later in life. Third, the users themselves will benefit. High speed rail will allow travelers the opportunity to better utilize their time, and rail will be less susceptible to disruptions due to weather and highway bottlenecks.

Thank you for the opportunity to provide this testimony to the Committee, and for your support of high speed rail in general and the Keystone Corridor in particular. Should you or your staff be interested in further information about the Centre Area Transportation Authority or our interest in high speed rail, please do not hesitate to contact us.

Sincerely,

John C. Spychalski
Chairman

Hugh A. Mose
General Manager

Pc: CATA Board of Directors
Dan Sieminski, Penn State