Evaluation of the FDOT-FOX Miami-Orlando-Tampa High-Speed Rail Proposal

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EXECUTIVE SUMMARY

- A high-speed rail line has been proposed for the 322-mile corridor from Miami through Orlando to Tampa with trains operating up to 200 miles per hour. The Florida Department of Transportation (FDOT) and the developer, Florida Overland Express (FOX), believe that the line would attract significant numbers of travelers from automobiles and airplanes. As a result, FDOT and FOX forecast that highway traffic congestion (gridlock) and air traffic congestion (winglock) would be alleviated, reducing requirements for highway and airport expansion. They also predict that various other environmental, traffic safety, and economic benefits would ultimately be enjoyed by the state because of this project.

- The FOX line would require nearly $3.5 billion in subsidies. The state of Florida would provide $3 billion in subsidies, the federal government $300 million, Orlando International Airport $100, million and Miami International Airport $50 million. FOX would provide $350 million in equity, construct the line, build the trains, and operate the system for 40 years. Infrastructure debt of $6.5 billion would be incurred.

- **The proposed high-speed rail system is likely to be a financial disaster for Florida.** ***This analysis, based upon FDOT, FOX, and generally available planning and market data, finds that high-speed rail is exceedingly unlikely to live up to the claims of its promoters. High-speed rail is likely to cost much more, carry fewer passengers, and expose the state to greater financial risk than is presently anticipated.***

- High-speed rail operates in Japan and Europe along highly populated corridors where the lines are fed by well used city transit systems. Those lines are an integral part of comprehensive intercity rail systems that provide frequent service in both Japan and Europe. High-speed rail fares are competitive with or below the cost of competing modes of transport (autos and airlines). Nonetheless, rail market shares are declining and impending airline deregulation is likely to significantly challenge high-speed rail in both Japan and Europe.

- The market for high-speed rail is more challenging in the United States. Lower population densities, less used transit systems, and the absence of frequent connecting intercity rail service are significant disadvantages for high-speed rail in this country. Near high-speed rail service (125 miles per hour) operates in the New York-to-Washington corridor, but no genuinely high-speed rail systems operate. Two recent national studies—one by the United States Department of Transportation Federal Railway Administration and another by the National Research Council—have concluded that high-speed rail is not commercially viable in the United States.

- The forecasts of officials planning large infrastructure projects have tended to underestimate costs and overestimate usage: Denver's International Airport experienced cost escalation of 300 percent, and the English Channel Tunnel cost 140 percent more than expected. Boston's Central Artery/Tunnel has doubled in cost. All three projects experienced opening delays of at least one

year. Usage forecasts have also been inaccurate. Florida project forecasts have also been inaccurate both in costs and usage. Examples include Miami's Metrorail and Metromover, Tri-Rail, and Jacksonville's Sky Express people mover line. Even Florida's Turnpike authorities significantly overprojected demand for its newest roads, despite decades of experience.

- The Florida market is comparatively unfavorable to high-speed rail. The Miami-Orlando-Tampa corridor has much less population and lower population densities than high-speed rail corridors in Japan, Europe and New York-Washington. There is no frequent connecting intercity rail service and transit services are poorly patronized.

- The FOX high-speed rail line would have no advantage over airlines. FOX fares are projected at 30 percent or more below air fares. However, in recent months the South Florida-Tampa and South Florida-Orlando air markets have been entered by discount air carriers, and average air fares have dropped significantly—the average airfare is now 15 percent *below* FOX's anticipated average rail fare. In the Miami-to-Orlando market, rail travel times will be similar to that of the airlines, while rail will face a one hour disadvantage in the Miami-to-Tampa market. Further, the airlines are likely to become more competitive in future years.

- The FOX high-speed rail line would be far more costly than autos. FOX fares are projected at 33 to 250 percent above the full cost of business automobile travel. FOX fares would be from two to 20 times the cost of a personal auto trip.

- The FOX high-speed rail line would be slower than autos for some trips and faster for others. FOX travel times would be one hour and 30 minutes faster than autos, door to door between South Florida and Tampa or Orlando. However, high-speed rail would be slower than autos between Orlando and Tampa. This represents a major problem because FOX projects one-third of its ridership would be attracted from autos in the Orlando-to-Tampa corridor—a distance far too short to provide a competitive advantage to high-speed rail.

- This study projects that ridership under favorable circumstances would be 55 percent below FOX estimates, as the ridership projections are extremely optimistic. Both FDOT and FOX state that high-speed rail will capture more than 65 percent of the airline market. This would be a formidable task even if rail fares were well below air fares, but air fares are already lower than projected high-speed rail fares. The predicted diversion from autos is very high in light of the auto's travel time advantages in short markets and its overall cost advantages. The lower population densities, lack of connecting rail service, and low levels of transit usage would also impair high-speed rail patronage.

- The FDOT and FOX high-speed rail cost projections are highly optimistic. The projected operating and capital costs are lower than industry estimates, and the forecasts do not include a contingency fund to accommodate the significant cost escalation characteristic of projects of this size.

- High-speed rail is likely to cost Florida much more than projected. In the best case, this report estimates that the state of Florida would be required to increase its subsidy from $3 billion to $14

billion, and in the worst case to nearly $39 billion. It is unlikely that commercial revenues will be sufficient to pay debt service by the fourth year (out of 40 years). The financial projections are so fragile that small operating and capital cost overruns could force a default on debt in less than 10 years even if FOX generated its projected fares and commercial revenues (which this report considers well beyond realistic).

- The state of Florida would assume virtually all of the risk. Because the state would be required to guarantee project completion and operation, its obligation would be open-ended (up to $39 billion). FOX's risk would be limited to $350 million.

- High-speed rail would not materially improve the environment, air traffic congestion, or highway traffic congestion despite the claims of promoters.

    - The impact upon the environment would be negligible or even negative.

    - Because high-speed rail would reduce automobile traffic by a negligible amount, increased highway investment would produce greater improvements in traffic safety.

    - The problem of air traffic congestion—winglock—has been exaggerated. All airports in the Miami-Orlando-Tampa corridor are expanding or intend to expand to accommodate rising demand. Even if the unrealistic FOX projected diversion from the airline market share were to occur, it would still only reduce airline operations by 2 percent. FOX would not reduce the demand for airport expansion, which is more cost effective than building high-speed rail.

    - The problem of highway traffic congestion—gridlock—is more difficult. But FOX would remove so few automobiles from highways that traffic congestion would essentially remain unchanged. Diversion from automobiles would average 1/30th of the traffic in a single traffic lane. Thus, FOX would not reduce the demand for highway expansion, which is more cost effective than building high-speed rail.

- FDOT has adopted a policy of preference toward high-speed rail which could actually injure Florida's economy. The state bias would result in greater highway congestion and impede Florida products in reaching their markets. Also, the likely high-speed rail cost escalation would require funding sacrifices in other public services, or tax increases, which reduce economic growth and job creation.

- High-speed rail planning is based upon assumptions, not analysis. FDOT and FOX claim that high-speed rail would produce transportation, environmental, and economic benefits for Florida. They are proceeding with high-speed rail on the assumption that high-speed rail's theoretical benefits would be achieved, without a critical examination of the likely *actual* benefits.

- This analysis concludes that *even if FDOT-FOX ridership projections were achieved*, high-speed rail would have at best negligible impact on either transportation or the environment, because so few people would be diverted from autos or airlines. More importantly the FDOT and FOX projections are extremely optimistic—thus not even the negligible results are probable. Consistent with existing large infrastructure projects:

    - ridership is likely to be far lower than projected,
    - fares and commercial revenues are likely to be far lower,
    - operating costs are likely to be higher than projected, and
    - capital costs are likely to be higher than planned.

In sum, the proposed Florida Overland Express high-speed rail system would provide only negligible benefits, but its cost to Florida would be enormous.

I. INTRODUCTION

The Emergence of High-Speed Rail

High-speed rail systems have been operating in Japan since 1964 and in France since 1981. High-speed rail has generated interest in the United States as well. High-speed rail has been proposed as a strategy to relieve highway congestion (gridlock) and air traffic congestion (winglock) in markets of under 500 miles. This, proponents claim would reduce the necessity for highway expansion and air system expansion (which, it is claimed, is limited by the inability to "build new airspace").[i] Proponents also claim that a significant air pollution improvement would result as high-speed rail captures a large portion of the intercity travel market from automobiles and airlines.

A high-speed rail line has been proposed for a 322 mile corridor from Miami through Orlando to Tampa. Top operating speeds would be 200 miles per hour. The line would be in operation by 2004, and would be financed by private developer capital of $350 million, local state and federal funding of nearly $3.5 billion, and commercial revenues, primarily passenger fares (all financial data is in constant 1995 dollars unless otherwise noted). The cost of this construction project will be approximately $6.5 billion, most of which would be raised through the sale of bonds.

Purpose of this Report

Most previous planning documents on the proposed Florida project evaluated high-speed rail on its theoretical capabilities. This study evaluates high-speed rail's potential to reduce highway and air traffic congestion. It

- reviews the high-speed rail experience around the world,
- reviews the proposed Miami-Orlando-Tampa high-speed rail line, and
- evaluates the proposed FOX line based on the reasonableness of FOX projections and prospects for achieving the stated public purposes.

Most of the financial and ridership data is for the year 2010, the planning horizon used by FDOT and FOX.

Based upon an analysis of available planning and market data, this report finds the Florida high-speed rail proposal to be extremely optimistic. High-speed rail is likely to cost much more, carry many fewer passengers, and require considerably higher state subsidies than planned. Moreover, high-speed rail's impact on transportation, the environment, and the economy would be generally negligible or even negative.

The Public Purposes of High-Speed Rail

The state of Florida Department of Transportation (FDOT) has awarded a franchise to Florida Overland Express (FOX), a limited partnership between Fluor Daniel, Odebrecht Contractors of

Florida, Bombardier, and GEC Alsthom. FOX was selected through a competitive process that attracted five proposers.

The state legislature, in enacting legislation to authorize high-speed rail development, stated that high-speed rail was to "solve transportation problems and eliminate their negative effect on the citizens of this state." State legislation expresses the expectation that high-speed rail would "eliminate unduly long and traffic-congested commutes for day to day commuters," create employment, encourage development, generate economic growth, reduce traffic fatalities, reduce the cost of automobile accidents, and generate environmental benefits.[ii] The legislature expects high-speed rail to provide much needed transportation capacity in Florida:

> *Because Florida has a fast growing population of residents and visitors, many highways and airports are near or exceed design capacity. Expansion plans for these transportation facilities have not been able to keep up with the demand for services.*[iii]

Beyond the benefits anticipated by the legislature, FOX indicates that high-speed rail would provide a substantial boost in transportation capacity at considerable savings to Florida. FOX estimates that construction of a new four-lane expressway from Tampa to Orlando to Miami would cost $8.9 billion, at least $3 billion more than the proposed high-speed rail line. Further, FOX indicates that the high-speed rail line would be "capable of transporting the equivalent of approximately 10 lanes of traffic when operating at maximum capacity," and that the high-speed rail system "will yield a far greater traffic mitigation return to the State than expansion of the Florida highway network."[iv]

FDOT policy limits the number of lanes on state highways. The policy restricts Florida's Turnpike to four lanes (two in each direction) between Kissimmee and the northern Palm Beach County boundary. This segment of roadway serves virtually all of the South Florida to Orlando automobile traffic, and is the only segment along the high-speed rail corridor that is not urban. The policy states that additional capacity will be provided by "other alternatives and strategies," and indicates that:

> *Emphasis on the development of intercity rail service will be placed on the following corridors: Tampa-Orlando; Orlando-Miami.*[v]

Moreover, FDOT expects the project to remove 21,000 annual airline flights in the Miami-Orlando-Tampa corridor.[vi] According to FOX, the service would offer "nearly the speed of air travel but at a cost that compares favorably to auto travel." With 24 trains daily in 2010, FOX claims that it would "offer more departures than is possible by air."

The proposed high-speed rail benefits to Florida (public purposes) are listed in Table 1.

Table 1 Proposed Public Purposes of High-Speed Rail (Benefits to Florida)
Auto traffic reduction and reduced highway investment
Air traffic reduction and reduced airport investment
Environmental benefits
Improved highway safety
Economic benefits

II. HIGH-SPEED RAIL: INTERNATIONAL EXPERIENCE

Japan

The world's first high-speed rail line—Japan's "bullet train"—began operation in 1964. The first trains traveled at top speeds of 130 miles per hour, while more recent trains have operated at up to 186 miles (300 kilometers) per hour.

When service was initiated, Japan was a much poorer country than it is today. Automobile ownership was very low; there was one automobile for each 46 persons in 1965. Commercial air service was limited, and railroads accounted for 67 percent of passenger travel, while automobiles carried only 11 percent.

Japan's original line, from Tokyo to Osaka through Nagoya, is 320 miles long. It travels through some of the largest urban areas[vii] in the world: Tokyo-Yokohama (Tokyo), with more than 30 million people, is the world's largest urban area; Osaka-Kobe-Kyoto (Osaka), with more than 15 million, is the world's sixth largest urban area; and Nagoya ranks among the top 40 urban areas, with more than five million. Other factors favor high-speed rail.

- **High urban population densities:** The (central) city of Tokyo has 41,000 people per square mile. The urban (developed) area densities in Nagoya, Osaka, and Tokyo range from 15,000 to nearly 30,000 per square mile. The three metropolitan areas along the original high-speed rail route have a population of 52 million with more than 160,000 people per route mile.

- **Extensive transit networks** feed the high-speed rail system. Tokyo-Yokohama ridership alone is approximately three times that of the entire United States population. Unlike the rest of the developed world, most urban transit service in Tokyo, Nagoya, and Osaka is profitable, with buses, interurban rail lines, and even subways privately owned.

- **Extensive rail network:** Japan has an extensive intercity rail network focused on city center stations where there is convenient access to high-speed rail services. Further, Japan's geography is particularly favorable to high-speed rail. The main island of Honshu is from 50 to 200 miles wide. The 1,000 mile main high-speed rail line is within reach of more than 100 million people either directly or by frequent connecting rail service. Almost all of Japan can be reached within a day by rail.

High-speed rail is priced competitively compared to other modes of transport. For example, the $123 one-way fare from Tokyo to Nagoya (200 miles) makes high-speed rail very attractive.

- **High driving costs:** The cost of gasoline and tolls alone is nearly $110. Gasoline is expensive—nearly $3.40 per gallon as a result of domestic refiner protection and 120 percent taxation. The highway tolls between Tokyo and Nagoya are approximately $75.00.[viii] Parking is much more restricted and more expensive than in the United States, which raises the cost of driving even more. The full price of driving, including auto purchase, taxes, insurance and maintenance, is well above high-speed rail fares.

- **Restricted air market:** The airline market has been strictly regulated, both in fares and service frequencies. Airline deregulation is beginning, as the nation's first new airline in more than 40 years has recently been authorized. The economy airline fare has dropped to $116. However this advantage can be more than eliminated by high parking charges, airport access tolls, or taxi fares.

In the intervening years, Japan has emerged as one of the world's most affluent countries. And, despite the advantages of high-speed rail, automobile use has increased exponentially. Automobiles now account for 52 percent of travel in Japan, while the rail market share has been nearly cut in half, to 35 percent.[ix] Nonetheless, high-speed rail carries volumes of up to 23,000 passengers per hour in one direction in the Tokyo area.[x]

But new high-speed rail construction has become politicized. In the past, high-speed rail lines have been built to accommodate rising rail demand on crowded rail corridors. Commercial passenger railroad companies have expressed[xi] concern about the commercial viability of the new routes, which have been called "hopelessly uneconomic."[xii] Future routes would be built with government capital subsidies of at least 50 percent.[xiii]

Japan has exceedingly dense rail corridors that connect some of the most crowed urban areas in the developed world. Japan is a uniquely favorable environment for operation of high-speed rail. Nonetheless, as airline deregulation proceeds, high-speed rail could be hard pressed to maintain its market share.

France

Like Japan, France built high-speed rail to accommodate growing demand on its rail system. Operations on the first route, Paris to Lyon, began in 1981. Three routes now radiate from Paris. One of the lines reaches the English Channel tunnel (Eurotunnel), through which the Eurostar service operates to London.

Population densities are lower in France than in Japan. However, the hub of the French system, Paris, is continental Europe's largest metropolitan area, with more than 10 million people. Paris is very densely populated. The central city has 53,000 people per square mile, while the metropolitan area has nearly 20,000 per square mile. Other large French metropolitan areas are also densely populated and have extensive and well-used transit systems that feed central city rail stations. The population per route mile along the Paris to Lyon corridor is more than 45,000.

Further, France's high-speed rail services are an integral part of a much larger passenger rail network throughout Europe. Even before service began to England through the Eurotunnel, more than 200 million people were connected by this system with frequent daily departures.

High-speed rail fares compare favorably to other modes. For example, the present coach class (second class) fare from Paris to Lyon (264 rail miles) is $74. In contrast:

- Highway tolls and gasoline for the same trip by auto total $91—more than 20 percent higher than the rail fare. Gasoline is taxed at approximately 400 percent and costs more than $4.50 per gallon, while highway tolls in this corridor are approximately $30. Full automobile costs, including purchase, insurance, and maintenance are higher. A further disadvantage to travel by auto in the Paris to Lyon corridor is that it is 21 miles longer than the rail journey.

- The one-way coach airline fare for the same trip is $192, more than two and one-half times the rail fare. High air fares in high-speed rail corridors have been a staple of French regulatory policy, which requires an "appropriate" spread over rail fares to encourage rail usage.[xiv]

- France also banned competing bus service on this route to boost high-speed rail ridership.[xv]

Ridership along the already heavily traveled rail corridor from Paris to Lyon has increased by nearly 70 percent, from 12 million to 20 million.[xvi] However, reflecting the importance of the extensive rail network (of which high-speed rail is a part), only 25 percent of the riders in the corridor begin and end their travel in Paris, Lyon or in between.[xvii] Approximately 35 percent of the new high-speed rail ridership has been attracted from airlines and 20 percent from automobiles, while 45 percent is "induced" trips — new trips.[xviii] Despite its considerable speed and price advantages, high-speed rail has attracted only 10 percent of the Paris to Lyon automobile travel.[xix]

Like the United States, France is an automobile dependent nation. Automobile travel volume is 11 times that of rail, and rail is losing market share.[xx] The nation is now building 1,500 miles of new expressways, while some new high-speed rail construction has been delayed or even halted.[xxi] Since 1980, bus ridership has increased by a larger number of riders than rail ridership.

The artificially constrained domestic airline market was deregulated April 1, 1997. The previous deregulation of European air services between countries has already produced drastically lower fares in some markets. It seems likely that high-speed rail's fare advantage is likely to be eroded, if not eliminated entirely. In the longer term, airlines are likely to win market share from high-speed rail. French high-speed rail services will face more competitive challenges in the future.

Europe in General

While France has been the European leader in high-speed rail, lines have been or will be built in other European nations. Besides France, high-speed rail is operating or is planned in countries such as the United Kingdom, the Netherlands, Belgium, Spain, Germany, Switzerland, and Italy. When complete, the European high-speed rail system is expected to attract 3 percent of highway traffic, equal to one-year's growth in European highway demand. When Sweden implemented high-speed rail service, 62 percent of the new ridership came from airlines and only 8 percent from automobiles.[xxii] Replicating what would be expected in a competitive market, English Channel ferry companies responded to Eurotunnel train services by reducing their fares and expanding services.

Europe is far more automobile dependent than Japan. Nearly 80 percent of European travel is by automobile and 6.2 percent is by rail. Since 1980, the rail market share has dropped by more than 25 percent while airlines have expanded their market share by 80 percent to nearly equal that of rail.[xxiii] At the same time, the European Union is undertaking steps to make its passenger rail services commercial, including high-speed rail services.[xxiv] Maintaining market share is likely to be difficult as the deregulated market increasingly provides higher levels of service at lower fares.

III. HIGH-SPEED RAIL IN THE UNITED STATES

The Market

The United States is a far more challenging environment for high-speed rail because it differs from Japan and France in urban development and population density. Urban areas in the U.S. tend to have 2,000 to 5,800 people per square mile, which is very low compared to the 15,000 and more that is typical of Japanese and European urban areas. Transit systems in America are incapable of providing frequent, convenient service to cover these spread-out areas. The United States covers 25 times the area of Japan, yet has only two times as many people. Compared to the European Union, the U.S. covers more than three times as much area and has almost 90 percent as many people. The longer intercity travel distances rendered America's once extensive national passenger rail system obsolete. It has been replaced by an airline system that makes it possible to travel from any point to any other in just a few hours. Deregulation of the airline industry increased service and lowered fares, bringing airline travel within the financial reach of most income groups. Amtrak, the remnant of the national rail system,

provides infrequent service except along the Washington-New York-Boston corridor,[xxv] but other large metropolitan areas have no rail service.

Gasoline is priced closer to market rates in the United States, with taxation (mainly highway user fees) at 40 percent above the market price. Highway tolls are far lower than in France and Japan, and most intercity expressways have no tolls.

Nonetheless, the United States is not significantly different from Europe with respect to travel. Automobiles account for 87 percent of travel, compared to Europe's 79 percent. The largest difference is in rail travel—Americans average 50 mile annually, Europeans 500 and Japanese nearly 2,000 (see Table 2).

Table 2
Passenger Transport Market Share: 1994
(Person Miles)

	Auto	Bus	Rail	Airline
United States	87.0%	3.4%	0.3%	9.3%
European Union	79.7%	8.3%	6.2%	5.8%
Japan	51.5%	8.7%	34.5%	5.3%

Travel trends are similar in Japan, Europe, and the United States (see Table 3). Railway market share is declining rapidly in all three and airline market share is increasing substantially. In the United States, airline market share has expanded by more than 25 percent since deregulation, generating a small reduction in auto market share. In both Japan and Europe, airline market share is rising more rapidly, with a modest increase in automobile market share in Europe and a substantial increase in Japan. Both Europe and Japan are in the first phases of airline deregulation, which suggests further escalation of airline market shares that would steepen the rail market share decline and moderate future increases in auto market shares.

Table 3
Change in Passenger Transport Market Share:
1980-1994

	Auto	Bus	Rail	Airline
United States	-1.7%	-8.0%	-23.4%	25.1%

European Union	3.7%	-27.3%	-27.2%	80.6%
Japan	24.3%	-38.9%	-14.9%	39.5%

Near High-Speed Rail: New York to Washington

Amtrak currently provides *Metroliner* service from Washington, D.C. to New York City, operating up to 125 miles per hour. The four large urban areas along this 225-mile corridor (New York, Philadelphia, Baltimore, and Washington) have a population of more than 25 million, approximately 113,000 people per line mile. However, these urban areas cover substantially more land area than Japanese or European urban areas.

While its top operating speeds are well below that proposed by FOX, *Metroliners* operate fast enough to provide service equal to airline service between origins and destinations in central Washington and Manhattan. Thus, from a consumer perspective, the barely perceivable time differences between rail and air service in the Washington-New York corridor replicate the anticipated air-rail travel time performance that is typical of high-speed rail markets.

Further, Amtrak's *Metroliner* service has a substantial fare advantage over air fares—Amtrak *first-class* fares are 45 percent lower than airline *coach* fares. Amtrak's express trains are far more spacious than airline shuttle services, which do not offer first class service. While suburbanization has made downtown rail station locations less advantageous in most U.S. travel markets, the New York-to-Washington market retains a strong downtown focus. New York has by far the most vibrant downtown in the nation, and Washington's federal offices and downtown are one of the nation's busiest employment centers.

Transit systems in this corridor are the strongest in the nation, but are less comprehensive and less used than in Europe and Japan. The network of frequent connecting intercity rail service is meager, and is limited to trains from Boston and Albany to New York.

Amtrak carries approximately 40 percent of the point-to-point Washington-to-New York combined air and rail market share.[xxvi] Even so, Amtrak estimates that its services in this corridor (including passengers using intermediate stations) removes fewer than 500 automobiles per hour from highways along the corridor—approximately 10 percent of two-way lane capacity. Moreover, as has occurred when airlines have ceased operations, air carriers in the New York-to-Washington market could accommodate Amtrak passengers with only temporary inconveniences.[xxvii]

Proposed Projects

During the last two decades, high-speed rail lines have been proposed for commercial operation in a number of corridors. Detailed planning has occurred for some routes such as Los Angeles-San Diego,

Los Angeles-Las Vegas, Houston-Dallas-San Antonio, and Miami-Orlando-Tampa. All of these projects have been canceled, in large measure for failure to attract commercial investment.[xxviii]

Two recent national reports have concluded that high-speed rail is not commercially viable in the United States. A 1991 National Research Council report[xxix] reviewed 33 potential high-speed rail markets and found:

In nearly all these markets, break-even operation would require not only low costs but also the ability to charge premium fares well above airline levels. The combined occurrence of both these conditions in any one market would be extremely unlikely.[xxx]

A study by the Federal Railroad Administration (FRA) similarly found that commercial revenues would fall far short of costs in all studied corridors over the period from 2020 to 2040 (see Table 4).[xxxi] The most favorable performance was projected in the Washington-New York-Boston corridor at 55.3 percent, which would require a public subsidy of 44.7 percent. FRA projected that commercial revenues in the Miami-Orlando-Tampa corridor would cover 37.7 percent of costs, requiring a public subsidy of 62.3 percent.[xxxii]

Table 4
High-Speed Rail Corridors
FRA Feasibility Study: 2020

Corridor	Commercial Revenues	Subsidies
Chicago-Detroit	21.6%	78.4%
Chicago-Milwaukee-Detroit-St. Louis	22.8%	77.2%
Chicago-St. Louis	13.6%	86.4%
Eugene-Portland-Seattle-Vancouver	17.0%	83.0%
Houston-Dallas-Austin-San Antonio	42.7%	57.3%
Los Angeles-San Diego	15.6%	84.4%
Miami-Orlando-Tampa	37.7%	62.3%
San Francisco-Los Angeles-San Diego	31.8%	68.2%
Washington-New York-Boston	55.3%	44.7%
Average: High-Speed Rail	28.7%	71.3%
Exhibit: Amtrak 1994	*43.6%*	*56.4%*

FRA found ridership would be even lower where discount airlines operated, noting that an air fare reduction of 30 percent would reduce high-speed rail ridership by 30 percent.[xxxiii]

In contrast to this report, neither the National Research Council nor FRA evaluated the capability of high-speed rail to reduce air or highway traffic congestion or investment requirements.

IV. FORECASTING INFRASTRUCTURE COSTS AND USAGE

International Experience

Forecasting the costs and performance of major infrastructure projects with a reasonable degree of approximation is very difficult. Despite relying upon the finest technology, the most adept computer models, and the sharpest minds, projections for many major infrastructure projects have been exceedingly inaccurate.

- The New Denver International Airport was estimated to cost $1.7 billion when it was approved for construction. Eight months into construction, costs had increased 60 percent. After opening 16 months late, the cost had escalated to $4.8 billion (each month of delay cost nearly $20 million), a construction related cost overrun of $3.1 billion. The higher levels of bonded debt would require approximately $2 billion in additional interest payments, raising the cost overrun alone to $5.1 billion—a more than 300 percent increase over the cost estimate on which the decision to proceed was made (all figures in 1996$).[xxxiv]

- The Channel Tunnel between England and France was to have been built for $7.8 billion. Costs escalated to $18.6 billion—an increase of nearly 140 percent, which does not include the higher cost of interest due to larger borrowing requirements than projected.[xxxv] After opening a year late, its first year of operation produced a loss of $1.5 billion. The competitive response of cross-channel ferry operators reduced tunnel traffic to below expectations. After failing to pay interest on its debt for more than a year, a financial bailout was negotiated with creditors converting half of their loans to equity. This project was privately financed as both the British and French government were unwilling to provide either public subsidies or debt guarantees.

- The cost of Boston's Central Artery/Tunnel expressway project has nearly doubled from a projected $5.5 billion to $10.4 billion (1996$). The project is scheduled to open six years late in 2004.[xxxvi]

- Amtrak, which was created to salvage the national passenger rail system, was intended to achieve profitability shortly after its establishment in 1971. Yet Amtrak continues to post significant losses and taxpayers subsidies have exceeded $15 billion. Amtrak claims that fares and other commercial revenues will eventually exceed its operating, but not capital costs. The United States Government Accounting Office has found that Amtrak's financial condition is deteriorating and that it is unlikely to earn commercial revenues that exceed its operating costs, much less its capital costs.[xxxvii] Amtrak is now seeking a new federal tax.

- Large urban rail projects have consistently cost more to build and operate, attracted fewer passengers, and generated less passenger revenue than projected. During the 1980s, federally financed urban rail projects cost 46 percent more to build, and 78 percent more to operate than projected. Ridership averaged 59 percent below projections. So few new passengers were attracted that the annual cost per new passenger exceeded the cost of leasing a car in virtually all new systems.[xxxviii] In response to ridership shortfalls, transit agencies have begun to issue radically reduced ridership estimates shortly before system openings.

- The more recently completed Los Angeles-Long Beach light rail project was estimated to cost $210 million when the Los Angeles County Transportation Commission[xxxix] decided to proceed with the project (1981). Costs rose to $500 million by the time final plans had been formalized and nearly $900 million when completed, a cost escalation of more than 300 percent. Annual operating costs were 150 percent above projection.[xl]

Florida Experience

Florida infrastructure projections have also been inaccurate:

- Miami's Metrorail cost 33 percent more to build and 42 percent more to operate than projected. Daily ridership was to have been 239,900 by 1988 but by 1995 was only 47,800, 80 percent below projection.[xli] As a result, the cost per rail passenger was nearly *nine times* the projection.[xlii]

- Miami's Metro mover (people mover) cost 106 percent more to build and 84 percent more to operate than projected. Daily ridership was to have been 41,800 by 1988, but was under 13,300 in 1995, 68 percent below projection despite a more than doubling of the route's length.[xliii] As a result, the cost per rail passenger was nearly *seven times* the projection.[xliv]

- The two infrastructure projects above were to have substantially increased transit ridership in Miami. By 1995 ridership was 65 percent lower than the level predicted for *1988*.[xlv]

- Tri-Rail, the commuter rail operation between Miami and West Palm Beach, was to have carried 14,000 passengers daily, but ridership is barely half that level. Passenger fares were to cover 60 percent of operating costs, but are below 30 percent.[xlvi] Despite a ridership drop of 20 percent from 1993 to 1996, planners still forecast an eventual *600 percent* increase in ridership to 56,000 daily.[xlvii]

- Jacksonville's Sky-Express "starter line" was to have carried 10,000 daily riders. In 1991, ridership was 1,600, and has since declined to below 1,000, 90 percent below projection. Extension of this short system from 1.0 to 2.5 miles was to have attracted 48,000 daily riders, 60 percent more than daily ridership on Jacksonville's nearly *600 miles* of bus routes.[xlviii]

- New Florida Turnpike roadways have also failed to produce anticipated ridership. In 1996, revenue on both the Veterans Expressway and the Seminole Expressway fell 42 percent short of projection. The Turnpike District has since revised its projections downward.[xlix]

An Inexact Science

Inaccuracy in highway usage forecasts illustrates the difficulty inherent in projections even where there is a wealth of experience. In contrast, high-speed rail is new to North America. It has not been built or operated before, and there is no experience with a passenger market.[l]

There are valid reasons why ridership and revenue projections are often high and cost projections are low. The planners and administrators who oversaw each of the projects above can supply a litany of reasons why forecasts were not met. Unforeseen circumstances, such as additional environmental mitigation requirements, changes to project scope, and construction delays can add to costs. Usage projections can be high because projected demographic trends or market conditions do not materialize. But there are additional reasons for the unreliability of forecasts. Infrastructure decisions are often made without regard to the historic inaccuracy of forecasts. Forecasts can also be influenced by political factors.

> *... forecasts that underscore a priority which is out of political favor are likely to be ignored, whereas forecasts that support politically favorable positions are likely to be embraced.*[li]

Projections can also be manipulated to achieve predetermined results.

> *... most of the forecasts used in the planning of America's rail transit systems are statements of advocacy, rather than unbiased estimates.*[lii]

Government infrastructure decisions can be based upon "myth," to the exclusion of overwhelming evidence that a particular approach cannot achieve the stated public purpose. A pre-occupation with particular technological solutions can occur:[liii]

Major infrastructure projects can take on a life of their own. The experience demonstrates that, once authorized, even cost escalation that doubles or triples the cost of a project will not result in its cancellation.

There will always be detailed explanations for cost escalation and failure to attract projected ridership and revenue; some are more valid than others. But in publicly financed projects the bottom line is the same—the cost of unreliable forecasts is paid by users. Or, if public subsidy is involved, the excess cost is paid by the taxpayers.

V. HIGH-SPEED RAIL IN FLORIDA: THE FOX PROPOSAL

Description

The FOX would extend from Miami to Orlando and Tampa, a distance of 322 miles. FOX information indicates that:

- There would be seven stations: Miami Airport, West Broward, West Palm Beach, Orlando Airport, Orlando Attractions, Lakeland, and downtown Tampa.

- Trains would operate at up to 200 miles (322 kilometers) per hour—faster than the present top speed of 186 miles (300 kilometers) per hour operated on some French services. All crossings would be grade separated.

- Travel time from Miami Airport to Orlando Airport would be 1:33, with an additional 55 minutes required to reach Tampa.

- Coach class fares would be $54 from Miami to Orlando, $22 from Orlando to Tampa, and $65 from Miami to Tampa. First class fares would be $108, $39, and $124.

- One train per hour would be operated in each direction. The highest service levels would be achieved during peak periods with two trains per hour.[liv]

- Service from Miami to Orlando would begin in 2004, and service to Tampa in 2006.

FOX is projected to carry approximately 6.2 million passengers per year or 17,000 daily.[lv] It is forecast that 45 percent of FOX riders would be diverted from automobiles, 31 percent from airlines, and 24 percent would be new trips.

Summary of Financing: FOX would be built under a "public-private partnership" between FDOT and FOX. FOX would operate the system for 40 years under a franchise awarded by FDOT. Construction costs and the cost of the trains is projected at $5.4 billion, with infrastructure debt at $6.5 billion (nominal dollars). The state would own the infrastructure (right of way, rail and improvements), while FOX would own the trains.

FOX would contribute $350 million in equity. Public funding of nearly $3.5 billion would be provided: $3.0 billion from FDOT, $300 million from the federal government, $100 million from Orlando International Airport and $50 million from Miami International Airport. Construction capital would be provided through the issuance of tax exempt bonds secured by passenger revenues and issued by a special district to be established by state legislation. In addition, FDOT seeks at least some federal backing of the bonds.

Status: FDOT and FOX are working toward a target date of June 30, 2000, for certification of the project, with construction to commence thereafter. Milestones have been set for various dates leading up to certification and failure to meet any milestone could result in cancellation of the project. Perhaps the most important milestones are set for January 31, 1998:

- Enactment of federal legislation granting $300 million for the project and guarantees or credit enhancements with respect to the bonded debt.
- Enactment of state legislation authorizing FDOT to guarantee that the FOX system will be completed and operated.
- Written assurances from Miami International Airport and Orlando International Airport that their aggregate contribution to the project of $150 million is "reasonable and obtainable."[lvi]

Currently, approximately $9.5 million is being spent on additional studies and legislative advocacy ($435,000). Most of the work, including a $2.25 million detailed ridership projection, is being performed by FOX, which is being reimbursed by FDOT at a 75 percent rate. If the current agreement ("Pre-Certification Post-Franchise Agreement") is terminated before January 31, 1998, FDOT would be obligated to pay 100 percent of FOX's costs (even if the termination is initiated by FOX).

The Market

Despite being the nation's fourth largest state and having four metropolitan areas of a million or more, conditions for high-speed rail are less favorable in Florida than in the other markets. Mass transit is sparse and ridership per capita is half that of the national average. There is virtually no network of connecting rail service (see Table 5).[lvii]

Table 5
High-Speed Rail Corridors
Demographic Factors

	Population (Millions)	Population per Line Mile	Annual Transit Ridership per Capita
Tokyo-Osaka	52.0	163,000	436
Paris-Lyon	11.6	46,000	284
New York-Washington	25.5	113,000	105
Miami-Orlando-Tampa	8.4	26,000	14

Population and Urban Densities: The population of the metropolitan areas along the FOX corridor is 8.4 million. Each of the high-speed rail corridors described above has a higher population in at least one of its terminal urban areas alone. Urban population densities in the Miami-Orlando-Tampa corridor are far lower than in the other high-speed rail corridors. The Miami-Orlando-Tampa corridor is virtually the same length as the Tokyo-Nagoya-Osaka corridor, and the major cities are separated by mileage similar to that separating the Florida urban areas.

- The developed areas of Miami-Fort Lauderdale-West Palm Beach, Orlando and Tampa-St-Petersburg could accommodate the population of Tokyo, Nagoya and Osaka respectively with room left for Orlando and Fort Myers-Cape Coral (Chart 1: *Comparison of Florida and Japan Rail Corridor Urban Population)*.[lviii]

Chart 1

- The developed area of Tampa-St. Petersburg could accommodate the 13 million people who live in the Chicago and Dallas-Fort Worth metropolitan areas at Paris metropolitan densities.

- Developed Orlando could accommodate the metropolitan populations of Seattle, Denver and Portland (Oregon) combined at Paris metropolitan densities.

Other high-speed rail corridors are more densely populated, which increases demand. The Tokyo-to-Osaka population per route mile is 163,000; Paris-to-Lyon is 46,000, and Washington-to-New York is 113,000. In contrast, the Miami-Orlando-Tampa corridor population per route mile is only 26,000, barely half the weakest high-speed rail market. Even Florida's high rate of growth will change these ratios little in the foreseeable future. The relatively low population density along the Miami-Orlando-Tampa corridor would make it more difficult to attract riders.

Local Transit Connections: Unlike other high-speed rail applications, the FOX system would not be supported by either extensive transit connections or by a proclivity on the part of Floridians to use transit services. Comprehensive metropolitan rail transit systems serve high-speed rail stations in Tokyo, Nagoya, Osaka, Paris, Lyon, New York, and Washington, together with frequent bus service.

Transit ridership in the Tokyo area is more than double that of the *entire* United States, while combined Tokyo-Nagoya-Osaka transit ridership is nearly four times total U.S. ridership.[lix] Paris and Lyon transit ridership is more than 3 billion annually, while New York-Washington corridor ridership is more than 2.5 billion. In contrast, all of the transit systems in the Miami-Orlando-Tampa corridor combined carry less than 120 million passenger trips—less than 1/20th that of the New York-Washington or Paris-Lyon corridor and nearly 1/200th that of Tokyo-Nagoya-Osaka.[lx] Among the 39 U.S. metropolitan areas of more than one-million population in 1990, Miami-Fort Lauderdale ranks 18th in per capita annual ridership; Tampa-St Petersburg is 38th and Orlando is 39th (last). Weak Miami-Orlando-Tampa corridor transit ridership would be a significant deterrent to high-speed rail ridership. This deficiency is so severe that it cannot be corrected by a FOX shuttle bus system or any transit improvements under consideration.

Connecting Intercity Rail Network: While Japanese and French high-speed rail lines are supported by extensive intercity rail connections serving 100 million or more people, almost no one can connect to

the FOX line by frequent rail service. Two daily round trip Amtrak trains serve Orlando and one serves Tampa (in the middle of the night). Despite its close proximity to Florida, there is no direct service to Atlanta. An Amtrak trip from Atlanta to Orlando would require routing through Washington, D.C., and take more than 39 hours for a trip that can be made by auto in under eight hours.[lxi]

Tourism: FOX anticipates substantial growth in tourism, which would generate higher ridership. But future growth may be much more limited than expected. After years of steady growth, tourism in the Miami-Orlando-Tampa corridor has declined. From 1990 to 1994, tourism dropped by 3.4 percent, a 0.9 percent annual decline. FOX attributes this drop to the "national and international recession early in this decade." Yet during a similar period, 1980-1984, Florida's tourism grew 36 percent, an annual increase of 8.1 percent.[lxii] The periods were similar in economic growth and both included recessions. Continuing stagnation or a lower growth rate could make it more difficult for FOX to achieve its ridership and revenue projections.

Chart 2

Competitive Analysis: Airlines

High-speed rail competes with airlines over distances of less than 500 miles, performing virtually the same function as an airline. FOX projects that high-speed rail would attract more than 65 percent of the air market between Tampa and South Florida and between Orlando and South Florida. FOX expects to attract 80 percent of the Miami-to-Orlando air market. (Chart 2: *Projected Market Share: 2010*).

Air and Rail Travel Time: Door-to-door high-speed rail travel times are likely to be similar to airline times from South Florida to Orlando.

- High-speed rail travel times should have up to a 15 minute advantage from Miami to Orlando Attractions. FOX would have an "overhead" time advantage[lxiii] to Orlando Attractions by virtue of its station at that location. Travelers to that station would arrive closer to recreational and entertainment sites, reducing overall travel time compared to airlines.

- However, FOX would have up to a 15 minute disadvantage to Orlando destinations served from the Orlando International Airport station.

High-speed rail is also likely to have a considerable disadvantage—up to one hour—from Tampa to Miami. This is because FOX would operate over a longer route through Orlando. Despite an hour travel time disadvantage, FOX predicts that it would attract more than 50 percent of the Miami-Tampa air market.

Airline service is much faster between Tampa and South Florida because it operates directly between Tampa and South Florida, not through Orlando (see Table 7, page 25). This illustrates one of high-speed rail's most daunting difficulties—the inflexibility of its route infrastructure. High-speed rail requires expensive infrastructure between terminals, making it prohibitively expensive to provide speedy service to more than one market. Airline route infrastructure is much less expensive, and consists primarily of computers.

Further, FOX will not have an advantage typical of most high-speed rail systems—downtown stations—which make high-speed rail competitive with airlines for downtown oriented trips. FOX's only downtown station, Tampa, serves a relatively weak commercial center that contains only 3 percent of the metropolitan area's employment.

Air and Rail Travel Costs: FOX anticipates a considerable price advantage relative to airlines. First class rail fares are to be 28 percent below airline first class fares and full economy fares are to be 40 percent below airline economy fares.

However, the projected FOX rail fare advantage over air fares has already disappeared. Within the last two years, the nation's leading low fare airline, Southwest Airlines, entered the Tampa-to-Fort Lauderdale market. And in 1996, Southwest entered the Orlando-to-Fort Lauderdale market. As has routinely occurred in other U.S. air markets, major airlines have matched the new lower fares of the new market entrant. Further, the impact of lower fares is felt in adjacent airline markets in the same metropolitan areas. Air patrons in the Miami-Fort Lauderdale area are served by two airports with substantial commercial service, Miami International and Fort Lauderdale International. The considerably lower fares in the Fort Lauderdale-to-Orlando and Tampa markets attract patrons that might otherwise fly from other airports, especially Miami. Fort Lauderdale's market share of Miami/Fort Lauderdale-to-Orlando air travel

Chart 3

nearly doubled after Southwest Airlines entered the market[lxiv] (Chart 3: *Airline Market share: Orlando to South Florida; 1996: First Nine Months & Last Three Months*).

Moreover, the cost competition at Fort Lauderdale has put downward pressure on fares at Miami International Airport. Air fares have dropped substantially since 1995 (see Table 6). The average fare in all markets combined had dropped to 44 percent below FOX's projected airline discount economy fare and 59 percent below FOX's projected full economy air fare. In recent months, airline fares have dropped more than 30 percent in Florida, which, according to FRA, should reduce high-speed rail ridership by at least 30 percent (Section III, above) to 4.2 million or less. Average air fares in 1996[lxv] are estimated to be at least 15 percent below the proposed average FOX fare in 2010.[lxvi]

The 1996 fares still may not reflect the full effect of the increasing competition in Florida's air markets, because they do not reflect a complete year of heightened competition. In the first full quarter after Southwest Airlines entered the Orlando-to-Fort Lauderdale market, the average fare dropped 22 percent to $43.80.[lxvii] By March 1997, Southwest Airlines' unrestricted one-way fares between Tampa and Fort Lauderdale and between Orlando and Fort Lauderdale were $65. It was *not possible* to pay a higher fare. Discount fares had dropped to as low as $22 between Miami and Orlando.[lxviii]

Competitive Positioning: Moreover, it is reasonable to expect that the airlines will become even more competitive as time passes.

- U.S. airline fares per passenger mile have been steadily declining, a drop of more than 40 percent from 1984 to 1994 (inflation adjusted).[lxix] Preliminary data indicates a continuation of the same rate through 1996.[lxx]

- Smaller regional jets will replace propeller driven aircraft on shorter routes, which will further reduce costs. Some of the commercial flights in the Miami-Orlando and Miami-Tampa markets are propeller driven. Because many people avoid propeller driven aircraft, substitution of jet for propeller aircraft will increase the attractiveness of air service.

Table 6
Comparison of FOX 1995 Air Fares and Actual 1996 Air Fares

Market	FOX 1995 fares			1996 Fares	
	Full Economy	Discount Economy	Restricted Economy	Average Fare	Compared to 1995 Discount Economy
Orlando-Miami	$204.00	$145.00	$69.00	$84.66	-41.6%
Orlando-Fort Lauderdale	$213.00	$160.00	$65.00	$55.80	-65.1%
Orlando-West Palm Beach	$262.00	$149.00	$99.00	$90.42	-39.3%
Tampa-Miami	$199.00	$154.00	$29.00	$80.48	-47.7%
Exhibit: Tampa-Fort Lauderdale[lxxi]				$51.46	
Weighted Average	$205.73	$150.64	$57.18	$83.74	-44.4%
Excludes Passenger Facility Charge ($3.00)					

- Larger, more efficient jets are also being introduced. For example, Southwest Airlines will soon operate 162-passenger Boeing 737-800 jets. Other carriers may substitute larger and more fuel efficient aircraft, such as *Boeing* 757's, next generation *McDonnell-Douglas* MD-80s or new *Airbus* models. This is likely to reduce airline costs in the Tampa- and Orlando-to-South Florida markets and will make it possible for airlines to accommodate a substantial increase in passengers *without* adding flights.

- The more established, larger airlines are likely to continue to become more cost effective as they implement more efficient labor-management work practices and establish more competitive subsidiaries (such as the United Airlines' "Shuttle").

- Additional entrepreneurial airlines may enter the market.

The airlines are already providing daily departures in excess of the 24 that FOX asserted would not be possible. Air service frequencies now exceed FOX's "impossible" threshold by 30 percent in both the Orlando-Miami and Tampa-Miami markets. In these and other markets the only barrier to higher service levels in other markets is insufficient demand.[lxxii]

The airline industry is dynamic and volatile. The average airline fare in the Tampa-South Florida and Orlando-South Florida markets is already below the proposed average rail fares. It is probable that air fares will continue to decline in real terms. But even if they were to increase, airlines can be expected to respond to a new entrant's lower fares by meeting them, as they have in virtually every previous case.

Competitive Analysis: Automobile

High-speed rail has been more successful in attracting airline passengers than auto users. FOX projects that its trains would attract a much smaller percentage of the automobile market, 6 percent. However in some markets, the FOX projects that rail market share would be higher at more than 15 percent in the Miami-Orlando market and 11 percent in the Orlando-Ft. Lauderdale market.

Auto and Rail Travel Times: FOX trains are likely to provide door-to-door improvements over automobiles of 1:15 to 1:30 from Miami to Orlando and Tampa. However, the automobile is likely to be 25 or more minutes faster than high-speed rail from Tampa to Orlando (see Table 7).[lxxiii]

Table 7
Estimated Travel Time[lxxiv]

Corridor	Auto	Air	High- Speed Rail (HSR)	HSR Advantage Relative to	
				Auto	Air
Miami-Orlando Airport	4:23	2:58	3:07	1:16	-0:09
Miami-Orlando Attractions	4:23	2:58	2:48	1:35	0:10
Miami-Tampa	5:12	2:38	3:40	1:32	-1:02
Tampa-Orlando	1:33	2:20	2:07	-0:34	0:13
Tampa-Orlando Attractions	1:11	2:20	1:35	-0:24	0:45

Auto and Rail Travel Costs: Travel by high-speed rail would generally be more expensive than by automobile (see Table 8).

The cost difference between nonbusiness auto and rail trips would be the greatest, because people tend to consider only the variable cost of automobile travel when making trip decisions—the cost of gasoline and tolls. Travel would be from two to 20 times as expensive by rail, including parking and taxi charges. (The cost would be greater if an auto is rented at the destination.) The differences would be even greater for families and multiple person travel. The availability of a personal automobile at the destination is an advantage of auto travel relative to high-speed rail, adding further to rail's cost and convenience disadvantage.

Business travel by rail would be from 33 to 250 percent higher than fully costed travel by auto, depending on whether a cab is hired or an auto is rented at the destination. The gap between rail and auto would widen if more than one person were on the business trip. (Chart 4: *Miami-Orlando Business Trip: Costs.)*

Chart 4

Moreover, the cost of automobile travel has been declining in inflation adjusted terms. From 1980 to 1994, the total cost per vehicle mile of automobile travel declined by 20 percent (inflation adjusted).[lxxv] A continuation of this trend would make FOX travel less attractive for automobile trips.

FOX would effectively compete for longer auto business trips along the corridor. FOX's more than one-hour time advantage may negate some or all of its disadvantage in price as long as no more than one person is on the trip. FOX would be at a great disadvantage in the nonbusiness auto trip market, where its relative costliness is unlikely to offset its travel time advantages.

Short Trips: FOX projects that more than 1.7 million passengers would be attracted annually from the Interstate 4 corridor between Tampa and Orlando, more than 5 percent of the automobile market. This includes trips between Tampa and Lakeland (35 miles), Lakeland and Orlando (49 miles), and Tampa and Orlando (84 miles). FOX's projections are so dependent upon the I-4 corridor that only 40 percent of passenger diversions from auto to high-speed rail come from other portions of the route.

U.S. Department of Transportation data indicates that the overwhelming majority of intercity trips of less than 100 miles are by automobile. Less than 0.5 percent of such trips are by airplane. Air travel tends to be slower than auto travel times because of the overhead time—traveling to the airport, checking in, and waiting to depart. As a result, approximately 99 percent of travel in such short travel markets is by auto. High-speed rail would face virtually the same competitive disadvantages.

In a short corridor, an automobile averaging 45 to 60 miles per hour (or faster) can provide a faster door-to-door trip than an airplane capable of 600 miles per hour or a train capable of 200 miles per hour. If Tampa-Orlando were a lucrative high-speed market, significant numbers of people would be using airlines today, but they are not. An additional factor limiting airline and high-speed rail in short corridors is their high cost compared to automobile travel (see Table 8).

Table 8
Estimated Travel Costs

Trip	Auto	High Speed Rail		Auto Advantage Compared to High-Speed Rail	
		Basic	With Car Rental	Basic	With Car Rental
Miami-Orlando					
Personal	$29	$62	$102	$33	$73
Family of 3	$29	$143	$183	$114	$154
Business	$74	$103	$128	$29	$54
Business: 2 People	$74	$180	$205	$106	$131
Miami-Tampa					
Personal	$18	$84	$109	$66	$91
Family of 3	$18	$182	$201	$164	$188
Business	$85	$123	$148	$38	$63
Business: 2 People	$85	$221	$246	$136	$161
Tampa-Orlando					
Personal	$4	$26	$66	$22	$62
Family of 3	$4	$59	$99	$55	$95
Business	$25	$56	$81	$31	$56
Business: 2 People	$25	$90	$115	$65	$90

For assumptions see endnote.[lxxvi]

In contrast, FOX projects a much smaller diversion from automobiles in the Miami-to-West Palm Beach corridor, despite its similar length and much higher travel demand. FOX projects the Miami-West Palm Beach corridor auto diversion at less than 1/15th the I-4 corridor rate. Most improbably, auto users are projected to use FOX in the 35 mile Tampa-to-Lakeland market more than in the 75 mile Miami-to-West Palm Beach market. FOX does not explain why people in central Florida would have such a greater propensity to ride high-speed rail than people in South Florida.[lxxvii]

Evaluation

Prospects for high-speed rail appear less than favorable in the Miami-Orlando-Tampa corridor.

Florida and Other High-Speed Travel Markets: The Florida market is considerably less favorable for high-speed rail than other markets.

- Low population and population density: Population and population density are considerably less favorable for high-speed rail in Florida than in Japan, France, or even the New York to Washington corridor.

- No ridership from connecting intercity rail: Unlike Japan and France, Florida would have no market of existing rail riders to make up the bulk of high-speed rail ridership, as other rail services of significance do not exist. In both Japan and France a significant percentage of high-speed rail riders have been attracted from *other* existing rail services.

- Weak and poorly used transit systems: Transit use and connections are meager in the Miami-Orlando-Tampa corridor.

- Competitive airline market: Unlike Japan and France, high-speed rail in Florida would not be protected from competition by government policy. Air fares, therefore, are likely to be the same as rail fares.

Chart 5

- Far less expensive auto travel: Unlike other high-speed rail corridors, automobile trips would be considerably less costly in Florida (Chart 5: *Personal Trip Costs*).

The FDOT-FOX projections reflect the weakness of the Florida market. While Japan's most successful line carries 138,000 person miles of travel per route mile each day, the FOX system would carry 7 percent as many person miles, less than 10,000 persons.[lxxviii]

Ridership: The FOX ridership projection appears to be extremely optimistic for the following reasons:

- FOX's forecast of a 65 percent capture of the air market is exceedingly high. In the New York-Washington market, Amtrak's high-speed services attract only 40 percent of the market despite a more than 40 percent price advantage. FOX is not likely to have a fare advantage and seems likely to do less well than Amtrak.

- Diversion from automobiles appears to be overstated, especially in the Orlando-Tampa market. Further, FOX auto diversion projections are high in Orlando-to-South Florida markets. FOX anticipates attracting more than 11 to 15 percent of Orlando-Miami and Orlando-Fort Lauderdale automobile trips. Diversion from autos in the Paris-Lyon corridor is only 10 percent, despite perceived automobile costs that are 20 percent above rail fares. In Florida, the perceived cost of traveling by auto in this corridor is approximately 50 percent below the economy rail fare.

- FOX projected ridership appears to be higher than the total ridership within the Paris-Lyon corridor, where 75 percent of the riders begin or end their trips at points beyond Paris and Lyon.

Revenue: Similarly, the FOX commercial revenue projections appear to be overly optimistic. Without much larger subsidies, average FOX fares could be no more than the going market rate—the average airline fare.

- It is inconceivable that FOX would be able to price its tickets at 28 percent to 40 percent below airline fares. Airline fares have already fallen below FOX projected fares.[lxxix]

- The airlines would have more flexibility to reduce air fares than FOX, because airline fixed costs (capital costs and debt service) are a much lower percentage of overall costs. Airlines typically have fixed costs of below 25 percent,[lxxx] while FOX's fixed costs would be at least 55 percent, assuming that its operating and capital costs are no higher than projected. If airline productivity continues to improve at 1980-1996 rates, FOX fares would need to be set below the level required to cover fixed costs.

- National studies have predicted that commercial revenues would fall far short of system costs. FRA projected commercial revenues at 37.7 percent of Miami-Orlando-Tampa costs in 2020. In that year FOX projects a *profit*.

Operating Costs: FOX operating costs appear to be optimistic. According to FDOT, FOX operating expenses "appear to be underestimated by at least 10 percent."[lxxxi] High-speed rail operating costs have been estimated at from 29 percent to 122 percent above FOX proposed costs.[lxxxii] FOX's costs per train mile are projected at less than one-half those of Amtrak.

Receipt of federal funding could substantially increase operating costs. Federal passenger rail and transit assistance has been subject to federal labor protection provisions that require up to six years (yes, years) severance pay to laid-off employees. FOX has indicated that it does not expect to be subject to federal labor protection, which would make FOX the only federally funded surface transportation so exempted. This seems unlikely. Federal labor protection provisions are expensive. In Amtrak's case, potential labor protection costs have been estimated at between $2 billion and $5 billion. Transit costs are estimated to be up to $2.5 billion higher *annually* because of federal labor protection (15 percent of operating costs).[lxxxiii]

There is considerable uncertainty surrounding high-speed rail operating costs. No similar high-speed rail technology has been operated in the United States, and operating cost forecasts have been inaccurate on many other infrastructure projects (Section IV).

Capital Costs: The costs of constructing high-speed rail in the United States have been estimated at from 14 percent to 114 percent above FOX projections. Some large infrastructure projects have experienced much greater cost escalation, up to 300 percent. It would be prudent to plan for capital costs escalation of up to 100 percent (Section IV).

Any delay after construction starts would produce an estimated $250 million in interest charges annually. And acceptance of federal funding could substantially increase capital costs due to federal mandates and labor protection provisions.

Overall Evaluation: Three cases were prepared for evaluation of the FOX proposal (see Table 9 and Appendix)

- Optimistic Case: The Optimistic Case assumes that FOX would be able to achieve its anticipated average fare per passenger and would attract 35 percent of the air market. This is nearly as much as rail in the New York-Washington market, which has substantial fare advantage relative to airlines. The automobile market share is assumed at the Paris-Lyon rates. In all three cases, an adjustment is made to reflect a more realistic estimate of FOX's ability to attract automobiles in the Orlando-Tampa corridor. The most conservative operating and capital cost escalation values are used. This case is considered highly optimistic because (1) rail does not attract such a large air market share where fares are competitive, (2) the highly automobile-oriented Florida market is less likely to switch to rail, (3) and large infrastructure projects are often far more costly to build and operate than the low cost escalation assumptions used.

- Realistic Case: The Realistic Case assumes that FOX fares would drop to meet the current 13.6 percent airline average fare advantage. A 25 percent air market share is assumed, while attraction from automobiles is reduced by approximately 30 percent. Capital and operating cost escalation is estimated at the midpoint between the Optimistic Case and the Pessimistic Case.

- Pessimistic Case: The Pessimistic Case assumes that FOX fares would have to be reduced by 47.5 percent to meet the lower airline fares permitted by continued airline productivity improvements and that high-speed rail's air market capture would be 20 percent. Attraction from automobiles is estimated at Swedish rates. The highest cost escalation estimates (over 100 percent) are used. Cost escalation could be more significant, however, because large infrastructure projects have experienced cost escalation of up to 300 percent.

Table 9
Evaluation Assumptions: Summary

	Optimistic Case	Realistic Case	Pessimistic Case
Market Rate Fare*	100% of FOX Plan	13.6% Below FOX Plan	47.5% Below FOX Plan
Air Market Share	35% Share	25% Share	20% Share
Diversion from Autos	Scaled to Paris-Lyon Rate; Downward Orlando-Tampa Adjustment	Midpoint of Optimistic Case & Pessimistic Case. Downward Orlando-Tampa Adjustment	Scaled to Sweden Capture Rate; Downward Orlando-Tampa Adjustment
Induced Travel	Air & Auto Ratio	Air & Auto Ratio	Air & Auto Ratio
Operating Costs	28.7% over FOX	75.2% over FOX	121.7% over FOX
Capital Costs	14.5% over FOX	64.8% over FOX	115.0% over FOX

** Average Air Fare*

The results of this evaluation follow (see Table 10):

- Optimistic Case: Ridership would be 2.8 million, 55 percent below the FDOT-FOX projection. The net present value on the FDOT subsidies would be $4.3 billion (as contrasted with the $0.285 billion projected by FDOT-FOX [1996$]). Project revenues would be insufficient to service debt by 2007. To keep the system afloat, the state would need to appropriate $10.8 billion in addition to the planned $3.0 billion.

- Realistic Case: Ridership would be 2.0 million, 66 percent below the FDOT-FOX projection. The net present value on the FDOT subsidies would be $9.9 billion (1996$). Project revenues would be insufficient to service debt by 2006. To salvage the project, the state would need to appropriate $23.0 billion in addition to the planned $3.0 billion.

- Pessimistic Case: Ridership would be 1.1 million, 82 percent below the FDOT-FOX projection. The net present value on the FDOT subsidies would be $15.1 billion (1996$). Project revenues would be insufficient to service debt by 2005. To keep the project operating, the state would need to appropriate $35.5 billion in addition to the planned $3.0 billion.

Table 10
Evaluation Results: Summary
With On-Time Opening

	FOX Proposal	Optimistic Case	Realistic Case	Pessimistic Case
Annual Ridership: 2010	6.2 million	2.8 million 55% below FOX	2.0 million 68% below FOX	1.1 million 82% below FOX
Commercial Revenue: 2010	$420 million	$237 million 44% below FOX	$145 million 66% below FOX	$51 million 88% below FOX
State Subsidy Required	$3.0 billion	$13.8 billion	$26.0 billion	$38.5 billion
Net Present Value of State Subsidy (1996$)	$0.3 billion	-$4.3 billion	-$9.9 billion	-$15.1 billion
State Subsidy per 2020 Household	$366	$1,708	$3,209	$4,750
First Year Revenues Insufficient to Pay Debt Service	Never	2007 (4th Year)	2006 (3rd Year)	2005 (2nd Year)
1995$ unless otherwise noted.				

Construction delays could worsen the results. An 18 month delay, similar to the delay that occurred at Denver International Airport, would have the following impacts (see Table 11):

- Optimistic Case: The net present value of state subsidy would decline to $4.7 billion (1996$).[lxxxiv]

- Realistic Case: The net present value of state subsidy would decline to $10.1 billion (1996$).

- Pessimistic Case: The net present value of state subsidy would decline to $15.7 billion (1996$).

Table 11
Evaluation Results: Summary
With 18 Month Delay in Opening

	FOX Proposal	Optimistic Case	Realistic Case	Pessimistic Case

State Subsidy Required	$3.3 billion	$14.3 billion	$26.6 billion	$39.3 billion
Net Present Value of State Subsidy (1996$)	-$8.2 million	-$4.7 billion	-$10.1 billion	-$15.7 billion
State Subsidy per 2020 Household	$412	$1,760	$3,285	$4,849
No adjustment made for higher operating costs that could occur from the delay. *No adjustment made for delayed growth in ridership.*				

The results are considerably less favorable than the FOX projections primarily because adjustments are made to compensate for two excessively optimistic FOX expectations:

- FOX's airline market share projection of more than 65 percent is above any reasonably achievable level in the competitively priced air market that has developed.

- FOX's projected Orlando-Lakeland-Tampa attraction of passengers from automobiles is considerably higher than can be reasonably expected in such a short travel market.

The commercial revenues projected in the Realistic Case are nearly identical to the level forecast for the Miami-Orlando-Tampa corridor by FRA.[lxxxv]

Sensitivity: Relatively minor forecasting errors could significantly increase the state's obligation.

- If FOX were to achieve its projected ridership (highly unlikely), charge market fares (no higher than airline fares) and experience *no* capital and operating cost escalation, additional state appropriations of $2.5 billion would be required.

- If FOX were to achieve its projected ridership (highly unlikely), charge market fares (no higher than airline fares) and experienced a modest 10 percent cost escalation, an additional state appropriation of $4 billion would be required, and project revenues would be insufficient to make bond payments by 2012.[lxxxvi]

The policy initiatives that could theoretically make it possible for FOX to meet its revenue projections are improbable. The airline industry is unlikely to be returned to the expensive and non-competitive regime of regulation. It is inconceivable that gasoline taxes would be raised to Japanese, much less European, rates. And, if gas taxes were raised, there would be no need for high-speed rail because Florida's tourism industry would be decimated. Automobile tourism would be significantly reduced, while the resulting economic dislocation would make air travel unaffordable to many people.

The conditions under which high-speed rail could be successful are not reasonably achievable.

> *...it appears that HSGT (high-speed rail) could break even only if costs were low compared with typical estimates for such systems, if fares were high compared with current air fares, and the new system captured a market equal to or greater than the current air travel volume in the corridor. Such a combination of factors, though possible, is remote.*[lxxxvii]

Financial Arrangements

Infrastructure Debt: The high-speed rail system would require federal credit enhancements that could involve bond guarantees of up to $6.5 billion, as proposed. (It seems unlikely that the bonds would be marketable with less than 100 percent federal backing.) Federal credit enhancements could create a contingent financial liability of up to $130 billion for the federal government, as other states seek similar treatment for their own future infrastructure bond issues.[lxxxviii]

While FOX's financial risk is limited, the state's is not. The project would require a state guarantee to debt holders that the FOX rail line would be completed and operated (completion covenant). In the likely event that project funds are insufficient to meet bond payments:

- The project could be canceled after construction begins. If cost escalation is at Denver International Airport, Central Artery, etc. rates, it could be more prudent to cancel the project before completion and simply pay the debt holders. But cost escalation occurs little by little. There is rarely a point in a project's development that the incremental cost escalation appears to be so significant that policy makers find cancellation a viable option. And, as time goes on the prospects for cancellation diminish. However, given the two stage construction schedule (Orlando-to-Miami followed by Orlando-to-Tampa), there might be some potential for canceling the Orlando to Tampa segment in response to the cost escalation.

- The special district could negotiate a financial bailout, following the model of Eurotunnel. This could involve significant losses to both the state and debt holders.

- The special district could default on debt service, as occurred in the 1980s with the Washington Public Power Supply System (WPPSS).[lxxxix] But the completion covenant would still bind the state, while the federal government would be required to pay the bonds (assuming a federal government bond guarantee). No state of Florida agency has defaulted on bonds during the last 100 years.

The FOX bonds would not be guaranteed by the "full faith and credit" of the state. However the state's completion covenant produces virtually the same effect, the state would ensure that the system would be completed and operated. Moreover, FDOT has noted that the FOX bonds could have a negative effect on the state's credit rating[xc]—the state's ability to finance school construction or other important public purposes could be impaired.

Minimum Support Payment: In January 1996, FDOT indicated its determination to limit minimum support payments to $70 million annually (current dollars) through 2029, without adjusting upward for inflation. FDOT has since agreed to *escalate* minimum support payments by 33 percent above inflation annually, and *extend* the payments through 2039.[xci] This represents a 117 percent increase over the maximum amount FDOT indicated would be an acceptable condition for continuing the project ($1.6 billion in 1995$).[xcii] Considerable future increases are anticipated by this report.

Fixed Price Contract: It is anticipated that FOX would build the system for a guaranteed maximum cost. A number of factors could make this impossible, such as unforeseen environmental or other project requirements and the uncertainty attendant to cost estimates for technology unfamiliar to the U.S. environment. Moreover, the guaranteed maximum price could be substantially above current estimates, similar to the Denver International Airport cost escalation that occurred in the early months of construction.

Conflict of Interest: FDOT expressed concern that "inherent conflicts of interest" existed in the FOX proposal because FOX or its affiliates would hold contracts for "design, construction, equipping[xciii] and operation of the system." Subsequent agreements have not substantially altered this situation.

> *... conflict of interest considerations should dictate that firms involved in the planning analysis be prohibited from a major role in the design contracts.*[xciv]

By this standard, FOX has a significant conflict of interest.

The Public-Private Partnership: The FOX system is a public-private partnership in which state subsidies, federal subsidies, and airport contributions represent approximately 90 percent of non-commercial funding, while the private contribution is approximately 10 percent.

Further, under the FDOT-FOX agreements, the FOX profit is paid from system revenues *before* state bond payments are made. Thus, FDOT could be required to pay FOX a guaranteed rate of profit (12.68 percent of commercial revenues) even if revenues were insufficient to pay infrastructure bonds. FOX and FDOT intend to identify a return on investment level to which FOX would be entitled over the 40 year project life. FOX hopes to earn a healthy 15 percent after tax return on investment. FOX or FOX partners would make additional profits in producing planning studies, rail cars, and constructing the infrastructure.

For example, if passenger revenues were 50 percent below projection, FOX would be paid $275 million in profits, while the state would have to increase its subsidy by $9 billion. If, in addition, construction costs doubled, FOX would be paid the same $275 million profit, but the state would have to increase its subsidy by $18.5 billion.

FOX, like any other commercial enterprise, would seek to achieve the projected results. However, virtually all of the "downside" risk belongs to the state. FOX's profits are paid before debt service. The state has a much greater financial stake in the project. Its minimum commitment of $3.0 billion is equal

to 13 percent of state taxes in 1997. FOX's commitment of $350 million is approximately one percent of the gross revenues of the four partners, and less than half of 1996 pre-tax net profits (after taxes).[xcv]

Safety

It is not clear that FOX would improve safety. At equal levels of usage high-speed rail is safer than automobile travel. But highway investment, especially construction of interstate standard highways, reduces traffic and injuries. It has been estimated that each $1.7 million spent constructing interstate standard roadways reduces traffic fatalities by one and injuries by 60.[xcvi] A $3.0 billion higher FDOT investment in expressway construction or improvement could reduce traffic fatalities by 1,700 and injuries by 105,000 over the next 40 years.[xcvii] On the other hand, automobile traffic diverted to FOX could be expected to reduce traffic fatalities by 400 and injuries by 34,000.[xcviii] Diversion of travel from airlines is projected to reduce fatalities by three and injuries by one.[xcix] Even at the inflated FOX ridership projections, state investment in FOX trains would yield a lesser safety return than highway investment, increasing traffic fatalities by nearly 1,300 and injuries by 71,000. This perhaps surprising conclusion results from the relatively small percentage of highway users that FOX estimates would be diverted from Florida's highways.

Winglock

The extent of air traffic congestion (winglock) has been overstated. In fact, more air space is being built by advances in the air traffic control system, free-flight routing, and global positioning systems. Commercial airlines are capable of carrying any reasonably expected demand in the United States, including Tampa-South Florida and Orlando-South Florida. Perhaps the most important barrier is the outdated state of the nation's air traffic control system, which is to be significantly improved by 2010.

Even so, FOX would have little impact on Florida's airports. The FDOT projected reduction of 21,000 flights in 2010 is simply not significant in 2010. It is only 60 flights daily, barely 2 percent of the daily air carrier operations at the five airports. Moreover, all airports intend to expand to accommodate the increasing demand. Miami International Airport has begun an expansion project that will nearly double its capacity. Tampa International Airport intends to expand as required. Orlando International Airport, currently operating at 74 percent of capacity, is planning expansion as demand requires; it has sufficient land for unconstrained growth.[c] None of Florida's airports is scaling back future investment plans in response to high-speed rail.

High-speed rail versus airport expansion: High-speed rail is not a cost effective alternative to airport expansion. The capital cost of high-speed rail per annual passenger is at least seven times as much as the cost per annual passenger of the current Miami International Airport expansion.[ci] Indeed, high-speed rail's construction cost per annual passenger is five times that of Denver International Airport despite that facility's reputation for cost escalation.[cii] Moreover, airport expansion would be paid for by users,[ciii] unlike the FOX high-speed rail line, which would require billions in non-user subsidies. Further,

a large proportion of the air system user revenues that finance airport expansion would be paid by people from outside Florida, while most of the public subsidy for FOX would be paid by Floridians.

Gridlock

It is more difficult to control the increase in automobile traffic congestion, but the FOX and FDOT data demonstrate that high-speed rail would provide little relief (see Table 12).[civ]

Diversion from Autos: Peak and Lowest Traffic Points: High-speed rail would attract a minuscule percentage of autos at peak highway traffic points.

- In the Miami-Orlando corridor, FOX projected diversion from autos represents 0.5 percent of traffic at the busiest point (Broward County, I-95, and Florida's Turnpike), one out of every 200 cars. The Realistic Case projects one out of every 500 cars.

- In the Miami-Tampa corridor, FOX projected diversion from autos represents 0.2 percent of traffic at the busiest point (Hillsborough County, I-75),[cv] one out of every 500 cars. The Realistic Case projects one out of every 1,000 cars.

High-speed rail would attract a greater portion of traffic where there is little congestion and no immediate need for expanded highway capacity.

- In the Miami-Orlando corridor, FOX projected diversion from autos represents 11.3 percent of traffic at the lowest point (Osceola County, Florida's Turnpike), one out of every nine cars. The Realistic Case projects one out of every 18 cars. Traffic growth is unlikely to require additional lanes until 2040.[cvi]

- In the Miami-Tampa corridor, FOX projected diversion from autos represents 1.4 percent of traffic at the lowest point (Collier County, I-75), one out of every 70 cars. The Realistic Case projects one out of every 165 cars. Traffic growth is unlikely to require additional lanes until after 2050.

Table 12
Daily High-Speed Rail Diversion from Automobiles and Highway Travel Demand: 2010

	Peak Traffic Point		Low Traffic Point	
	Miami-Orlando	Miami-Tampa	Miami-Orlando	Miami-Tampa
Daily Traffic	487,000	118,000	22,000	13,000
Fox Ridership	2,408	186	2,486	186

Percentage	0.5%	0.2%	11.3%	1.4%
This Evaluation Ridership	1,196	78	1,218	78
Percentage	0.2%	0.1%	5.5%	0.6%

High-speed rail versus highway expansion: One of the fundamental public purposes of high-speed rail is to alleviate traffic congestion, thereby reducing the need for highway expansion. At its highest point of diversion from automobiles (between West Palm Beach and Orlando), fewer than 80 cars per hour would be removed from the highway, 3 percent, or 1/30th of a single lane's capacity. Even if peak hourly volumes were double this figure, high-speed rail would divert the equivalent of only 6 percent, 1/17th of a highway lane's capacity (Chart 6: *Average Hourly High-Speed Rail Diversion from Autos Compared to Single Highway Lane Capacity*).[cvii]

Chart 6

High-speed rail's minuscule impact on traffic congestion renders it an exorbitantly expensive alternative to highway expansion. Using U.S. Department of Transportation data, it is estimated that a new six lane expressway could be built along the entire corridor for $4.6 billion[cviii], which is considerably less than FOX's claim of $8.9 billion for a four-lane expressway, and $750 million less than the FOX high-speed rail line. Adjusted to hourly one-way capacity, a single lane highway expansion is considerably more cost efficient than FOX. The highway lane would cost $1,100 per person (hourly capacity), while the high-speed rail line would cost $64,000, 56 times as much based on FDOT and FOX projections. Under the Realistic Case, high-speed rail would cost $97,000 per person, 86 times as much as a new highway lane [cix] (which could be built for less than the FDOT planned subsidy to FOX).

Further, unlike high-speed rail, the highway expansion would be wholly financed by users, primarily through fuel taxes, without net public subsidy.[cx] The diversion from automobiles projected by FOX is so small as to provide virtually no reduction in state requirements for expanding or building new highways or highway lanes.

This is not to suggest that highway expansion is the only answer to Florida's growing traffic congestion. However, at its exorbitant cost and negligible impact, high-speed rail is not part of the answer. *Traffic congestion would be virtually the same with or without high-speed rail.*

High-Speed Rail Capacity

The FOX high-speed rail line would be significantly overbuilt.

1. Under the most favorable circumstances, high-speed rail might be able to move 10 lanes of highway traffic, as FOX claims (Section I). The busiest high-speed rail line in the world (Tokyo) carries nearly as many people per peak hour (23,000) as 10 highway lanes if only one person is in each vehicle.[cxi]

2. FOX's infrastructure capacity will be substantially smaller at 3,540 per hour (each direction). Capacity could be raised to 5,300 through the use of double-deck trains. FOX does not propose their use in the first 40 years, since demand is so small.

3. More importantly, FOX will operate only enough trains to carry 500 passengers per hour. FOX's actual capacity would be one-seventh its infrastructure capacity and 1/50th the theoretical capacity of high-speed rail. Even with only one person in each vehicle, a highway lane can carry the equivalent of five FOX high-speed rail lines with every seat filled (Chart 7: *Hourly One-Way Capacity: Highway Lane Compared to FOX Theoretical and Actual).* Of course, it would be impossible to achieve such ridership levels even if five high-speed rail lines were built in the corridor.

Chart 7

4. The actual usage would be even less. In 2010, FOX estimated average hourly ridership would be less than 350, while the Realistic Case projects under 175.

FOX intends to operate one-tenth as much service as its infrastructure would allow, claiming that this large unused capacity would provide a "wide margin for growth." Similar logic could lead the University of Florida to expand its football stadium to seat 800,000 people, providing a "wide margin for growth" over the present 83,000 capacity. FOX's infrastructure could, theoretically at least, provide for centuries, if not millennia of growth. Both high-speed rail's theoretical capacity and the much lower FOX infrastructure capacity bear no relationship to the reality. There is at most only modest demand for high-speed rail in Florida.

Environment

Environmental concerns have been raised with respect to high-speed rail.

- High-speed rail's ability to materially reduce air pollution and energy consumption is dependent upon significantly reducing automobile and airline use. The FDOT and FOX projections, already optimistic, anticipate so few people transferring from autos and air that any air pollution or energy gain would be inconsequential.

- Further, construction of major infrastructure projects consumes energy. It has been estimated that San Francisco's BART rapid transit system consumed more energy in construction than the future diversion from automobiles would save.[cxii]

- Most Florida electric power is generated by burning fossil fuels, a process that expends approximately two times as much energy as it produces. Electric propulsion thus loses some of its advantage over fossil fuel propulsion.

- High-speed rail produces considerable amounts of noise, which has generated strong opposition to extension in France. The problem becomes much worse at speeds above 186 miles per hour.[cxiii] FOX would operate at up to 200 miles per hour.

- French champagne growers claim that high-speed rail embankments trap cold air, threatening their crops.[cxiv] A similar effect in Florida could make preservation of adjacent citrus crops more challenging. Environmental objections slowed development of high-speed rail in Germany and Belgium and mitigation measures sharply increased capital costs.[cxv]

- The proposed routing on a flood control levee along the eastern edge of the Everglades is cause for environmental concern.[cxvi]

Economic Impact

Proper evaluation of an investment requires comparison to one or more alternatives. An alternative use for the proposed FDOT subsidy to FOX is expansion of highways in the Miami-Orlando-Tampa corridor.[cxvii] (Airport expansion is already underway and so is not an alternative investment strategy). Because high-speed rail would attract such a small percentage of automobile (and airline) users:

- Highway (and airport) investments are considerably more cost effective than high-speed rail.

- Highway expansion would be more effective in reducing the costs of automobile accidents.

In addition:

- Expanded highways are likely to produce at least as much new economic activity as a high-speed rail system, due to their much greater use. It has been estimated that the nation's interstate highway system has produced three times as much economic benefit as its cost of construction.[cxviii]

- Use of funding for high-speed rail would exacerbate traffic congestion, which would continue to grow at virtually the same rate as without high-speed rail. Use of the funding for general mobility improvements would produce substantially greater benefits.

- Increasing traffic congestion will add to the cost of commercial transportation and could negatively impact Florida industry and agriculture in the increasingly competitive world economy.

- The large rail related bond issues could negatively impact the state's credit rating and bonding ability, making it more difficult to finance other public needs.

The economic disadvantages of subsidizing high-speed rail would become more severe if financial performance is below forecast (as seems likely):

- Higher than planned state appropriations could diminish the state's ability to meet other needs, such as education and health care.

- Higher than planned state appropriations could necessitate enactment of new taxes or higher tax rates. Higher taxes reduce economic growth which slows job creation. It has been estimated that each additional dollar in taxation destroys $1.40 in economic growth.[cxix]

- The state has a 10 year funding shortfall of more than $40 billion in highway transportation projects. Local jurisdictions have begun to provide funding for state highway projects that FDOT cannot now afford, with FDOT repayment expected later.[cxx] Higher state appropriations to FOX could increase that shortfall.[cxxi]

Other strategies are likely to provide greater traffic relief and general mobility, such as intelligent transportation options that increase the capacity of existing highways, or programs to encourage telecommuting. High-speed rail is a relatively inefficient and ineffective use of state appropriations both in terms of economic benefits and the use of state appropriations. Its comparatively small market share, even by FDOT and FOX projections, represents no more than a "niche" or "boutique" market, the investment in which reduces the state's ability to improve mobility necessary for economic growth.

Additional Issues

Additional issues not analyzed in this report include:

- The proposed FDOT-FOX partnership could be in violation of Article 7 Section 10 of the Florida Constitution:

  > *Neither the State nor any county, school district, municipality, special district, or agency of any of them, shall become a joint owner with, or stockholder of, or give or lends or use its taxing power or credit to aid any corporation, association, partnership or person...*[cxxii]

- FOX seeks state legislation to limit its insurance liability for train operations. In view of high-speed rail safety claims, this seems unnecessary.

- FOX average speed estimates might not be achievable. This could reduce ridership and increase operating costs.

- Diversion of automobile traffic could reduce the toll revenues of Florida's Turnpike and the Everglades Parkway (Alligator Alley).

- Diversion of airline traffic could reduce passenger facility fees at the five major airports. If FOX projected ridership were achieved, this could amount to nearly $1 billion over 40 years.[cxxiii] At Realistic Case rates, the figure would be approximately $450 million. This would be in addition to the $150 million to be contributed by Orlando International Airport and Miami International Airport.

In reality, the highway toll and airport revenue reductions are likely to be small. Nonetheless, they should be included in the FDOT's financial analysis.

VI. DECISION MAKING BASED UPON ANALYSIS NOT ASSUMPTIONS

Assumption Based Planning

The problem of traffic congestion and the difficulty in financing and developing new transportation investments has been defined (though insufficiently with respect to airports). High-speed rail has been proposed as an alternative investment strategy. While the FDOT and FOX documents cite high-speed rail's theoretical capabilities, they contain no analysis of its actual problem-solving impacts. (Chart 8: *High-Speed Rail: Assumption Based Planning*).

Chart 8
High Speed Rail: Assumption Based Planning

Analysis Based Planning

The state has a duty to conduct an objective planning process that does not prejudice the outcome by the acceptance of unproven assumptions. The critical question must be analyzed: can high-speed rail attract enough people from automobiles and airplanes to materially reduce congestion or investment requirements? The conclusions of such an analysis would lead either to authorization or rejection of publicly financed high-speed rail (Chart 9: *High-Speed Rail: Analysis Based Planning*).

Chart 9

High Speed Rail: Analysis Based Planning

A Public Purpose Failure

The assumption that the proposed high-speed rail system would help solve the congestion problem is not supported by facts. Data in FDOT and FOX documents show that high-speed rail cannot noticeably reduce traffic congestion on either the highways or the airways. The assumption therefore emerges as false, as mythical. High-speed rail does not achieve its public purposes (see Table 13).

1. High-speed rail would not significantly reduce highway traffic congestion. As a result, high-speed rail cannot materially reduce the demand for highway expansion.

2. High-speed rail would not noticeably reduce air traffic congestion. As a result, high-speed rail cannot materially reduce the requirement for investment in airport expansion.

3. Because the proposed high-speed rail project is not capable of removing significant numbers of automobiles from the highways and aircraft from the skies, its other public purposes cannot be met in any meaningful way. High-speed rail would not improve traffic safety or materially reduce air pollution or energy consumption.

Table 13
Evaluation: Public Purposes of High-Speed Rail
(Benefits to Florida)

Asserted Benefit	Evaluation
Auto traffic reduction and reduced highway investment	Nominal highway traffic relief at both projected capacity and usage. Virtually no reduction of demand for highway expansion. Very expensive in comparison to highway expansion.
Air traffic reduction and reduced airport investment	Nominal air traffic relief at both projected capacity and usage. Virtually no reduction of demand for airport expansion. Very expensive in comparison to airport expansion, which is proceeding to meet demand.
Environmental benefits	Without significant air or highway traffic reduction, material environmental benefits cannot be achieved.
Improved highway safety	Attraction of automobile users to high-speed rail is so insignificant that highway expansion would provide a higher degree of safety improvement than high-speed rail.
Economic benefits	Benefits would be less than with strategies that would provide greater mobility**.** Significant economic losses could occur from probable higher state appropriations.

4. Because of its potential for massive state funded cost overruns, high-speed rail could place a significant drag on Florida's economy.

The test of high-speed rail's public purposes is not how many people would ride the train, but rather how many cars or airplanes would it replace. If the project proceeds, much higher levels of state subsidy are likely to be required, and, as is the case with similar projects, political realities are likely to render a "close-down" option impossible.

> *While it is true that trains could carry people at a fraction of the environmental and energy costs of other modes, there is nothing more costly than running trains that are not full. As many urban public transit systems in the United States have painfully demonstrated, the promises of economic and environmental efficiency vanish with low load factors. Without enough passengers the system will not cover its costs. It could become a burden on taxpayers and end up as one of the most unfortunate transportation planning disasters of the century.*[cxxiv]

Conclusion

This analysis concludes that *even if FDOT-FOX ridership projections were achieved*, high-speed rail would have no more than negligible impact on either transportation or the environment because so few people would be diverted from autos or airlines. More importantly, the FDOT and FOX projections are

extremely optimistic; not even these negligible results are probable. Consistent with other large infrastructure projects:

- ridership is likely to be far lower than projected,
- fares and commercial revenues are likely to be far lower,
- operating costs are likely to be higher than projected, and
- capital costs are likely to be higher than planned.

High-speed rail: Little benefit at great cost: In consequence, completion of the system would require larger debt issues, which would be beyond the capability of the fares and other commercial revenues to repay. Much larger state appropriations would be necessary to build and operate the FOX high-speed rail system. High-speed rail would provide only negligible benefits, but its cost to Florida would be enormous.

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APPENDIX: DESCRIPTION OF EVALUATION ASSUMPTIONS

The following assumptions were used in the ridership and financial evaluation.

High-speed rail capture of airline market:

- Optimistic Case: 35 percent (In the New York-Washington market, Amtrak's high-speed service captures 40 percent of the market but has a 40 percent fare advantage. FOX is likely to have no fare advantage)

- Realistic Case: 25 percent

- Pessimistic Case: 20 percent (FRA estimates that a 30 percent reduction in air fares would lead to a 30 percent reduction in diversion from air. This case assumes continuation of the historic airline productivity trend, which would reduce air fares by another 40 percent).

High-speed rail capture of automobile market. In all cases the Tampa-Lakeland-Orlando projection is reduced to 0.134 percent of the market (consistent with USDOT data for a trip of this length):

- Optimistic Case: Downward 6.2 percent adjustment of FDOT-FOX projection based upon maximum 10 percent market share assumption (consistent with Paris-Lyon) in the combined Orlando-West Palm Beach-Fort Lauderdale-Miami markets).

- Realistic Case: Midpoint of Optimistic Case and Pessimistic Case.

- Pessimistic Case: 60 percent below Optimistic Case (reflecting relative lower performance of Swedish high-speed rail diversion from autos compared to Paris-Lyon).

Revenue:

- Optimistic Case: FDOT-FOX projection. This assumption is considered optimistic because it is more than 15 percent above present airfares.

- Realistic Case: 13.6 percent below FDOT-FOX projection (set at rate of average air fare per rail person mile).

- Pessimistic Case: 47.5 percent below FDOT-FOX projection trend line of airline productivity improvement.

Operating Cost:

- Optimistic Case: Generic operating cost per train mile from National Research Council.
- Realistic Case: Midpoint of Optimistic Case and Pessimistic Case.
- Pessimistic Case: High end of operating cost per train mile range from National Research Council.

Capital Cost:

- Optimistic Case: Generic capital cost per mile from National Research Council.
- Realistic Case: Midpoint of Optimistic Case and Pessimistic Case.
- Pessimistic Case: High end of capital cost per mile range from National Research Council.

Construction Delay: $248 million annually

End Notes

i. Joseph Vranich, *Super-Trains: Solutions to America's Transportation Gridlock* (New York: St. Martin's Press, 1991)

ii. *Florida Statues 341.321.*

iii. "Issue Paper: High Speed Rail Program Status Report," Florida House of Representative, Committee on Transportation, November 1996.

iv. Florida Overland Express (FOX) Proposal to FDOT. Throughout the report the source of FOX information is the FOX proposal, unless otherwise noted.

v. Ben G. Watts, *Policy Statement: Maximum Number of Lanes on the State Highway System to be Provided by Department Funds* (Tallahassee: Florida Department of Transportation, March 13, 1996).

vi. Florida Department of Transportation, *DRAFT 1997 Short Range Component,"* July 1, 1996.

vii. As used in this report urban area means developed area (includes no rural areas). The United States Census Bureau uses the term "urbanized area."

viii. All gasoline prices from the American Petroleum Institute. Assumes 21 miles per gallon.

ix. Calculated from Japan Transport Research Center data.

x. Hiroshi Okada, "Features and Economic and Social Effects of the Shinkansen" (Internet publication).

xi. Japanese passenger railways, which are profitable, were privatized starting in 1987.

xii. "Failing to Bite the Bullet Train," *The Economist,* January 25, 1997.

xiii. Syuri Daimon, "Shinkansen Plans Yet to Get on Right Track: Differences, Questions Remain Over Financing, Gauge, Impact, Management," *Japan Times*, August 15, 1996.

xiv. Ontario Round Table on Environment and Economy (Ontario Roundtable), "The Role of Transportation Technologies in Reducing Greenhouse Gas Emissions" (Pilrusso Consulting Company).

xv. Ontario Roundtable.

xvi. *In Pursuit of Speed: New Options for Intercity Passenger Transport* (Washington, D.C.: Transportation Research Board, National Research Council, 1991).

xvii. Adib Kanafani, "No Rush to Catch the Train," *Access*, Spring 1994. This includes travel between Paris, Macon and Lyon.

xviii. Kanafani

xix. Association des Societes Fancaises d'Autoroutes data.

xx. Calculated from European Union Council of Transport Ministers data.

xxi. Ross Swan, "Contra Flow," *World Highways*, October 1996.

xxii. Kanafani

xxiii. Calculated from European Union data.

xxiv. European Commission Transport Ministry, *A Strategy for Revitalizing the Community's Railways* (White Paper), March 1996.

xxv. Outside this route, there are more than five daily round trip trains only in the New York-Albany, Los Angeles-San Diego and Chicago-Milwaukee corridors. Most routes are served by a single round trip or three times weekly service.

xxvi. *The Northeast Corridor Transportation Plan: Washington, D.C. to New York City: Phase 1: Report to Congress,* Federal Railroad Administration and Amtrak, May 1996.

xxvii. Jean Love, Wendell Cox & Stephen Moore, *Amtrak at 25: End of the Line for Taxpayer Subsidies?* (Washington: Cato Institute, December 1996).

xxviii. High speed rail has also been proposed for Canada's Windsor-Toronto-Montreal-Quebec corridor. A recent Transport Canada report found high speed rail to not be commercially viable.

xxix. National Research Council.

xxx. National Research Council.

xxxi. *Overview Report: High Speed Ground Transportation for America* (Washington, D.C.: Federal Railroad Administration, United States Department of Transportation, August 1996).

xxxii. Section 1036 of the 1991 Intermodal Surface Transportation Act of 1991 required the U.S. Department of Transportation to conduct a study on the commercial feasibility of high speed rail. The report appears to have violated the Congressional mandate, by evaluating high speed rail on a non-commercial basis. USDOT counted non-user benefits and consumer surplus as commercial revenues. Consumer surplus is the difference between the price paid by a purchaser and the price that the purchaser would be willing to pay for the good or service. No amount of rationalization can convert non-user benefits and consumer surplus into commercial revenues — they are simply not real money. If they were, the rates of non-user benefit and consumer surplus used by USDOT could be used by Congress and the President to balance the federal budget this year and forever, pay off the national debt in three years and cancel state and local taxation in perpetuity.

xxxiii. Requested data that would have permitted a more complete review of the USDOT report was not made available.

xxxiv. Calculated from data in *Denver International Airport: Information on Selected Financial Issues* (Washington, D.C.: U.S. Government Accounting Office, September 20, 1995).

xxxv. "Eurotunnel: Au Revoir Alastair," *The Sunday Times* (London), October 6, 1997. Figures converted to US$ at 1.5938 (exchange rate at March 20, 1997).

xxxvi. Calculated from data in David Luberoff and Alan Altshuler, *Mega-Project: A Political History of Boston's Multi-billion Dollar Artery/Tunnel Project* (Cambridge, MA: John F. Kennedy School of Government, Harvard University, April 1996) and *Transportation Infrastructure: Managing the Costs of Large-Dollar Highway Projects* (Washington, D.C.: U.S. Government Accounting Office, February 28, 1997).

xxxvii. "Intercity Passenger Rail: Amtrak's Financial Viability Continues to be Threatened," U.S. Government Accounting Office testimony before the Committee on Transportation and Infrastructure, U.S. House of Representatives, March 12, 1997.

xxxviii. Don Pickrell, *Urban Rail l Transit Projects: Forecast Versus Actual Ridership and Costs* (Washington, D.C.: Urban Mass Transportation Administration, U.S. Department of Transportation, October 1989).

xxxix. The author was a policy board member of the Los Angeles County Transportation Commission from 1977 to 1985, which included this project's planning period.

xl. Analysis board meeting documents and *Final Environmental Impact Report: The Long Beach-Los Angeles Rail Transit Project,* Los Angeles County Transportation Commission, March 1985.

xli. *Metro-Dade Transit: Annual Performance Report Fiscal Year 1994-1995.*

xlii. Urban Mass Transportation Administration

xliii. *Metro-Dade Transit*

xliv. Urban Mass Transportation Administration

xlv. Urban Mass Transportation Administration

xlvi. Fawn Germer, "Commuter Line Delayed," *The Miami Herald,* February 5, 1988 and National Transit Database.

xlvii. "Tri-Rail's Future," *Sun-Sentinel*, February 12, 1997.

xlviii. Data from National Transit Database.

xlix. Florida Department of Transportation - Turnpike District, *Traffic Engineer's Annual Report: Fiscal Year 1996* (Tallahassee, FL: URS Consultants, December 15, 1996).

l. The New York-Washington market has a strong history of ridership. The airlines entered the rail market, not the other way around.

li. William Ascher quoted in Edward A. Mierzejewski, "Recognizing Uncertainly in the Transportation Planning Process: A Strategic Planning Approach," paper presented to the 76th Annual Meeting of the Transportation Research Board (Washington, D.C., January 1997).

lii. Martin Wachs quoted in Mierzejewski.

liii. Jonathan E. D. Richmond, "The Mythical Conception of Rail Transit in Los Angeles," (Sydney, Australia: Institute of Transport Studies, University of Sydney, 1997).

liv. An additional train would be operated during a single Friday afternoon peak hour after 2017.

lv. FDOT was helpful in providing information and documentation. However it advised that ridership assumptions that would correspond with the current FDOT-FOX Base Case Model (in the *Pre-Certification Post-Franchise Agreement*) were not available, and that the ridership was a "blend" of FOX projections and projections developed by KPMG Peat Marwick for FDOT. Base Case Model fare revenue projections for 2010 are approximately four percent lower than the FOX proposal projections. This report assumes that the FOX average fare is used in the Base Case Model, which would reduce the ridership projection by 4 percent. This adjustment revises the FOX projected annual ridership from 6.4 million to 6.2 million. If the

alternative assumption had been used — holding ridership constant and adjusting average fare — the impact on financial performance would be substantially similar. All of the ridership and financial information in this report is based upon this interpretation of the Base Case Model unless otherwise noted.

lvi. *Pre-Certification Post-Franchise Agreement by and between the State of Florida Department of Transportation and Florida Overland Express, L.P.* November 12, 1996.

lvii. To be practical as a national passenger rail network, Amtrak would need to provide frequent service that, with connections, reaches every urban area in the contiguous 48 states expeditiously. It does not.

lviii. Because the developed area of Miami-Fort Lauderdale-West Palm Beach could accommodate only 90 percent of Tokyo's 30 million people, 10 percent would need to be housed in Tampa-St. Petersburg.

lix. Estimated from data in *Jane's Urban Transport Systems.*

lx. The U.S. National Transit Database reports ridership as "boardings." A single trip can involve more than one boarding of a vehicle. Other nations use "passenger journeys," which do not count transfers as individual trips. U.S. passenger journeys have been estimated by multiplying boardings by 0.8, the most recently reported industry average.

lxi. The distance between Atlanta and Orlando is 450 miles. The rail travel time converts to an effective 12 miles per hour.

lxii. Calculated from data in *The Florida Transportation Almanac: 1995* (Center for Urban Transportation Studies, University of South Florida).

lxiii. High speed rail travelers would generally spend less time in terminals than airline passengers, largely due to longer walks to gates at airports. However the traveler's high speed rail terminal experience would be more complicated than would be expected at an Amtrak station. There would be airport style security and, if the practice of some European high speed rail services is followed, advance check in.

lxiv. Data from the Bureau of Transportation Statistics, U.S. Department of Transportation.

lxv. Average air fare calculated using present air travel market weights without high speed rail.

lxvi. Calculated on a person mile basis, weighted to present air travel market weights.

lxvii. Data from the Air Transport Association.

lxviii. Vanguard Airlines, with a 14 day advance purchase. Includes $3 Passenger Facility Charge.

lxix. Calculated from U.S. Department of Transportation data.

lxx. Calculated from data in *Air Transport World.*

lxxi. The FOX Proposal did not include the Tampa-to-Fort Lauderdale market. It is estimated that inclusion of the market would have changed the reduction from the FOX Proposal to approximately 47 percent.

lxxii. In February 1996 there were at least 30 daily round trip departures between Orlando and Miami, and Tampa and Miami, 21 between Tampa and Fort Lauderdale, and 18 between Orlando and Fort Lauderdale.

lxxiii. Travel times are assumed to be the same in 2010 as today. FDOT data forecasts slower travel for Tampa-Orlando (18 minutes), and Miami-Orlando (2 minutes), while forecasting an improvement for Miami-Tampa (12 minutes). FDOT, *Florida High Speed and Intercity Rail market and Ridership Study: Final Report* (Vienna, VA: KPMG Peat Marwick, July 1993).

lxxiv. Auto travel time calculated using "Automap Direct" software (Next Base, Ltd., 1994), with adjustment to account for recently posted 70 mile per hour zones. Terminal times as in KPMG, except for outbound terminal times which are 0:30 for high speed rail and 0:45 for air.

lxxv. Calculated from U.S. Department of Transportation and U.S. Commerce Department data.

lxxvi. South to central Florida trips two days. Tampa-Orlando trips one day. "Basic" includes destination taxi except for personal trips to Orlando. Personal mileage = gas + tolls; business at IRS rate. personal rail travel at coach rates, Business travel at weighted average of coach & first class. It is assumed that air and high speed rail costs would be virtually the same. Personal (non-business) travel at FOX coach rates ($54 Miami-Orlando, $65 Miami-Tampa, $22 Tampa-Orlando), with one half fare assumed for a child. Personal driving cost equals gasoline plus tolls. Overhead personal expenses: $15 for destination taxi, $4 parking. Business mileage costs at IRS rate. Business travel at average fare ($77 Miami-Orlando, $97 Miami-Tampa, $34 Tampa-Orlando). Overhead business expenses: destination taxi $15, car rental $40; Parking at outbound station $4 per day, mileage $3.

lxxvii. Nationwide Personal Transportation Survey, 1990.

lxxviii. Okada.

lxxix. Rail fares could be priced below discount air fares if the state provided larger subsidy appropriations. There is precedent for this — Amtrak's average subsidy per person mile exceeds the average airline fare per person mile (Jean Love, Wendell Cox and Stephen Moore, *Amtrak at 25: End of the Line for Taxpayer Subsidies?* (Washington, D.C.: Cato Institute, December 1996).

lxxx. For example, in 1995 Southwest Airline's fixed costs were 21.1 percent (Southwest Airlines "10K Report").

lxxxi. FDOT, *Final Order Awarding Franchise to Florida Overland Express, L.P.: Franchise Terms and Conditions*, April 4, 1996.

lxxxii. National Research Council.

lxxxiii. Wendell Cox, "U.S. Urban Transport Labor Law Puts Employees Above Riders & Taxpayers," *The Public Purpose: Internet Public Policy Journal*, January 1996.

lxxxiv. If all FDOT-FOX projections were reached (a result judged to be highly improbable), the net present value would decline to -$8.2 million (1996$). However, a result this positive is beyond reasonable probability.

lxxxv. Federal Railroad Administration.

lxxxvi. With no capital or operating cost escalation the net present value would be $700 million; with 10 percent capital and operating cost escalation the net present value would be $1.4 billion (assumes FOX ridership and market fares).

lxxxvii. National Research Council.

lxxxviii. Calculated using the ratio of Florida population to that of the United States.

lxxxix. At more than $6 billion, WPPSS was the largest public bond default in history. A FOX system default could equal or exceed that record.

xc. FDOT *Final Order.*

xci. Inflation is assumed at three percent; the minimum support payment would be increased by four percent annually.

xcii. Statement made in statement in *Final Order*, revised in *Finance Post-Franchise Agreement by and between the State of Florida Department of Transportation and Florida Overland Express, L.P.,* August 12, 1996.

xciii. Building the trains.

xciv. Mierzejewski.

xcv. One of the partners wrote off $170 million in Eurotunnel investments — equal to half the proposed gross private investment in FOX. in 1996. All data is from corporate data on the Internet. Data was not obtained for partner Odebrecht.

xcvi. American Highway Users Alliance estimate.

xcvii. Calculated using difference between high speed rail fatality rate and highway fatality rate.

xcviii. Calculated using Florida highway fatality rate, assuming vehicle occupancy of 1.0.

xcix. Based upon 1990-1994 data. Airline fatalities tend to be very concentrated, due to the catastrophic nature of airline accidents. Thus, the *probability* is that there would be no fatalities in Florida over the 40 year period, though average rates indicate three fatalities.

c. Calculated from data provided by Orlando International Airport.

ci. Calculated from data provided by Miami International Airport. High speed rail passengers and costs allocated to Miami International Airport using FOX air market share projections.

cii. Denver International Airport has an annual capacity of 50 million passengers (Denver International Airport Internet site).

ciii. The nation's major airport and airlines receive virtually no public subsidy. Funding is from the 10 percent air ticket tax, airline landing fees, airport passenger facility charges and airport commercial revenues.

civ. This analysis excludes the Tampa-Orlando corridor, in which this report finds FDOT-FOX projections to be well outside the range of probability (Section V, "Competitive Analysis: Automobile: Short Trips").

cv. Assumes all diversion from autos is from I-75 (none is assigned to alternate routes)..

cvi. Assumes additional lanes to be built when daily volume reaches 50,000. (A current expansion from four to six lanes is occurring near Okeechobee Plaza on the Homestead Extension, where daily traffic volume is approaching this figure.)

cvii. "This Evaluation" projection is Realistic Case.

cviii. Cost of freeway expansion calculated from Federal Highway Administration data and data in the *Florida Transportation Almanac: 1995:*

cix. Average cost per lane mile (approximately $5 million) and high speed rail mile (approximately $16 million) divided by maximum reasonable hourly use: 4,175 for a highway lane and 130 for diversion of autos to high speed rail (peak volume estimated at twice the hourly average). High speed rail costs allocated to highways using FOX highway-air market share projections

cx. User fees—fuel taxes, tolls and other highway use taxes more than pay for the nation's highways. However, diversion of highway user fees to other uses, especially mass transit, creates a revenue shortfall that requires local governments to use general revenues, especially property taxes to pay a portion of local street system costs. However, even in a user-fee based system, property taxes are a reasonable source of funding for local streets, since they would be needed whether or not there were motor vehicles.

cxi. The actual person carrying capacity of a highway lane is considerably higher. According to the U.S. Department of Transportation, average vehicle occupancy is 1.7. With a 2,500 hourly vehicle capacity, the normal person carrying capacity of a highway lane is thus in excess of 4,000.

cxii. T. J. Healy, *Total Energy Requirements of the BART System*, Santa Clara University, 1974.

cxiii. Okada

cxiv. *Champagne Growers Fight High Speed Rail*, Internet news report.

cxv. Ontario Roundtable.

cxvi. FDOT *Final Order.*

cxvii. Another use would be airport expansion. However the major airports in the corridor are already proceeding with plans to accommodate anticipated growth.

cxviii. American Highway Users Alliance.

cxix. Dale W. Jorgerson and Kun-Young Yun, "The Excess Burden of Taxation in the United States," *Journal of Accounting and Finance*, September 1990.

cxx. Florida Statutes 331.12.

cxxi. *Statewide Transportation Needs & Funding Study*, Center for Urban Transportation Research, University of South Florida, May 1995.

cxxii. See Dale F. Rubin, *Public Subsidies to Private Corporation: Stop Violating the Florida Constitution!* (Tallahassee: James Madison Institute, August 1996).

cxxiii. Assumes that the passenger facility charge would be periodically increased to reflect inflation.

cxxiv. Kanafani