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Thomas A. Lynch
Florida State University

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FINANCING HIGH SPEED RAIL AND MAGLEV SYSTEMS IN EUROPE JAPAN AND THE UNITED STATES: IMPLICATIONS FOR SYSTEMS FINANCING IN FLORIDA

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PREPARED BY:
DR. THOMAS A. LYNCH
DIRECTOR
CENTER FOR ECONOMIC FORECASTING
AND ANALYSIS
FLORIDA STATE UNIVERSITY
TALLAHASSEE, FLORIDA

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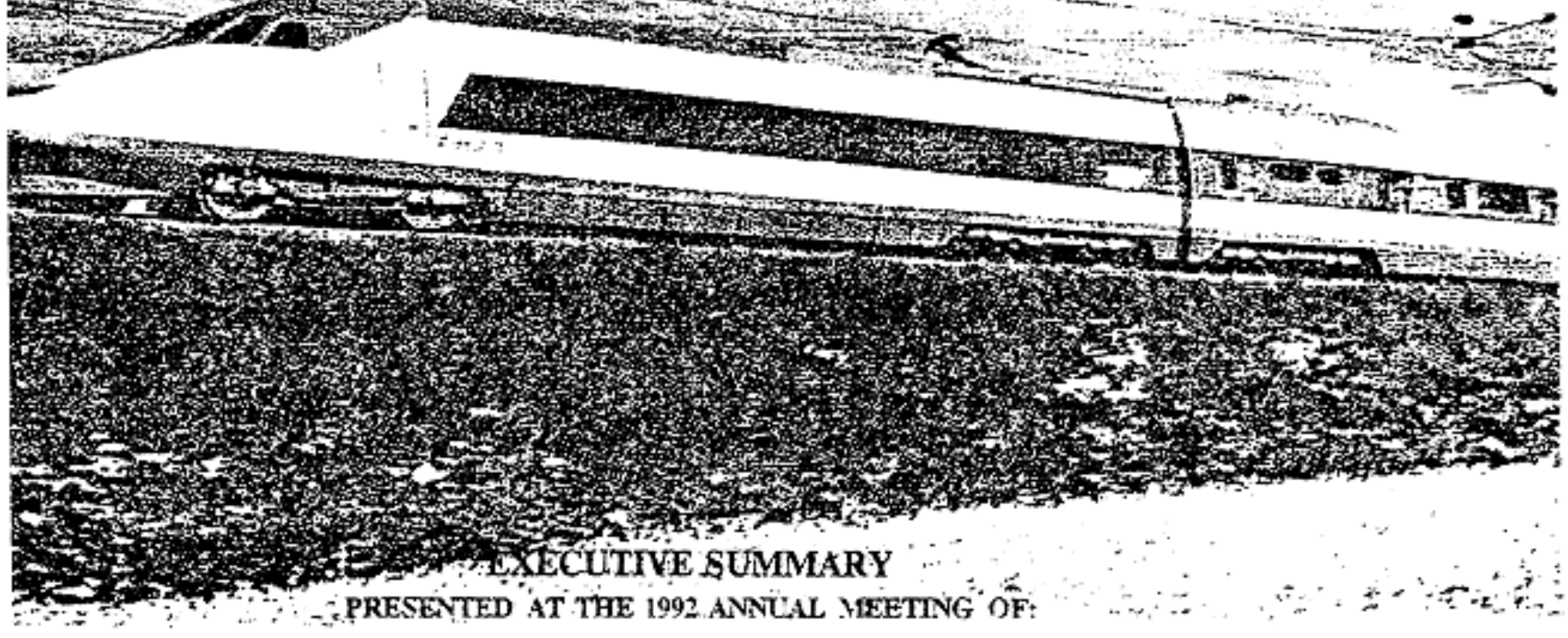

EXECUTIVE SUMMARY

PRESENTED AT THE 1992 ANNUAL MEETING OF:

EXECUTIVE SUMMARY

PUBLIC TRANSPORTATION POLICY DEVELOPMENT WITHIN EUROPE, JAPAN AND THE UNITED STATES

Several important common traits are identifiable among nations surveyed with existing or newly proposed high speed rail (HSR) or maglev systems:

- o In each nation a close and cooperative government-industry partnership exists to achieve the goals of HSR/maglev development and deployment. These models of teamwork are instrumental to system development and implementation success.

- o At the close of World War II (WWII) a number of developed nations rebuilt and modernized transportation (and other) infrastructure.

- o Large scale reinvestment in transportation infrastructure was deemed essential to domestic economic growth and well-being, and financed as a public investment.

- o The rail systems evolved into powerful national public entities and provided a vital public service -- public transportation.

- o In Europe, historically, the national rail systems were the principal means of moving large volumes of troops and equipment in two recent world wars. These systems were viewed, therefore, as national defense systems. Further investments to upgrade these systems were viewed as integral to the national defense interests of each nation. By contrast, in post WWII years in the U.S., major transportation emphasis was on investments in the multi- billion dollar National Defense Highway system.

- o A clear circular trend is evident when comparing the evolution of rail public policy in the U.S to other nations. Each point in this circle begets the next and so on until the last point again begets the first point. The points include :

    1. Substantial levels of public investments result in high levels and quality of public transportation and HSR service levels.

    2. Substantial levels of service and quality (and competitive fares) beget high levels of public usage and modal share;

    3. High levels of ridership (as a percent of the total population) generate large public support for public investments in these transportation investments.

    4. Public support for the systems investments generate high per capita tax levels and public investment for public transit and intercity HSR.

- Since the end of WWII these nations (along with the U.S.) all experienced a considerable growth in demand for automobile travel.

- While per capita auto ownership in these countries was historically only a fraction (50% to 75%) of U.S. levels. These differences in auto ownership levels are decreasing each year. Autos per capita increased by 120% and 103% in Germany and France respectively over the 1965-82 time frame, while only increasing 37% over that period in the U.S.

- In each country substantial growth in the airlines industry (also largely publicly owned) was also being felt.

- In each country (including the United States) rail transportation planners were realizing the rapid erosion of intermediate distance travel markets to the automobile, and longer distance travel markets to the air mode.

- Each country with a mature HSR system (Japan, France and Germany and to a lesser extent the other European and Asian Rim nations) realized that HSR service would provide a much more competitive new travel alternative to the air and auto mode helping to stem the large scale rail ridership erosion being experienced world wide. In the United States, this rationalization of transportation reality never materialized, as the dominance of the "new" air and auto modes were allowed full expression with no consideration of "new" rail.

- In the U.S. as elsewhere, the automobile is subsidized. In the United States, however, the subsidiary is considerably higher than in Europe and Japan. Increasingly in other nations, an environmental and other externality fee is attached to the automobile mode to more equalize the subsidies between modes.

- In each case the National Interregional Rail system (and transit) receives both operating and capital subsidies ranging from 29% to almost 70% of total combined expense. Public transit is similarly subsidized there and here.

- These public rail subsidies (and relatively low regulated fares) resulted in accumulation of substantial National Rail system debt for the nations examined. In each case (Japan, France, and Germany), by general agreement, the federal public sector is assuming responsibility for the vast majority of that debt.

High Speed Rail (HSR) System Developments

In Japan, France, Germany (and elsewhere in Europe) a HSR system was developed on top of an already highly-matured conventional rail system. As a result, much of the ridership on the considerably increased HSR service routes is diverted from the substantial base of conventional rail ridership.

- In each case, a part of HSR capital construction costs is subsidized. The TGV Paris-Lyon Southeast system "may" be an exception to this finding, but all accounts are not clear. Specific financing details are not available, but the evidence provided to date by SNCF suggests the TGV system does pay for all operating costs and a considerable amount of debt interest and (apparently) purchase and lease fees for rolling stock and initial HSR line construction debt and interest. In the case of the TGV Atlantic the federal grant subsidy was precisely 30% of capital costs (or approximately $600 million 1991 dollars).

- In each case where HSR is put into revenue service these systems contribute positively (or deter debt growth) to the national rail system's revenue earnings and throw off a surplus system profit. The financial profit to SNCF for the TGV Paris-Lyon system is 15% of total revenues, while the intermediate speed IC service generates a 9% surplus profit (over expenses) for the Germany National Railway. A similar (but not reported) positive return is generated by the Shinkansen in Japan, the U.S. Amtrak Metroliner service and (presumably) other HSR services across the world. These "profits" help sustain unprofitable conventional rail services elsewhere across the system and lower overall system accumulated debt.

- Financing of HSR systems have at least two principal revenue stream philosophies. The first is represented by the French TGV approach of exclusively focusing on a "light" HSR system that transports passengers and light packages only. The alternative is represented by the "heavy" HSR approach of building a system to commercially carry both passengers and freight. The potential increases in revenue earnings must be balanced off against considerably higher (as much as double from $16 to $32 million a mile) HSR system capital infrastructure costs and potentially higher O&M costs. The latter is not yet clearly established.

- The Europeans have established an important method to financing expensive new HSR rolling stock in at the lowest possible costs. They established a publicly held multi-national rail financing corporation. The 16 European (governmental owned) railway systems created Eurofima, a joint stock company under Swiss law for financing rolling stock, with an established triple A credit rating. The company can purchase vehicles in large series from international tender and provide advantageous funding for purchase or lease of these investments to member railway systems. The aggregate value of equipment financed from 1956 to 1989 is approximately 25.7 billion Swiss francs.

- A number of specific references are made to limited and even substantial real estate related gains associated with rail systems developments across the world. For example JNR, (much like early U.S. rail expansions) initially developed considerable real estate assets as a basis for generating revenue and ridership in its early years. Also, currently in Japan real estate revenues do retain an important part in private sector railroad systems balance sheets. In the U.S., Amtrak real estate revenues

exceeded $25 million annually in late 1980's, and Amtrak continues to attempt to increase those earnings. In Canada, France (Paris and Lyon), Germany, Sweden (and elsewhere) real estate development proceeds at and near station locations are valuable rail system attributes. However, real estate returns are not anywhere reported as a significant percent or portion of the system's revenue generation stream for specifically financing the HSR services in these countries.

- Despite current extent of HSR systems deployment in each nation conventional rail service continues to loose ridership. Auto and air modes continue to increase and dominate many segments of growing travel demand. Again, rail planners in these nations recognize in order to further stem the tide of continual erosion, increased investments in HSR/maglev public transportation systems will be warranted in the future.

Differences Between European-Japanese and U.S. Public Transportation-HSR Public Policies.

Distinctly different and specifically focused public policies have evolved in the European-Japanese nations (relative to the United States) in support of the high speed (and other) rail modes. These include (but are not limited to):

- The Japanese and European model of close Government-private corporation partnership and cooperation is one of the primary roots of sustained HSR and Maglev research achievements and deployment successes. This teamwork in turn more easily begets public support.

- In each country the major successes of HSR and Maglev research and development has been under written by public funds with substantial private industry research involvement.

- Very powerful public agencies own and operate the national public rail systems. (Japan recently moved to privatize JNR, but was totally public until 1988.)

- The cost of automobile use is considerably higher in Europe and Japan. This is true despite the fact that the U.S. auto fleet consumes more energy on average than any other nation examined.

- These higher automobile ownership and operation costs are mostly attributable to consciously applied public policies in each country with much higher fuel and vehicle purchase tax levels.

- Second, each HSR nation has an explicit policy of high motor oil (diesel and gasoline) taxes. The cost of the gasoline tax in every nation surveyed (except the U.S. and Canada) exceeds the cost of the fuel itself by a considerable amount. In Italy and

Denmark, as an example, the cost of gasoline tax exceeds the cost of the gasoline by 285% and 355%, respectively, while the tax is only 25% of the fuel cost in the U.S. in 1991.[1]

- Gasoline prices in the U.S., in real terms, are less expensive today than at any time since the end of WWII. This is attributable to the sustained low tax rate (in real terms) in the U.S. The spending value of federal and local gasoline taxes severely eroded up through the 1990's to be only a fraction of its value over the 1950-1970 time period. This under-priced value of the petroleum resource accelerates wasteful over consumptive use of the resource in the U.S., and detracts from the attractiveness of the public modes.

- Sales tax prices on new U.S. automobiles is only 5% of a new car price while it is 14% in Germany, 33% in France, and 40% to 50% in much of the rest of Europe and 186% of purchase price in Denmark.

- Average annual taxation of a standard car in the U.S. (1982$) is only $119 while in Europe the average tax varies from $450 to $825.

- Land use policies in Europe and Canada either explicitly prohibit sprawled suburban development or strongly encourage high-density cluster development, while in the U.S. sprawl urbanization is systematically encouraged at all levels of government implicitly and explicitly.

- Japanese, French and German governments have the ability to set public policy procedures restricting commercial transportation systems competition with HSR modes. Japanese, French and German airlines are predominantly governmentally owned and all charge air fares considerably higher than U.S carriers (over similar route miles) and the domestic HSR system fares.

The German government can dictate policy that will direct the HSR/air modes to be complimentary and not competitive to their respective economic death. For example:

> In Frankfurt (and elsewhere) the international airport was developed to facilitate inter- and intra-regional rail travel by providing direct access, in the airport, to both inter-regional HSR service and local light urban rail service.
>
> The German government encouraged its national airline, Lufthansa, to invest and own the interregional rail business shuttling passengers between airports on the Lufthansa shuttle express rail system.

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[1] Public Transportation Financing and Subsidies by Mode in the United States, A report to the High Speed Rail Association Conference, Lynch, T., Florida State University, May 7, 1991

The federal German government has instituted a national transportation policy that no domestic commercial airline flights will operate within the national boundaries of Germany by 1995. All internal travel will be on auto, surface HSR or other carriers.

The federal governments, as in the case of France, can effectively regulate national airline fares and thereby keep unwarranted price wars and uncompetitive market gouging from going on within certain corridors.

While the ability to regulate fares can be an asset, it can also operate as a constraint in differing settings. This ability can facilitate maintaining low HSR fares (as they are in France, Japan and Germany and all other cases examined - especially relative to the air mode) and this can greatly facilitate increasing travel and access to these markets to a wide spectrum of society. This ability to regulate fares can also tend to facilitate building of broad social support for the systems.

The constraining nature of this governmental prerogative can also be very debilitating to a system as it was in Japan. If rates are artificially maintained at too low a level for too long, insufficient revenue is generated and general debt becomes substantially bloated. The general traveling public becomes accustomed to very inexpensive travel costs (as the U.S. is with the price of gasoline) and resistant to any measurable increase in travel costs. Very low (governmentally regulated) JNR rail fares, resulted in the national railway accumulating a very large debt. This, in turn, resulted in inevitable fare adjustments in the mid-1980's which resulted in a brief general strike on the part of consumers and eventual governmental assumption of the huge debt and the dismemberment of the JNR national railways itself.

- The European nations examined evaluate the financial and socioeconomic feasibility of development of alternative HSR corridor developments in their analysis. Given that the accepted public purpose of these nationally owned HSR systems is to deliver transportation and other social and economic services (jobs, efficient economic growth and so forth), these public sector returns are calculated into the corridor feasibility evaluation. For example, while the TGV Southeast estimates a 15% financial Internal Rate of Return (IRR) for the French National Railroad system, planners also estimate a 30% socioeconomic IRR for that alignment. Similarly, the financial and economic returns for the TGV Atlantic are 12% and 23%, IRR respectively.

- The Community of European Railways estimated that as much as $120 billion investment in 5,600 miles of very high (155-200 mph) rail corridor, and 9,200 miles of intermediate speed (up to 130 mph) HSR service will be developed by 2010. They have estimated that this European HSR network will yield the following immediate

and longer run economic and financial returns to the rail companies and economic and socio-economic returns to the localities.

European High Speed Rail Network Financial Economic Viability[2]
Financial Investments Internal Rate of Return
Source: European Rail Community

Network Service	At Date of Entry Into Service	10 Years after Entry Into Service
V1 (1995)	9.4% in 1995	13.3% in 2005
V2 (2005)	9.8% in 2005	14.1% in 2015
V3 (2015)	10.8% in 2015	15.5% in 2025

European High Speed Rail Network
Financial and Socioeconomic Internal Rate of Return[3]

Network Service	At Date of Entry Into Service	10 Years after Entry Into Service
V1 (1995)	17.7% in 1995	24.1% in 2005
V2 (2005)	19.3% in 2005	26.4% in 2015
V3 (2015)	20.1% in 2015	28.1% in 20254

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[2] Gerardin, B., "Financing the European High Speed Train Network," Planning and Transport Research and Computation. Vol. P320, 1989, pp. 1-15, Seminar E, PTRC, Summer Annual Meeting.

[3] Ibid. Gerardin.

IMPLICATIONS FOR IMPLEMENTATION AND FINANCING OF HSR/MAGLEV ELSEWHERE IN THE UNITED STATES.

This review of HSR and other public transportation systems financing in Europe and Japan offer some clear implications for financing HSR systems in Florida. These include:

FINANCE

- Initial public support for HSR capital costs (for right-of-way, rail line construction, land purchase and so forth) is essential, to some extent, on virtually every proposed alignment.

- Levels of public support for infrastructure will vary considerably between different urban corridors

- State and Federal (or a public/private cooperative venture offering) low interest loans for additional capital and rolling stock purchases are essential to maintain a HSR positive cash flow.

- High quality and competitively priced HSR service will command substantial and loyal ridership base. This ridership base may, however, require a number of years to mature.

- Ridership revenues will, at a minimum, pay all operation costs and typically be able to offer some repayment of capital debt needs. This capability will expand with the maturing of the ridership base given the lack of substantial existing rail use.

- Evaluation of possible HSR freight markets within corridors should be examined.

- Direct real estate revenues from joint or individual developments can offer attractive returns but these prospects are typically localized to the station area (within a mile), or physically linked to the rail system. These revenues can most effectively be captured with development planned and executed in the earliest stages of rail system development and only be effective with local government cooperation.

- Capture of rail induced property value land appreciations near the rail alignment can be accomplished through special assessment districts. These revenues can most effectively be captured with local government cooperation.

- Rail fares should offer travel cost incentives below conventional air services.

- HSR corridor evaluations should comprehensively include socio-economic and environmental benefits and fairly compare system economic returns to the alternative modes.

PUBLIC POLICY

- The first adjenda is to design and implement a powerful and new **American model** of government/private sector cooperative partnership. This team must be forged immediately with a common purpose to research, build and deploy HSR and Maglev systems within the United States.

- The common mission of this new joint public/private partnership must be to deliver one service - high quality and efficient public transportation.

- The financial base of this new relationship should be joint public/private with dominant funding from public sources and private sector initiatives functioning to develop patients and properly capitalize on implementation and operation aspects.

- Coordinated Federal, state and local government public policy and environmental reviews must operate to facilitate HSR system ridership growth.

- HSR systems must be efficiently integrated with airports, public mass transit systems, conventional rail systems, and automobile modes. These complimentary multi-modal linkages are central to success or failure of HSR ridership growth.

- Extensive expansion of competitive inter-urban transportation networks should be discouraged. For example, HSR airport linkages (and associated costs) should be explored instead of expansion of regional airports capacity. Continued highway capacity expansion should be halted in corridors competitive with deployed HSR services.

Compatible land use and comprehensive plan designations adjoining the HSR alignment and stations must be ensured.

A broad based public policy evaluation, and public education and communication program should accompany HSR system development. This program should explore the public services delivered by the HSR system and generate conclusions of that research to ensure public support.

Center For Economic Forecasting and Analysis

Dr. Tim Lynch, Director

The Center for Economic Forecasting and Analysis (CEFA), located at Florida State University, specializes in the construction of computer-based economic assessment and forecasting models. Analysis is conducted in a range of research areas including environmental and transportation economics, revenue forecasting, fiscal impacts, comprehensive planning and budgeting, capital and infrastructure evaluation, and real estate and land use planning .

The center provides technical support, training, and consultation in the areas of benefit/cost and cost/effectiveness analysis, statistical and computer model development, and other areas of economic analysis.

Select projects and studies include:

- Development of a sales tax economic forecasting and impact model, for assessing the diverse fiscal and societal implications of a proposed one percent local option sales tax increase for transit in Dade county.

- Evaluation of transportation-related benefits in Dade county from lower fares and upgraded rail and bus transit services across the county.

- Development of an environmental economic model, and analysis for the South Florida Water Management District to assess the costs and benefits of the Everglades comprehensive restoration and protection plan.

- Development of models, and completion of economic and fiscal analysis for the Florida Department of Transportation, Office of High Speed Transportation on proposed magnetic levitation and high speed rail systems.

- Training and development for the staff of public and private agencies in the areas of benefit/cost and cost/effectiveness analysis, statistical and computer modeling, and guidance on federal and state economic impact assessment statements.

- Dr. Lynch currently serves as Visiting Scientist for Argonne National Laboratory developing transportation-related environmental assessment models. He is a member of the U.S. Senate Magnetic Levitation Technical Advisory Committee. Recently appointed, Dr. Lynch also serves on the National Academy of Science Federal Magnetic Levitation Development Program Advisory Board.

The Center for Economic Forecasting and Analysis is a state agency. Contracts or the purchase of services does not require competitive bidding for State and local agencies in Florida.