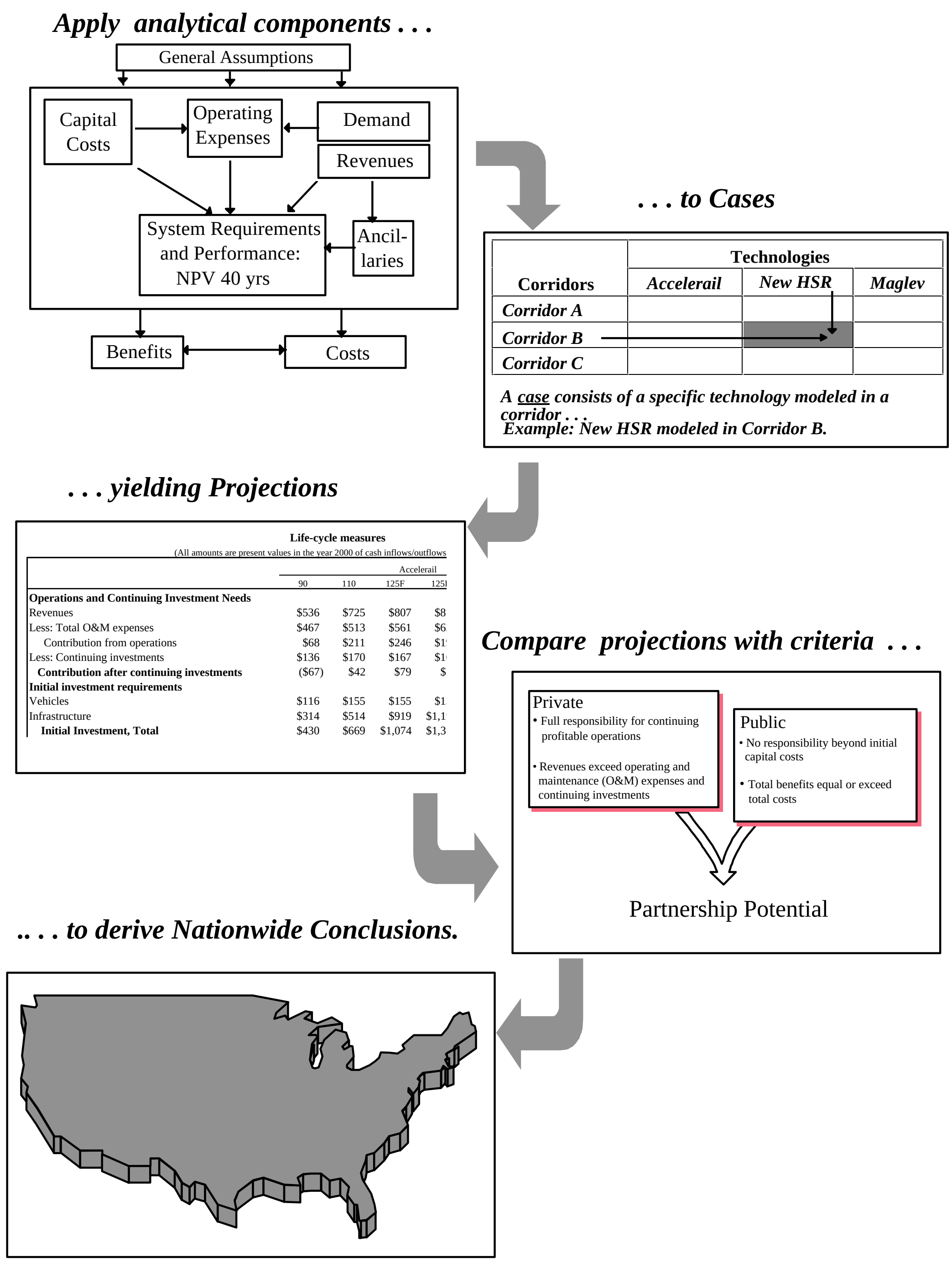
Chapter 3
ANALYTICAL FRAMEWORK

In assessing the economics of HSGT in the United States, the study consistently applied a set of analytical components to a series of "cases"—specific technological options in illustrative corridors—as shown in Figure 3-1.

Figure 3-1: Flow of the Analysis



The process depicted above yielded two interlinked types of projection data. This chapter compares and contrasts these two data types, shows how they drew support from the various analytical components, demonstrates how they were synthesized in the concept of "partnership potential," and introduces the illustrative cases that provided a basis for the report's results and conclusions. Subsequent chapters describe the assumptions underpinning the work (Chapter 4) and the methodologies for each component (Chapters 5 and 6).

HSGT PROJECTION TYPES

This study characterizes HSGT corridor options in two ways:

- By their **system requirements and performance—**their initial investments, travel demand levels, revenues, operating expenses, and related operating and financial measures on a strictly commercial basis; and
- More comprehensively, by a **comparison of their benefits and costs.**

Both types of information are indispensable to a full understanding of HSGT and its potential role in American transportation.

In effect, projections of **system requirements and performance** treat HSGT options as analogous to private freight railroads—constructing and maintaining their own rights-of-way, providing their own equipment, and conducting their own transportation and ancillary operations. Such projections depict each HSGT corridor as a largely self-contained business enterprise.

Commercial projections alone may provide too narrow a perspective on the value of HSGT, because intercity passenger transportation in the United States is a joint product of public and private investments. Unlike America's private freight railroads, each passenger travel mode—air, highway, and rail—shows distinctly split responsibilities for such essential functions as the provision, maintenance, and operation of rights-of-way, terminals, and vehicles. Thus, every means of intercity passenger transport in this country represents an implicit or explicit **private/public partnership** that—while incorporating user financing in large measure—also demonstrates governmental support and involvement.

Members of a private/public partnership will perceive a broader range of benefits and costs than those pertaining to strictly private enterprises. Therefore, an accurate portrayal of HSGT relies on a careful **comparison of benefits and costs** from a more comprehensive economic and environmental perspective than that provided by analogy with private freight railroads. While analysts may legitimately differ on the precise constituent elements and calculations of "benefits" and "costs," this more global viewpoint merits consideration alongside strictly commercial projections for HSGT. With both types of projection data available, private firms, governments, and the general public can better appreciate the full implications of HSGT implementation.

ANALYTICAL COMPONENTS AND THEIR USES

As shown in Table 3-1, the comparisons of benefits and costs relied on the full spectrum of analytical components, while the projections of system requirements and performance made use of a more limited set of procedures.

Table 3-1: Analytical Components in Relation to Projection Types

Analytical component	Entered into projections of **System Requirements and Performance?**	Entered into comparisons of **Benefits and Costs?**
Capital Investments	**YES**	**YES**
Travel Demand and Revenues	**YES** [As an element of System Revenues]	**YES** [As an element of Benefits to HSGT Users; also measures Costs Borne by Users]
Operating and Maintenance Expenses	**YES**	**YES**
Ancillary Activities	**YES** [As an element of System Revenues]	**YES** [As an element of Benefits to HSGT Users; also measures Costs Borne by Users]
Users' Consumer Surplus	**NO**	**YES** [As an element of Benefits to HSGT Users]
Benefits To The Public At Large	**NO**	**YES**

The following sections describe the function of each of these tools in the two types of analyses.

System Requirements and Performance

Commercial projections encompassed four main analytical components: capital costs, travel demand and revenue forecasts, operating and maintenance expenses, and ancillary activities. For each case, these projected cash outflows and inflows were summarized in a discounted cash flow analysis.

Capital Costs

Cost estimates reflected the specific needs of each technology, appropriate Federal Railroad Administration safety guidelines and regulations (for example, regarding highway/railroad grade crossings), the characteristics of each corridor, and prevailing unit costs.

The initial investment would include upgraded or new track[1]; structures; communications and train control systems; electrification (where applicable to the technology); highway/railroad grade crossing safety enhancements; fencing and environmental mitigation measures; right-of-way acquisitions and realignments; stations, yards, and shops; locomotives, cars, and other vehicles; and an allowance for contingencies, engineering, and program management.[2]

In addition to the initial investment, this study addressed continuing investments by the HSGT operator—for instance, expansions and replacements of the vehicle fleet during the 40-year planning period.

Travel Demand and Revenue Forecasts

For each case, the analysis first projected travel demand by mode **in the absence of HSGT**. Fares for HSGT were then set to maximize net revenue given HSGT's competitive stance versus other modes in city-to-city markets. (The capital investments and consequent total travel times powerfully influence that competitive stance.) A series of **diversion models** projected the ridership that the new HSGT service would attract from air, auto, existing intercity rail, and bus. Depending upon the market, up to 10 percent of diverted traffic was added to reflect "induced demand," trips that would not take place at all by any mode without the introduction of HSGT. The ridership projections, multiplied by the fare levels and summed over all city pairs, yielded revenues for each corridor.

Operating and Maintenance Expenses

The projections for each case included a build-up of operating and maintenance (O&M) expenses in the functional areas of maintenance of way; maintenance of equipment; transportation; passenger traffic and services; and general and administrative. In each functional area, the O&M model identified all the required activities and calculated the resources—personnel, materials, energy, and purchased services—needed to perform those activities at the projected level of ridership and operations.

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[1] "Guideway" in the case of Maglev.
[2] Ranging from approximately 30% of base costs for Accelerail to 41% for New HSR and Maglev.

Ancillary Activities

In addition to intercity passenger service, the HSGT operator could conduct ancillary activities that conform with or support its main line of business. The analysis estimated, on an activity-by-activity basis, the net revenues from mail and priority express service, parking, station concessions, and certain on-board service amenities (e.g., telephones). Varying in importance from case to case, these net ancillary revenues cumulatively amount to between three and ten percent of system revenues.

Derivative Measures

The four analytical components yielded a variety of measures of system requirements, performance, and efficiency. For example, the HSGT operator's annual "operating surplus" is the difference between system revenues (i.e., passenger transportation revenue plus net revenue from ancillary activities) and O&M expenses. The "surplus after continuing investments" is the present value of the future operating surpluses, less the present value of continuing investments projected to be made by the HSGT operator in future years. Chapter 7 describes these derivative measures in detail.

Comparisons of Benefits and Costs

To provide policy makers and the public with comprehensive information that would support a wide variety of interpretive techniques, this analysis attempted to quantify the full range of benefits and costs attributable to HSGT systems, as well as the parties on whom such benefits and costs might fall.

Total Benefits

As measured in this report, total benefits comprise the following elements:

- **Benefits to HSGT users** reflect the economic theory that travelers will pay only for transportation whose worth to them is equal to or greater than the applicable fare. Thus, the benefits to HSGT users consist of two elements:
    - **Benefits for which users must pay:** the product of the number of riders and the fares.[3] This equates to **system revenues** and was estimated as part of the projections of system requirements and performance.
    - The **users' consumer surplus,** which represents the difference between the full value of HSGT transportation to passengers and

[3] Income from ancillary activities is also included on the same economic grounds.

the fares they would pay. The surplus arises because fare levels are set to maximize net revenues rather than to exact payment from each traveler for the full worth of the transportation provided.[4]

- **Benefits to the public at large** redound to the general public and to users of modes other than HSGT. These benefits recognize the effects of diverting significant passenger volumes from existing modes to HSGT, and consist of savings from alleviated congestion and reduced emissions in air and highway travel.

These elements can be included in total HSGT corridor benefits because they are quantifiable in dollar terms and involve neither double counting nor transfers from one region or type of project to another.[5] On the other hand, total benefits do not include certain items that—although quantifiable—either duplicate the included benefits or represent "transfer effects" that might just as well accrue in other locations due to other major investments. Examples include economic impacts from HSGT operations and construction; capital savings on airports and highways; and energy savings. From the nationwide viewpoint of this report, such duplicative or transfer impacts—while of interest to potential partners in the development of specific corridors—could not appropriately enter into the projected total benefits of each HSGT corridor.

In addition, some impacts did not readily lend themselves to systematic quantification (for example: benefits to the American HSGT equipment industry; impacts on the automobile or aircraft industries) or required site-specific data exceeding the scope of this national study (for instance, such environmental impacts as noise and water pollution). Such items may merit scrutiny in studies of specific corridor proposals at the State level.

Total Costs

Total costs consist of the following:

- The **initial investment in HSGT infrastructure and vehicles;**
- **O&M expenses;** and

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[4] The models used to project revenues in studies of this type do not incorporate the oft-changing fares—keyed to such factors as the precise date and time of travel, overnight stay requirements, amount of advance booking time, and competing carriers' prices—that characterize yield management in modern passenger transport companies. To the extent that an actual HSGT operator exceeds this report's projections by implementing sophisticated yield management techniques that maximize net system revenues while forcing each rider to pay a fare that approaches the full value of the transportation to him or her, then "users' consumer surplus" will be converted to "system revenues."

[5] See Chapter 6 for the criteria for inclusion in total benefits.

- **Continuing investments** necessary (after initial system construction) to assure capacity for future traffic growth.

Viewed from the perspective of incidence, total costs fall into two fundamental categories:

- **Costs borne by users** (this equates to system revenues); and
- **Publicly-borne costs** (total costs less system revenues).

PARTNERSHIP POTENTIAL DEFINED

Recognizing the current structure of the intercity passenger transport industry, this report assesses HSGT cases for their **partnership potential—**their apparent capacity to draw the private and public sectors together in planning, negotiations, and, conceivably, project implementation. Partnership potential broadly gauges the attractiveness **to State and local governments** of an HSGT project but does not address the project's advisability, equity, or worth from the public policy perspective, nor its practicability from the financial viewpoint. Only detailed studies at the State level can fully treat the latter topics.

To exhibit partnership potential as defined in this report, the projections for an HSGT technology in a particular corridor must satisfy at least the following two conditions (see Figure 3-2), which respectively address system requirements and performance, and comparisons of benefits and costs:

First, **private enterprise must be able to run the corridor—once built and paid for—as a completely self-sustaining entity.** Thus, over the planning period, the HSGT operator's total revenues would need to cover not only the corridor's operating and maintenance expenses but also its continuing investment needs, such as for new vehicles to replace and expand the fleet. This condition would assist in attracting a private operator and would provide reasonable assurance to the public that its initial investment in HSGT is, indeed, a one-time contribution, not a prelude to continuing operating or capital subsidies. By positing a system free of operating subsidies, this report clearly differentiates between future HSGT corridor development and existing intercity passenger rail transportation.

Second, the total benefits of an HSGT corridor must equal or exceed its total costs. [6,7] As described below, other approaches to measuring benefits and costs may be of equal or greater interest to policy makers as they consider specific HSGT projects.

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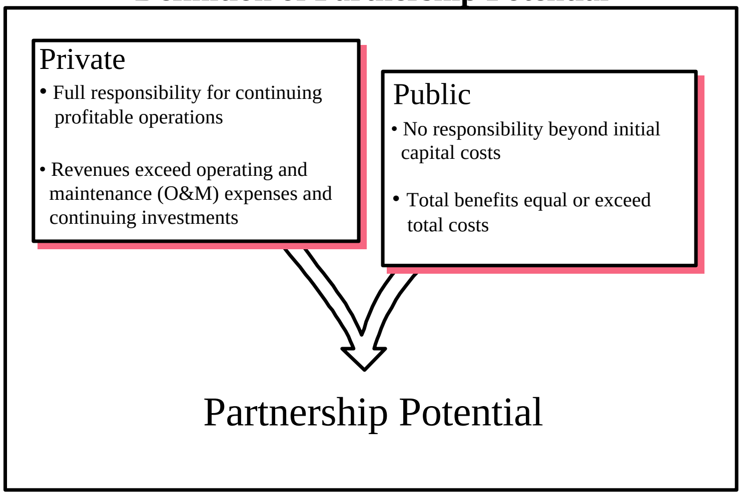
[6] Total benefits and total costs are expressed as present values, as of the year 2000, over the planning period (2000—2040).

[7] Chapter 5 describes in detail the methodology for projecting system requirements and performance, while Chapter 6 does the same for the comparisons of benefits and costs.

Figure 3-2
Definition of Partnership Potential



This report uses "partnership potential" as an indicator of the aggregate financial and economic impacts of HSGT alternatives in a set of illustrative corridors. Detailed State studies of individual corridors would benefit from site-specific investigations and data as well as additional evaluation measures. Thus, <u>while "partnership potential" may offer useful insights in assessing the likelihood of HSGT development by State and local governments and their private partners, it does not constitute an express or implied criterion for Federal approval or funding.</u> Any future Federal consideration of specific HSGT project proposals could apply additional criteria (e.g., comparisons of benefits to the public at large with publicly-borne costs) that could differ from, and be much more stringent than, this report's threshold indicators for "partnership potential."

Owing to locally perceived transportation conditions and business opportunities, States and private entities may still see partnership potential in options that lack it according to this report. Clearly, as long as States can develop the requisite financing, they can choose their own measurement techniques and thresholds to reflect local and regional public priorities.

ADDITIONAL MEASURES OF PARTNERSHIP POTENTIAL

State studies will inevitably use additional measures to assess whether early indications of partnership potential[8] can withstand further, necessary scrutiny. Examples of these additional measures include, but are not limited to, the following.

[8] Such as the findings of this report and of other preliminary investigations at the State level.

Financial Measures

It is highly desirable that the private sector should be able to make a substantial contribution, based on operating surpluses, toward the initial capital investment. Indeed, the potential for private/public partnerships becomes larger the higher the percentage of initial investment that can be covered by operating surpluses.

Furthermore, the absolute size of the initial investment requirement will strongly influence partnership potential, since different States and private consortia will have different capacities for assembling the financing required for a proposed HSGT project.

Benefit/Cost Measures

In performing definitive feasibility studies of HSGT systems, policy makers and the public may deem it essential to compare not just total benefits with total costs, but also the benefits and costs accruing to users and the public at large respectively. Comparisons of benefits to the public at large with publicly-borne costs, for instance, would allow policy makers to determine the degree to which the public at large would obtain a return on its investment in HSGT.

CASES

To assess the economics and the partnership potential of HSGT, the study applied its analytical components to **cases**, each of which paired a particular technology with a single illustrative corridor.

Technologies

The family of available HSGT options includes three groups: accelerated rail service ("Accelerail"), new high-speed rail systems ("New HSR"), and magnetic levitation ("Maglev"), in order of increasing performance capabilities and initial cost. This section pinpoints the salient characteristics of each of the HSGT technologies. Further specifications appear in Chapter 4.

Accelerail constitutes upgraded intercity rail passenger service on existing railroad rights-of-way, most of which belong to the freight railroads. The Accelerail options considered in this report have top speeds ranging from 90 to 150 mph.[9] At the lower

[9] The Accelerail 150 options generally assume a greater separation of passenger from freight service—see Chapter 4.

Table 3-2
The Accelerail Options

Top Speed (mph)	Non-electrified options	Electrified options
90	90	not analyzed
110	110	not analyzed
125	125F[10]	125E
150	150F[10]	150E

speed levels, only non-electrified systems[11] underwent scrutiny; the higher speed regimes comprised both electrified[12] and non-electrified motive power. (See Table 3-2.) Typical Accelerail-type systems include today's Metroliners between New York City and Washington, as well as the X-2000 in Sweden and the InterCity 225 service in the United Kingdom.

Two fundamental means exist to accomplish Accelerail[13]; these usually occur in combination, based on projections of time savings, net revenue impacts, and life-cycle costs:

- Improve the infrastructure (including, for example, track and structures) to allow for higher top speeds, remove site-specific speed restrictions (e.g., in urban areas, around curves, through switches), and offer higher line throughput capacity and enhanced reliability; and/or
- Improve the fleet of locomotives and cars (sometimes permanently or semi-permanently attached in larger units called "trainsets") to provide better acceleration, to achieve higher maximum speeds, and to alleviate the need to slow down for curves by providing additional banking within the vehicle ("tilt").

In addition to promising favorable operating results, efforts to upgrade existing service to Accelerail levels must adhere to evolving safety standards, the stringency of which generally increases with speed.

Costs to implement Accelerail solutions vary with two basic factors:

- The existing ownership, condition, freight and commuter traffic, and capacity of the rail line to be improved; and
- The future institutional arrangements, standards of service, and projected levels of traffic of all types.

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[10] Assumes successful development of non-electric locomotives capable of these speeds, with performance substantially equivalent to existing electric high-speed locomotives.
[11] That is, powered by on-train heat engines.
[12] Powered by remote power plants with electrical power distributed to trains via a system of overhead wires.
[13] The distinction is not hard and fast: certain system elements, such as train control and electrification, rely on a perfectly coordinated set of vehicle, right-of-way, and other improvements. In addition, even in the absence of line-haul trip-time savings, some reductions in total (door-to-door) travel times could conceivably occur—for example, through station relocations, additions, and reconfigurations; through parking and other access betterments; through higher train frequencies; and through streamlined ticketing and other processes.

Making use of existing facilities, Accelerail ordinarily represents the least ambitious and least expensive HSGT technology and may provide relatively high benefits in comparison with the investment required. Nevertheless, Accelerail solutions require concerted attention to the needs and operations of the freight railroads, which own most of the rights-of-way and which already provide a transportation service that is of supreme importance to the Nation's commerce. Accelerail's success thus depends on its ability to secure the cooperation of the railroad companies.

New HSR represents advanced steel-wheel-on-rail passenger systems on almost completely new rights-of-way. Through a combination of electrification and other advanced components, expeditious alignments, and state-of-the-art rolling stock, New HSR can attain maximum practical operating speeds on the order of 200 mph.[14] On the other hand, because it is compatible with existing railroads, New HSR can combine new lines in rural areas with existing approaches to urban terminals, and can offer Accelerail-type services beyond the confines of the New HSR lines *per se.*

The bulk of New HSR research and development has taken place after World War II in Japan, France, and Germany. Japan introduced the world's first New HSR—the *Shinkansen* (or "bullet train")—in 1964; France followed with its *train à grande vitesse* (TGV), and Germany with its Intercity Express (ICE). Other countries have followed suit. Although adhering to sometimes divergent design principles,[15] New HSR systems have uniformly succeeded in reducing journey times and capturing increased traffic among the major cities served.

New HSR has the benefit of a technology that has seen many successful years of revenue operation, that can compete on a door-to-door basis with air trip times, that has a cost structure confirmed by experience, and that allows for smooth linkages with other rail services. Unlike Accelerail, however, New HSR makes relatively sparing use of existing facilities and thus must support the higher costs—as well as the environmental reviews and mitigation requirements—associated with all new infrastructure projects.

Maglev is an advanced transport technology in which magnetic forces lift, propel, and guide a vehicle over a special-purpose guideway. Utilizing state-of-the art electric power and control systems, this configuration eliminates the need for wheels and many other mechanical parts, thereby minimizing resistance and permitting excellent acceleration, with cruising speeds on the order of 300 mph.[16] This high performance would enable Maglev to provide air-competitive trip times at longer trip distances than the other HSGT options.

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[14] The French National Railways (SNCF), for example, has successfully tested steel-wheel-on-rail systems at speeds well in excess of 200 mph.

[15] The French system was designed for passenger trains only, whereas the German New HSR lines initially allowed for freight traffic as well.

[16] Even higher speeds are possible.

There are two basic types of Maglev. One type is based on attraction forces: electromagnets exert force on an iron rail on the guideway to effect levitation. The second type is based on repulsion forces: superconducting magnets move across coils or aluminum plates on the guideway to propel and levitate the vehicle. Typically, the attraction-force Maglev has a gap of about one-half inch and can be levitated at zero speed. The repulsion force Maglev has a gap of about four inches and must be in motion for levitation to occur.

Germany has an attraction-force Maglev technology, Transrapid, ready for commercial use and planned for implementation in the Berlin-Hamburg corridor. Japan has a repulsion-force Maglev system under testing. The National Maglev Initiative (described in Chapter 1) developed performance guidelines for a U.S. Maglev system, which would improve on foreign systems in several respects[17]; those guidelines are incorporated in the Maglev case studies in this report. However, prototype development for a domestic Maglev design has not occurred.

In view of Maglev's advanced performance capabilities, the guideway and related propulsion, levitation, and guidance technology are more expensive than for New HSR: Maglev initial infrastructure costs amount to about 20 to 50 million dollars per route-mile, compared to about 10 to 45 million dollars per mile for some of the most advanced steel-wheel-on-rail systems, and $1 to $10 million for the various Accelerail options.

Maglev can provide air-competitive trip times and top-quality service in the 100-500 mile range considered in this report, and thus can generate very high ridership, revenues, and public benefits. Against that incomparable performance potential must be weighed Maglev's relatively high initial cost, its need for environmental reviews and mitigating measures appropriate for new construction, its lack of revenue service thus far, and its inability to offer same-train services extending beyond the limits of the Maglev line.[18]

In summary, the HSGT technologies represent a diverse portfolio of inherent capabilities and drawbacks. As demonstrated in Table 3-3, none of these technologies constitutes an intrinsically "perfect" solution; were they cost-free, they would already exist nationwide. Moreover, the relative benefits and costs of the HSGT options vary significantly with the contexts in which they are modeled—with the topography, demographics, economic characteristics, and transportation infrastructure and markets of the individual corridors. It is to those corridors that this report now turns.

[17] *Final Report on the National Maglev Initiative*, DOT/FRA/NMI-93/03, September 1993.
[18] The last two factors mentioned—lack of revenue service and incompatibility with existing technology—characterized all new technological initiatives, from the railroads of the early 1800s to the automobile and airplane at the turn of the century, to the compact disc of today.

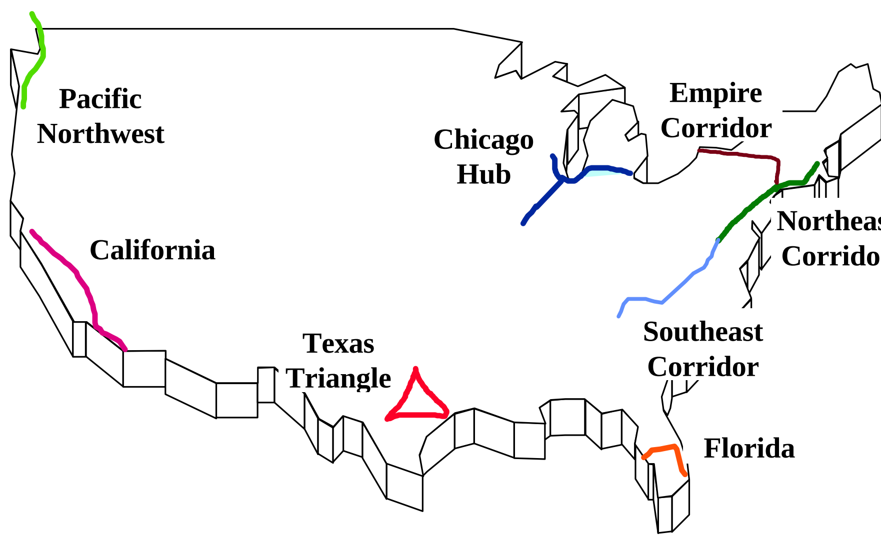
Table 3-3
Selected Inherent Advantages of HSGT Technological Options[19]

Selected Characteristics	Advantages of Technologies With Respect To Each Other (+ means the technology has an apparent inherent advantage)		
	Accelerail	New HSR	Maglev
Trip-time and revenue performance		+	+
Initial cost	+		
Autonomy from existing railroads		+[20]	+
Through train potential over other railroads	+	+	
Service-proven technology and cost structure	+	+	

Corridors

The analytical components were consistently applied to a set of illustrative corridors depicted in Figure 3-3.

Figure 3-3
The Illustrative Corridors



Providing a broad spectrum of configurations, lengths, and travel densities, these corridors represent:

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[19] These advantages are generic and do not address the relative performance of the options in specific corridors. For example, the "selected characteristics" may be weighted differently in one corridor than in another, and other characteristics may be of prime importance in certain corridors.
[20] New HSR would be autonomous over its dedicated rights-of-way, but would make limited use of existing railroads in some urban areas.

- **Existing corridors in which passenger trains regularly operate at speeds of 110 mph and above—**
    - — Northeast Corridor (Boston—New York City—Washington);
    - — Empire Corridor (New York City—Albany—Buffalo).[21]

- **The five potential HSGT corridors designated by the Secretary of Transportation for special grade crossing safety funds under Section 1010 of the ISTEA.** To be so designated, the ISTEA required that the corridor contain rail lines where railroad speeds of 90 mph are occurring or can reasonably be expected to occur in the future, and that other operational, financial, and institutional criteria be met.[22] The Section 1010 corridors are:
    - — Pacific Northwest Corridor;
    - — California Corridor;
    - — Chicago Hub;
    - — Florida Corridor; and
    - — Southeast Corridor[21]; and
- The **Texas Triangle**, which presents a unique nonlinear configuration of heavily populated metropolitan areas.

The study also derived, by truncation, additional illustrative corridors from the basic eight. Specifically, the Chicago Hub underwent scrutiny as a unified network (with three spokes—between Chicago and Detroit, St. Louis, and Milwaukee), while the Chicago—Detroit and Chicago—St. Louis corridors also received separate attention. Similarly, the study addressed both the California Corridor as a whole (San Francisco Bay Area—Los Angeles—San Diego) and the segment between Los Angeles and San Diego.

Two of the illustrative corridors—the Empire and the Southeast—connect directly with the existing high-speed Northeast Corridor, at New York City and Washington, D.C., respectively. Marketing considerations would dictate an operating plan that builds upon these connections, by means of either through service (where possible technologically) or

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[21] For corridors connecting with (and treated as extensions of) the Northeast Corridor, this study included the effects of the through traffic. For example, the Empire Corridor's traffic levels included passengers between Philadelphia and Albany, Wilmington and Albany, and similar city pairs. See chapter 8.
[22] Specifically: "Projected rail ridership volumes in such corridor, the percentage of the corridor over which a train will be capable of operating at its maximum cruise speed, projected benefits to nonriders such as congestion relief on other modes of transportation, the amount of State and local financial support that can reasonably be anticipated for the improvement of the line and related facilities, and the cooperation of the owner of the right-of-way that can reasonably be expected in the operation of high speed rail passenger service . . ."

carefully coordinated schedules. Therefore, this study treated the Empire Corridor and the Southeast Corridor incrementally—as an addition to Northeast Corridor high-speed service—rather than independently. Chapter 8 provides specifics on this treatment.

Although intended to be strictly illustrative, the study corridors still encompass almost three-fifths of the Nation's total metropolitan area population, 75 percent of the people living in the 50 most heavily populated metropolitan areas, and 90 percent of the inhabitants of the 17 metropolitan statistical areas with populations of 2.5 million or more.[23]

Matrix of Cases

A case is a specific **technology** projected in a specific **corridor.** The cells of the matrix in Table 3-4 represent the universe of cases that **could have been** modeled; the shaded cells are those that **were** modeled for this study. The rules for selecting cases for projections were as follows:

- Cases representing levels of service that already exist in full, or will be in place by the Year 2000, were omitted.[24]
- From an engineering perspective, the freight railroad right-of-way in certain corridors[25]—by virtue of its curvature, existing freight traffic levels, or other constraints—cannot provide a practical basis for the Accelerail 150 option, which thus was not modeled.
- The Texas Corridor presents an analytical challenge since it can undergo scrutiny in at least seven ways.[26] This study completed projections for the **entire** triangle under **all** technologies.
- All other corridors received full scrutiny under all technological options.

[23] Derived from U.S. Bureau of the Census, *Statistical Abstract of the United States—1995,* table 43; 1990 census data.
[24] E.g., all Accelerail options up to and including 150 in the Northeast Corridor.
[25] I.e., the Northwest Corridor, San Diego—Los Angeles, Florida, and the Southeast Corridor.
[26] The three sides of the triangle together; the three sides individually; and three combinations of two sides each. Also, there are multiple routing possibilities for the Accelerail options.

Table 3-4
Cases Analyzed and Reported

LEGEND: Borders and shading indicate that the case—combining the technology shown in the column with the illustrative corridor named in the row— was modeled for this study and reported on herein.

Corridors	Accelerail						New HSR	Maglev
	90	110	125F	125E	150F	150E		
California North/South (San Diego—Los Angeles—San Francisco Bay Area)								
California South (San Diego—Los Angeles)								
Chicago Hub Network (Chicago to Detroit, St. Louis, and Milwaukee)								
Chicago—Detroit								
Chicago—St. Louis								
Florida (Tampa—Orlando—Miami)								
Northeast Corridor (NEC) (Boston—New York—Washington)								
Pacific Northwest (Eugene-Portland-Seattle-Vancouver, B.C.)								
Texas Triangle (Fort Worth-Dallas-Houston-San Antonio)								
Empire Corridor: New York-Buffalo (treated as an extension of the NEC)[27]								
Southeast Corridor: Washington-Richmond-Charlotte (treated as an extension of the NEC)[27]								

[27] For the Empire and Southeast Corridors, analysis was completed on Maglev, New HSR, and one sample Accelerail case. See Chapter 8. Future, more detailed studies may yield more promising results for other Accelerail options than those completed for this report.