# Breaking the Speed Barrier in Europe

JEAN BOULEY

> **T***rains should not run as fast as possible, but as quickly as necessary*

High speeds have been the perennial leitmotiv for railways beginning with the 85 km/h (53 mph) set by the Rocket as early as 1829 through the 380 km/h (236 mph) set by the TGV in 1981 and the 407 km/h (253 mph) set by the German Federal Railway's ICE in 1988. Passenger traffic between any two European cities 400 to 700 km (249 to 436 miles) apart tends to expand whenever air, road, and rail carriers offer competitive services, and providing that the price is right, passengers will opt for the fastest mode.

Three of the four European railways that are currently building new high-speed lines [Italian Railways (FS), German Federal Railways (DB), and Spanish Railways (RENFE)] have combined passenger and freight traffic lines. The French National Railways (SNCF) has decided to build a line for passengers only. Each of these railways is convinced that it has made the right choice, because the geographical and economic conditions are different in each country.

Nevertheless, all of the new lines currently being built in Europe have one feature in common: they are well-integrated into the existing network and reach into the very heart of large cities because they connect the existing terminal stations and approach lines. High-speed trains for these lines have been designed to the UIC (Union Internationale des Chemins de Fer) vehicle gage so that they can be operated on any other lines of the network.

All four railways are backing new lines with plans for raising speeds from 200 to 220 km/h

(125 to 137 mph), which is the maximum for old infrastructure. The entire 200 km/h network reflects the progress under way, and it is profoundly shaping intercity high-speed rail. Before discussing the European high-speed network in detail, it is important to address the question: What difference will there be in years to come between a high-speed train between Frankfurt, Cologne, and Paris, operated on dedicated and conventional lines, and a Paris–Bordeaux train operated on the Atlantic TGV line from Paris to Tours and Tours to Bordeaux? In the end, although from a geographical standpoint, mixed traffic (i.e., passenger and freight) has not been adopted on all new lines, there is still a notion of mixed traffic, if only from the time point of view. This "chronological mix" determines the shape and scale of the pattern of services and the quality of operating conditions, which are two of the railways' major assets.

## Toward a European Network

Moving from the national level to the different scale of a European network focuses attention on factors such as implications for the market, international passenger mobility in the future, the size of the stakes for the rail industry, and the added number of decision makers involved. There are major advantages, but the problems also become singularly more difficult at this level.

There has been no better example of a certain image of Western Europe than that embodied by the Trans-European Express (TEE) trains. In Western Europe the climate is conducive to the development of a genuine high-speed network of rail services because this is where the market lies. The "large triangle" that demographers refer to covers Northern France, the Ruhr District, and the lower Rhineland areas. There are 60 million people living within this triangle, and close to 100 million if the area farther up the Rhine and the greater London and Paris areas are included.

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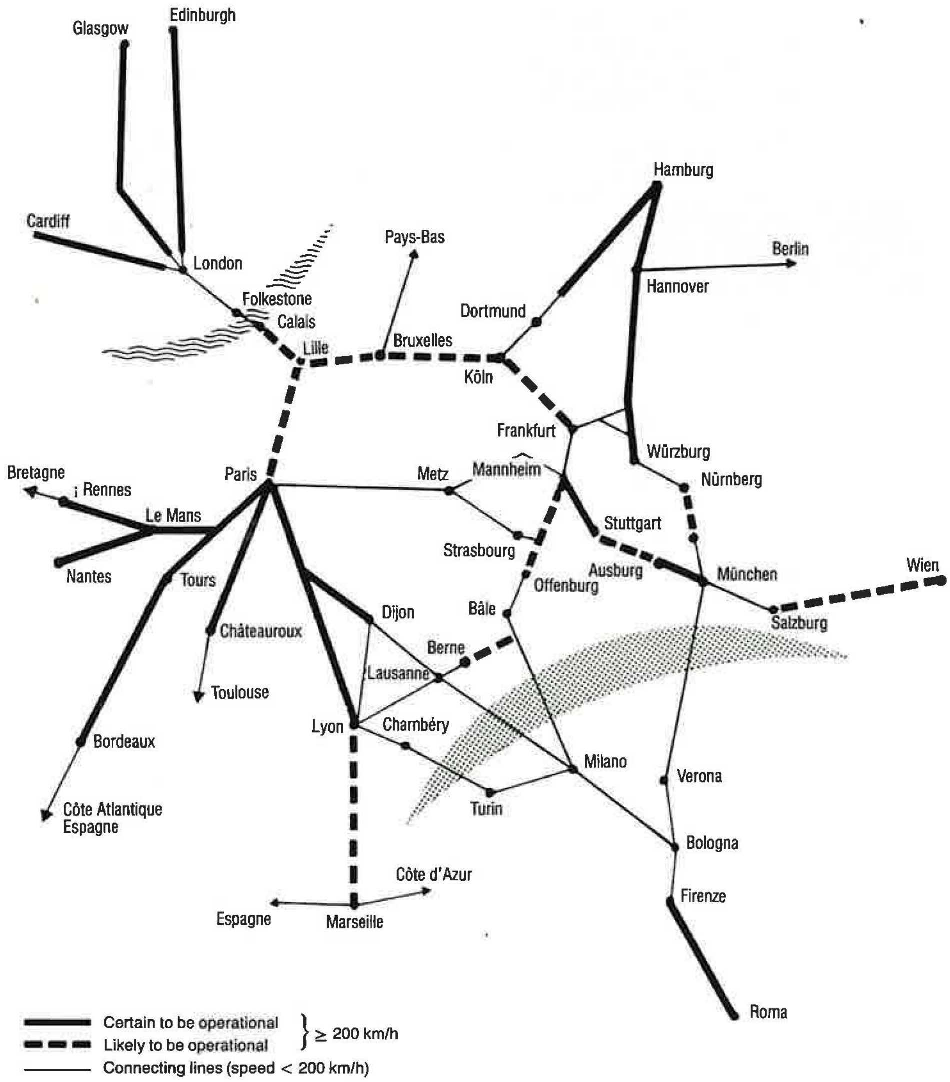


**FIGURE 1 Point-to-point links on proposed Trans-Euro-System, assuming speeds of 200 km/h (125 mph) or greater.**

The sides of the triangle represent distances within the reach of high-speed rail travel [500 to 600 km (311 to 373 miles)]. Moreover, these towns form clusters and could even be called a "constellation of towns," a context highly favorable to rail, which is in a far better position to cater to urban areas that are densely populated, but spread out, than the air mode, which cannot be equaled for point-to-point travel.

The European high-speed train will by definition be a train operated at 250 to 300 km/h (156 to 187 mph) on new lines and at about 200 km/h (125 mph) on existing lines that will have been upgraded. Approaches in France, Italy, Spain, and the Federal Republic of Germany were identical whether new lines were dedicated or not. Both types of lines are used for these services, and passengers should be unaware of the type of line on which they are traveling.

Viewed from this perspective, the concept of a high-speed network should be superseded by the concept of a high-speed intercity operating system; that is, a type of TEE system with high-speed "electrical shunts." I have given this concept a provisional and multilingual name: the Trans-Euro-System (TES). Within this system, the link via Brussels from the two subsystems in France and the Federal Republic of Germany obviously has top priority. However, it is quite legitimate to consider the next stages—new shunts or extensions that might be developed—and the connec-

TGV COMPANY

**TGV mail train from Paris to Lyons.**

tions between the system and other lines outside it.

First, national subsystems will have a natural tendency to complement each other. Projects are under way in France, Italy, and the Federal Republic of Germany to extend the network of new lines in these countries.

Second, links between lines to the north and south of the Alps are not imminent because the priorities of the market lie elsewhere. Mountain barriers mean that construction costs would be considerably higher, and no new high-speed tunnel will ever be built to cater to passenger traffic exclusively. On the northern perimeter of the Alpine arc, however, Switzerland and Austria are developing plans to bring their networks into tune with high speeds.

Third, with their Rail 2000 project, the Swiss Federal Railways (CFF) are laying the foundation for improving their intercity routes in the next 15 years. The principle is embodied in the slogan "Trains should not run as fast as possible, but as quickly as necessary." The CFF plan includes construction of some 130 km (81 miles) of new line for speeds of 200 km/h (125 mph) alongside saturated lines to the north and south of Berne. The Austrians plan to build two new high-speed sections for 200 km/h (125 mph) speeds between Vienna and Salzburg [70 km (44 miles) altogether].

Finally, the British and French decision to construct the Channel Tunnel opens the TES to thousands of British travelers, putting London three hours from Brussels, three and one-half hours from Paris in 1993, and five hours from Frankfurt before the end of this century.

In conjunction with the Paris–London, Brussels–Amsterdam, Cologne–Frankfurt project, new sections of line are planned in Belgium, The Netherlands, and between the Channel Tunnel and London for speeds of 200 to 300 km/h (125 to 187 mph).

## A Century of Rail

The strengths of the wheel-rail system have been an integral part of the geography of Europe and the heart of its cities for a century. Although high speeds represent a technological turning point, they are after all merely a further stage of development that can be reached step by step. High speeds will be achieved similarly to the way in which the railway network was built by our European ancestors—through modular development. The journey times in Table 1 provide a plausible picture of the framework of the TES for the year 2000 or shortly thereafter.

In reporting to the European Economic Community Commission in Brussels, the railways proposed a 30 000-km (18,750-mile) high-speed network of new, upgraded, and connecting lines to be developed in stages up to the year 2015. Proposals are based on a comprehensive analysis of market potential in Europe. Point-to-point links within the high-speed system can better be seen (Figure 1) when the operating program is developed, particularly the program for through trains on the network as well as conventional lines.

**TABLE 1 Journey Time Between European Towns Today and in the Future with the Trans-Euro-System**

| | BRUXELLES | LONDON | PARIS | AMSTERDAM | KÖLN | HAMBURG | FRANKFURT | BÂLE | MÜNCHEN | ROMA |
|---|---|---|---|---|---|---|---|---|---|---|
| BRUXELLES | | 3.06 | 1.30 | 2.30 | 1.11 | 4.59 | 2.20 | 4.48 | 5.45 | 15.16 |
| | | 5.04 | 2.26 | 2.51 | 2.36 | 7.03 | 5.15 | 6.13 | 9.22 | 19.37 |
| LONDON | | | 3.36 | 5.50 | 4.31 | 8.19 | 6.40 | 8.08 | 9.06 | 16.46 |
| | | | 5.12 | 8.07 | 7.23 | 11.52 | 9.58 | 13.27 | 13.56 | 23.20 |
| PARIS | | | | 4.02 | 2.43 | 6.31 | 3.52 | 4.34 | 8.02 | 12.56 |
| | | | | 5.23 | 5.08 | 9.44 | 5.56 | 4.34 | 8.42 | 15.18 |
| AMSTERDAM | | | | | 2.40 | 4.58 | 4.00 | 6.17 | 7.17 | 17.04 |
| | | | | | 2.46 | 5.03 | 5.13 | 7.24 | 8.44 | 21.50 |
| KÖLN | | | | | | 3.33 | 1.06 | 3.22 | 4.18 | 13.50 |
| | | | | | | 3.57 | 2.03 | 4.37 | 6.02 | 18.18 |
| HAMBURG | | | | | | | 3.40 | 6.22 | 6.40 | 17.33 |
| | | | | | | | 4.30 | 7.32 | 7.01 | 20.43 |
| FRANKFURT | | | | | | | | 2.36 | 3.02 | 12.49 |
| | | | | | | | | 2.53 | 3.44 | 16.34 |
| BÂLE | | | | | | | | | 6.09 | 10.13 |
| | | | | | | | | | 6.09 | 11.34 |
| MÜNCHEN | | | | | | | | | | 11.38 |
| | | | | | | | | | | 12.50 |
| ROMA | | | | | | | | | | |

| | |
|---|---|
| 1.30 | Future travel time with the network shown in Figure 1 |
| 2.26 | Best travel time at present |
| 3.35 | With a connecting service of at least 15 minutes |

## Conclusion

High speeds are well-suited to overland transport in Europe with its constellation of towns only one, two, or three hours apart by train. One hundred million people live in this area of Europe between the North Sea and the Alps alone—the most densely populated area.

The advantage of the wheel-rail system is that it already has arteries of infrastructure all over Europe, particularly in the cities. High speeds are quite accessible for this system, and the mode benefits from it, either because current route lines will be improved to their technical maximum [200 or more km/h (125 mph)] or because more or less long shunts operated at 250 to 300 km/h (156 to 187 mph) will be required to increase throughput and cut travel time. Some of these are already in operation and are making profits; others are under construction as national projects. As François Perroux said, "Europe is the field in which seeds are sown." So now it must sow the seeds of high speeds within its own community first; the market is there and so is the technology. The TES is about to be born.


TRANSRAPID INTERNATIONAL

**Transrapid 07 prototype revenue vehicle at the Elmsland 32-km (20-mile) test and demonstration site near Lathen, Federal Republic of Germany.**

*This article is an update of an earlier article by Jean Bouley, "TES: Towards a European High-Speed Rail Network,"* Rail International, *April 1986.*

# Point of View

## U.S. High-Speed Rail Network—Can It Happen?

George Haikalis

The opening of the French TGV Atlantic rail line this fall sets a new standard for high-speed steel-wheel-on-steel-rail travel. The 300 km/h (187 mph) cruise speed is a world's record for a regularly scheduled ground transport mode.

The TGV Atlantic is one of a growing European network of dedicated high-speed rail lines. These are not just links, they are an integral part of a much larger system of express, local, and commuter rail passenger services. Rail freight service also operates over much of this same trackage. With a fully integrated network, affordable fares, and frequent service, rail will continue to be a popular travel mode in Europe.

What happened in the United States? Why are we lacking a comparable rail passenger system?

### Decline in Leadership

In the 1960s the United States was a world leader in high-speed rail passenger technology. Electric-powered Metroliners and tilt body turbine trains, tested at top speeds of 165 and 171 mph, respectively, were operating in the Northeast Corridor at speeds of up to 120 mph. The Pueblo, Colorado, rail test facility was built to advance rail and other high-speed technologies.

In 1971 Amtrak was created to assemble the remains of the rapidly declining privately operated rail passenger service in the United States. Amtrak succeeded in producing a unified but skeletal national rail passenger system. However, it did not achieve its ambitious mandate of operating a profitable passenger rail service. Instead, each year intense debate precedes a decision to provide just enough federal subsidy to preserve the status quo. Meanwhile, public expenditures for investment in air and highway facilities continue to grow.

In recent years, however, federal rail research initiatives have encouraged states to examine new, discrete high-speed corridors that might be self-sufficient. Studies completed in Ohio, Pennsylvania, and Texas indicate that this is unlikely. Florida remains hopeful that a single link may be possible, with some state assistance.

### Public Interest

The United States has chosen to actively promote two intercity transport modes—highway and air—while supporting a minimal rail passenger network. With 80 to 90 percent of all U.S. households owning automobiles, it is not surprising that the nation's attention has focused on the need to build roads, rather than charging motorists directly for the full economic, social, and environmental costs of highway travel. Similarly, the nation's need to maintain air superiority for defense has led to windfall gains and public investment for civil aviation in the form of aircraft, trained personnel, airports, and airways. Few transportation researchers expect a "level playing field" to emerge any time soon that would permit privately operated rail passenger service to prosper.

The question then becomes: Would some public interest be served by sup-

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