CONNECTION MANAGEMENT BETWEEN NEW HIGH-SPEED RAIL SYSTEM AND EXISTING RAILWAYS IN EUROPE : THE FRENCH EXCEPTION

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1. Introduction

The main event concerning the european railways for the 15 last years has been the emergence of high speed trains, mainly running on a new and specialized infrastructure, but compatible with the pre-existing railway lines. Initially designed as a technical solution for situations of congestion, high speed had furthermore influence upon the purpose, the use, and the image of railways in an unfavourable context.

Moreover, high speed train impact is not only limited to the railways network : it changes relationship between network and territory. It is supposed to produce structuring effects that place high speed transportation in the heart of several town, regional and national planning policies. Stations become again a major centre of interest for urban designers.

This paper focuses on the different ways of management of the interface between the new lines, the "old" railways, the other modes of transport and the territory. The French case singularity is the juxtaposition of numerous more or less outstanding solutions, that can now be compared with connection policies runned in other european countries.

2. From line to network

High speed rail in Europe is the fruit of many years of struggle against competing modes, and especially against domestic airlines. As people mobility was constinuously increasing, producing more potential customers, railway companies were paradoxically focusing their commercial investment on businessmen fond of high performance in the best conditions : high speed, a little number of stops, etc. An example of this commercial policy is the "Trans Europ Express" (TEE) network, created in 1957, and joining between them all the main towns without any stop at the border-crossing points.

However, existing lines couldn't afford more traffic, and creating new inter-city trains was only possible if other trains were cancelled. A coexistence problem emerged between trains running at very heterogeneous speeds, from freight trains (80 km per hour) to TEE and intercity fast trains (up to 200 km per hour). It appeared that building new lines devoted to high speed passenger trains was necessary. It also appeared that a new rolling stock, fitted to more favourable routes, had to be designed.

The european solution, very different from the japanese one, is a perfect technical compability between existing and new lines, in order to avoid the building of new infrastructures in an urban context. Existing electrified lines can also be used beyond the new lines.

French "TGV" has been designed in 1967 by the SNCF Research Department under the project name "C03". Its main purpose was to relieve the pressure on the Paris - Lyon line, hardly perfectible and enduring a heavy traffic. At this time, no one was thinking about any new network : the TGV would be a fast intercity shuttle. Governmental approbation has been given only in 1974, provided that the operator put up the money for the whole project. This bet on the future became a huge commercial success (the investment has been paid back by additional receipts in ten years !).

The undeniable success of the first high-speed train line, profitable, attracting new customers

formerly airlines users or car users, developing mobility on the axis Paris - Lyon [1], led in 1984 to substantial changes in the TGV approach :

- new operating methods : the fast intercity shuttle gives place to a real network based ont the new line, covering the southeastern part of France, in order to generalize the high-speed effects to a large number of towns (including little ones like Montélimar or Montbard)(**fig.1**). Compatibility of the high-speed trains with classical infrastructures is a great advantage ;

- construction of two others new lines is decided : the "Atlantic" line to the western and southwestern parts of France and the "North-Europe" line to Belgium and Great-Britain (through the Channel Tunnel). There is a willingness to cover the most important part of the territory ;

- junction [2] of the three new lines by a short link crossing the eastern part of the parisian region, and serving peripheral polarizations like Charles de Gaulle Airport or Disneyland Paris.

The State plays a major role in the network development, financing even 30% of the "Atlantic" new line. In fact, TGV is progressively considered and used as a planning tool. This evolution results in the adoption of a national plan for new high-speed train infrastructures [3] (**fig.2**). 11 lines departing from Paris and two cross-country lines (Rhine-Rhone and Bordeaux-Narbonne) would be built. In fact, the 21 metropolitan regions would be concerned, following territorial equity rules, provided that the financing is possible.

At the same time, as other high-speed train projects appear in other countries (Italy, Germany, Spain, etc.), the European Community brings out its own plan, laying stress on desirable connections between neighbouring networks (the "missing links"). International agreements are signed for the first international new lines (Paris-London / Brussels, Lyon - Torino, Montpellier - Barcelona, etc.). The favourable geographic position of France in Europe confers a major role in international connections.

High-speed tends to become the reference level in train services in Europe. As the new lines change seriously accessibility conditions along the axis served, the other regions, considering that they comparatively suffer from their situation, demand other news lines, as they use to demand new motorways since decades, in order to be "opened up".

3. French high-speed train, a misused planning tool ?

Is it possible to make the development of fast and direct intercity train services compatible with the servicing of intermediary areas, which formerly enjoyed a classical train service ? It depends on the willingness of different actants and on the outcome of the inevitable balance of power between them :

- The operator argues about financial aspects : customers travelling on the longest distances

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[1] - The number of train users between Paris and Lyon has been multiplied by 2,9 between 1980 and 1990 (Beauvais, 1992).

[2] - And not "interconnection", so called by numerous authors, following the initial terminology of SNCF (which talks about "TGV-Junction" since 1993) : only one operator is concerned.

[3] - "Schéma directeur national des infrastructures ferroviaires à grande vitesse".

are more profitable. So they have to be favoured, to the detriment of users living in intermediary areas. Maintaining a double-oriented supply (TGV + classical trains) is too costly, and high-speed trains cannot stop as frequently as other trains ;

- The State stands up for a territorial equity principle : the new network has to be profitable for the whole country, and all the network users. This principle justifies significant subsidies for numerous lines in deficit. Moreover, regions intervene in public transport services financing beside the State (in France, Italy, Germany and Spain) ;

- The users (frequently defended by their local elected representatives) ask anyway for the preservation of the previous supply (considered as an "acquired right").

In the French case, the State stayed back, only worrying about the new infrastructures layout, and letting SNCF do its own way. So, the operator manages the TGV in a pure commercial way, since it has opened the first line. On Paris - Lyon, priority has been given to travels from one end to one other, and the only two intermediary stations stem from a "*compromise solution between the operator's logic and the concerned local communities*"(4). Later, the same conception prevailed, connections being limited to the bare minimum.

The effects of this policy have been negative for three kinds of lines :

- the previous main lines, followed by a new high-speed infrastructure (Paris - Dijon, Paris - Le Mans, Paris - Tours, Paris - Lille) : most of the long-distance trains enjoyed by the intermediary areas inhabitants have been replaced by direct TGV. The average travel duration to Paris and the service quality have been debased for some towns like Chartres or Amiens ;

- some lines, not parallel to a new infrastructure, but suffering from the competition with a combination of two high-speed train lines via Paris area. Long-distance traffic is captured by TGV using different and longer routes, but saving time compared with classical trains using the shortest route (**fig. 3**). Are in this situation some cross-country lines like Lyon - Tours - Nantes (TGV use successively the South-East and the Atlantic new lines, saving one hour (5)) but also radial lines like Paris - Brive - Toulouse (TGV use Atlantic new line and go through Bordeaux), or Paris - Amiens - Calais (TGV use North-Europe new line and go through Lille). All these lines are disadvantaged by the loss of an important part of their traffic. Moreover, long-distance trains cancelled are not replaced by other services for evident financial reasons.

- the classical lines used by TGV in continuation of the new high-speed infrastructure suffer from the cancellation of numerous stops, in order to save time for long-distance travels. Passengers formerly using long-distance trains for short intercity journeys (they had no choice) are disadvantaged. In other words, TGV replace previous classical trains without servicing all intermediary towns with the same quality. There has been lots of demonstrations at the beginning of TGV-Atlantic services, especially along the two main lines of Brittany (Rennes - Brest and Rennes - Quimper), where numerous little towns had

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(4) - "compromis entre la logique de l'exploitant *et celle des collectivités concernées*", BEAUCIRE & EMENGARD, 1985.

(5) - The cost of the hour saved is high : travellers pay the priced based on the real mileage (200 additional kilometers)

lost up to the half of the previous servicing ! Inhabitants and local elected representatives forced TGV to stop at the neglected stations, occupying every day the tracks. In some cases, the operator had to restore some stops.

Being free to organize the servicing in the most convenient way for itself, the SNCF took without any control decisions having significant repercussions on territories accessibility. And these outcomes are not positives in all cases : the "reducing effect" (*effet réducteur*) linked to high-speed train is only perceptible between large geographical centres of attraction. There will be by comparison a "distancing effect" (*effet distanciateur*) for little or mid-sized towns playing a local or regional role, and situated in the sphere of influence of large cities [7] . Giving greater importance to certain kinds of trips, and refusing to extend TGV effect to the largest area, the SNCF favoured a few large towns, and penalized a large number of the other cities.

4. Some dissimilar options of connection

Coexistence between TGV and "old" railways becomes problematical. The main reason why is that the increase in the number of new high-speed infrastructures tends to make TGV more and more autonomous vis-à-vis the classical network. Management of the relationship between them reveals the initial bias concerning the purposes of high-speed train network : is it considered as a revitalization tool for the whole train network (including high-speed and normal speed lines) or a new network developed to the detriment of the existing one ?

Countries as Germany or Italy have chosen the first option : the overlapping of the two kinds of infrastructures is complete. New infrastructures admit high-speed trains and other ones : intercity trains (up to 200 km per hour), and even freight trains during the night can also save time, even for a short mileage (there is an interchange every 40-50 km in average). Symmetrically, high-speed trains (the ICE in Germany, the "Pendolino" in Italy) can leave temporarily their specific line in order to serve intermediary-located towns. In short, high-speed effects are generalized to the maximum number of links, even those using very partly the new lines.

The French way is very different : new lines are rarely connected to the classical railway network, even if the two infrastructures are parallel one to the other. Connecting services depart only from large towns, provided that high-speed trains don't stop at a peripheral station only accessible by car. New infrastructures are completely dedicated to the TGV, and there are a very few interchanges between the two networks. French railways think that leaving the new lines in order to serve the central stations induce an unacceptable loss of time, provoking (according to the company) a loss of customers. Creating new peripheral stations on the new infrastructures limit the waste of time, and don't discourage long-distance travellers (the most lucrative ones).

Stations built on the new infrastructures in France can be allocated among three categories :

4.1. "Gares-bis" (paripheral stations dedicated to the TGV) : these stations located near mid-sized towns, are served a few times a day. The low level of service (provoking a alow level

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[7] - "*L'«effet réducteur» lié au TGV n'intervient qu'entre grands pôles géographiques. Il sera aussi par comparaison effet distanciateur pour les villes locales ou régionales, parfois importantes, situées dans l'aire d'influence des grands pôles urbains*", Francis BEAUCIRE, 1992.

of use) don't permit the building of a public transport link between the new peripheral and the central stations. There are now 13 peripheral stations planned along the different new lines to be built (**fig. 4**), and a "gare-bis" runs since 1982 in Mâcon-Loché, with a very weak success.

4.2. "Opening-up stations" (Gares de désenclavement) : This kind of new stations is justified by a poor-quality (even impossible) previous service, the TGV route offering a new opportunity (it doesn't follow every times the habitual corridors). For instance, the new line joining Paris to Lyon, taking the quickest way across the Morvan massif, offers to the Creusot-Montchanin-Montceau les Mines conurbation (110 000 inhabitants) a significant opportunity (now 1 hour from Paris, 4 hours before the building of the new line), coming at the right moment (a huge crisis of local traditional activities). Another interesting example is the new station of Vendôme, on the Atlantic new line. Vendôme is a little town located between the Paris - Orléans - Tours and the Paris - Brittany axis, not so far from Paris (120 km) but with a very weak level of train service (it takes 2 hours to reach Vendôme from Paris by classical train). The travel duration is now 40 minutes since the opening of the TGV line. Other "opening-up" stations are planned along the future East and Mediterranean lines, but, that is new and... strange, in rural areas (8)

4.3. New stations as exchange nodes : Established in the peripheral areas of the two most important cities, Paris and Lyon, their purpose is to connect the high-speed train network with other transport modes operated at different scales (regional train networks, intercontinental airlines), and sometimes with large scale amenities generating mass mobility. Each exchange node have to energize and to structure his neighbourhood in order to confer to this area a kind of autonomy vis-à-vis of the central part of the town. These stations are located on high-speed junction links ; therefore they will play in the future a significant role in the emergence of an autonomous high-speed network. In the particular case of the Île-de-France (the Parisian region), they will permit the generalization of the TGV-effects to the whole regional territory, and they will offer (provided that there will be a high-level of service) a clever alternative to the transit through the central stations, which are saturated. Five of the six planned stations will be in the Parisian region : Massy-Palaiseau, Roissy Charles de Gaulle Airport, Chessy-Disneyland Paris (all of these three stations are now in operation), Cergy-Pontoise and Melun-Sénart (only planned). The three last stations are (or will be) located in new towns, in order to give them some more attractivity. The sixth station, Lyon-Satolas Airport, opened in 1993. A seventh exchange node could be created in the business pericentral pole of La Défense.

The connection process between TGV and airlines has been outstandingly fast : there was in the interest of the airport managers, the French Railways and the French national airlines (Air France), in a highly-competitive context, to reach an agreement in order to raise the level of attractivity of the two airports, directly connected to an european high-speed train network. The adoption of a Global Distribution System (called "Socrate") derived from American Airlines one, and perfectly compatible with the major ones, can be linked with this process of connection.

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(8) - Jean VARLET detects in this evolution a third phase in the localization of new TGV stations, after the "*TGV in the heart of the town*" and the "*TGV in urban peripheral areas*". There is now a "rural TGV". "La ligne nouvelle évite tout contact urbain, passant loin des têtes de ligne, au point que des bretelles de raccordement sont nécessaires pour atteindre Amiens, St-Quentin, Reims, Metz, Nancy et même Strasbourg. À ces embranchements en plein milieu rural seront installées des garres TGV affublées du titre trompeur de «gare régionale» («Champagne-Ardennes», «Alsace», «Lorraine»)". (Varlet, 1992)

5. Conclusion

As connections between high-speed train services, other train services and other transport modes are well-organized in the towns, provided that they are served by central stations or peripheral exchange nodes, the quality of the networks/territory interface in the intermediary areas is more irregular. This is shown by the attached typology (**fig. 5**), worked out at the European level, and presenting the different ways to serve a town localized along a new high-speed line.

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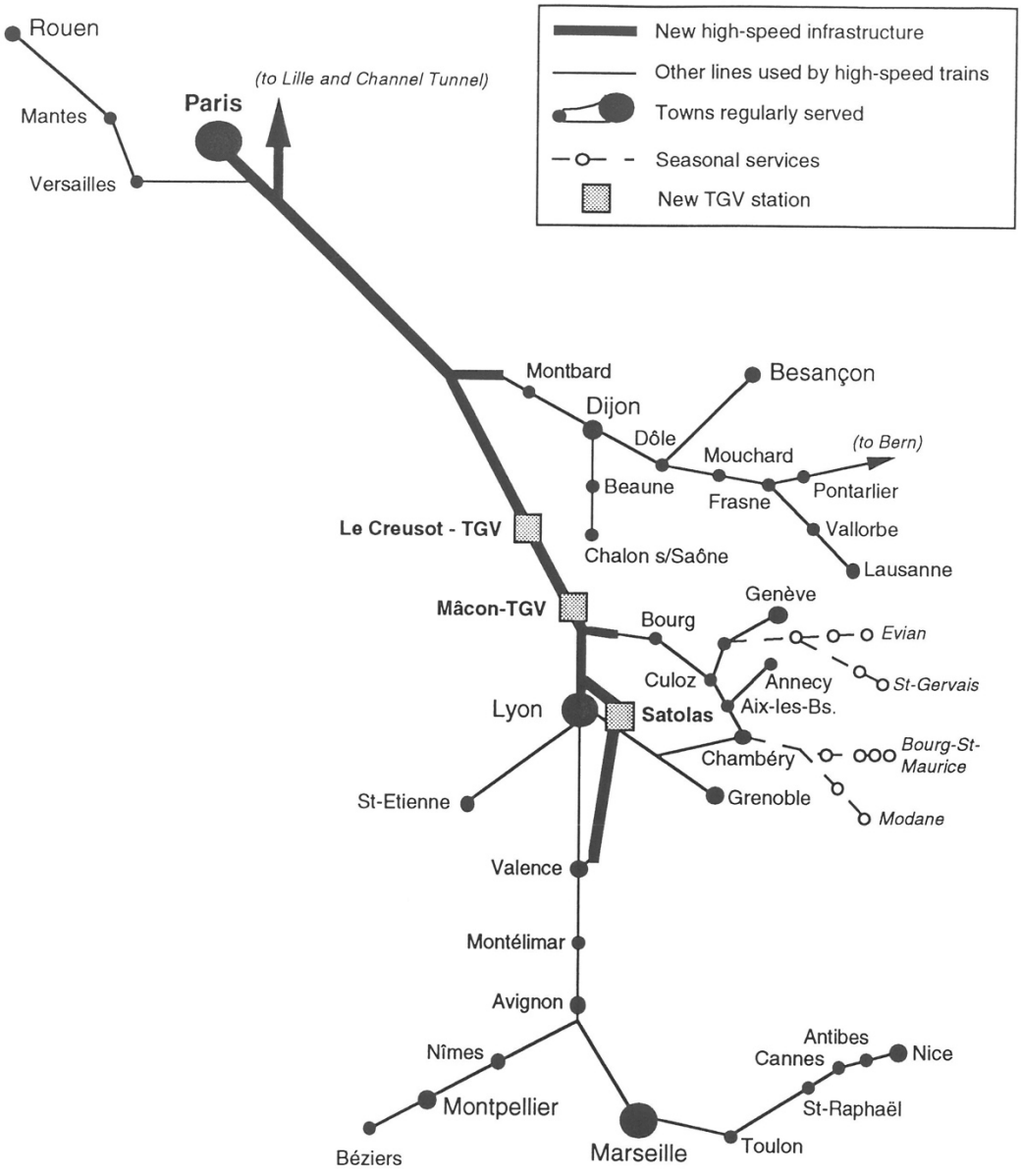


Fig. 1 - Lignes et villes desservies par le TGV Sud-Est en 1994
Lines and towns served by the TGV South-Eastern Network

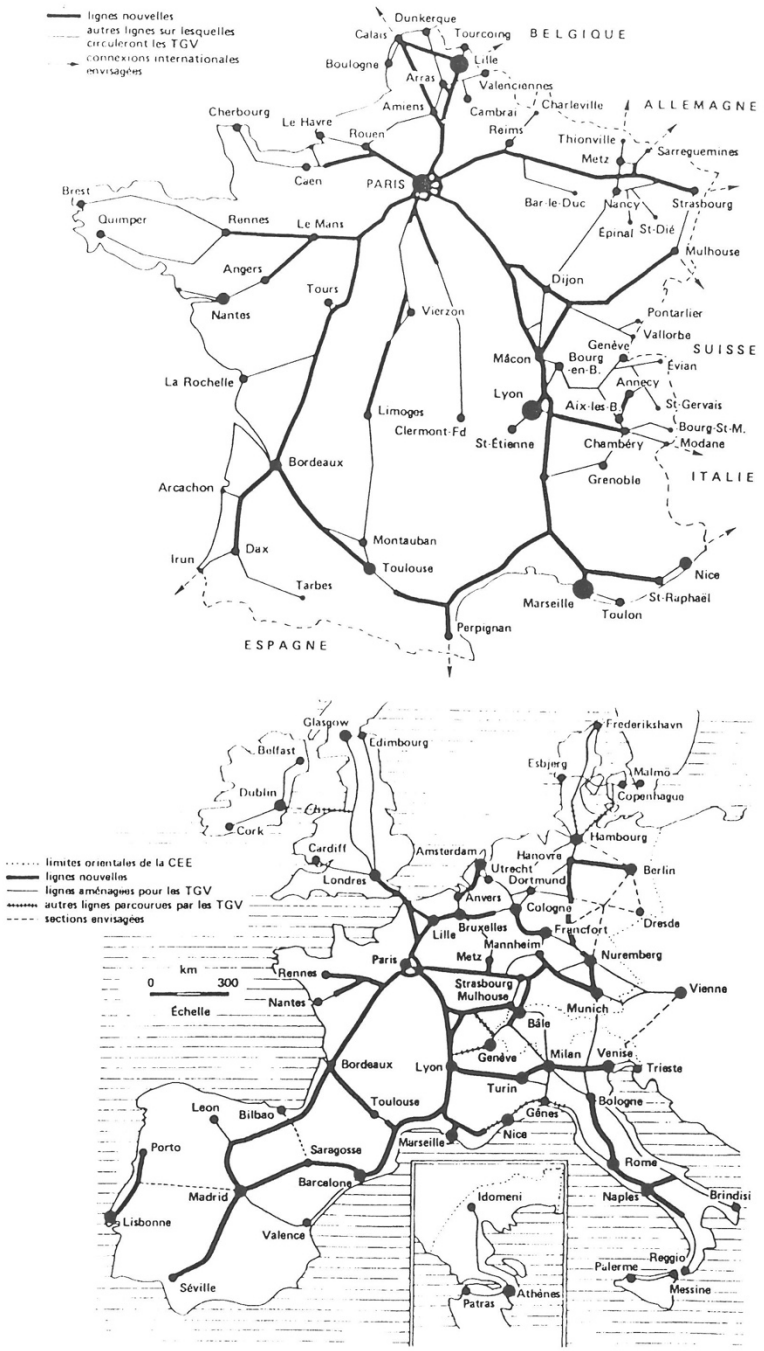


Fig. 2 - Les Schémas directeurs français et européen des infrastructures ferroviaires à grande vitesse de 1990.
The 1990' French and EC Plans for new high-speed train infrastructures

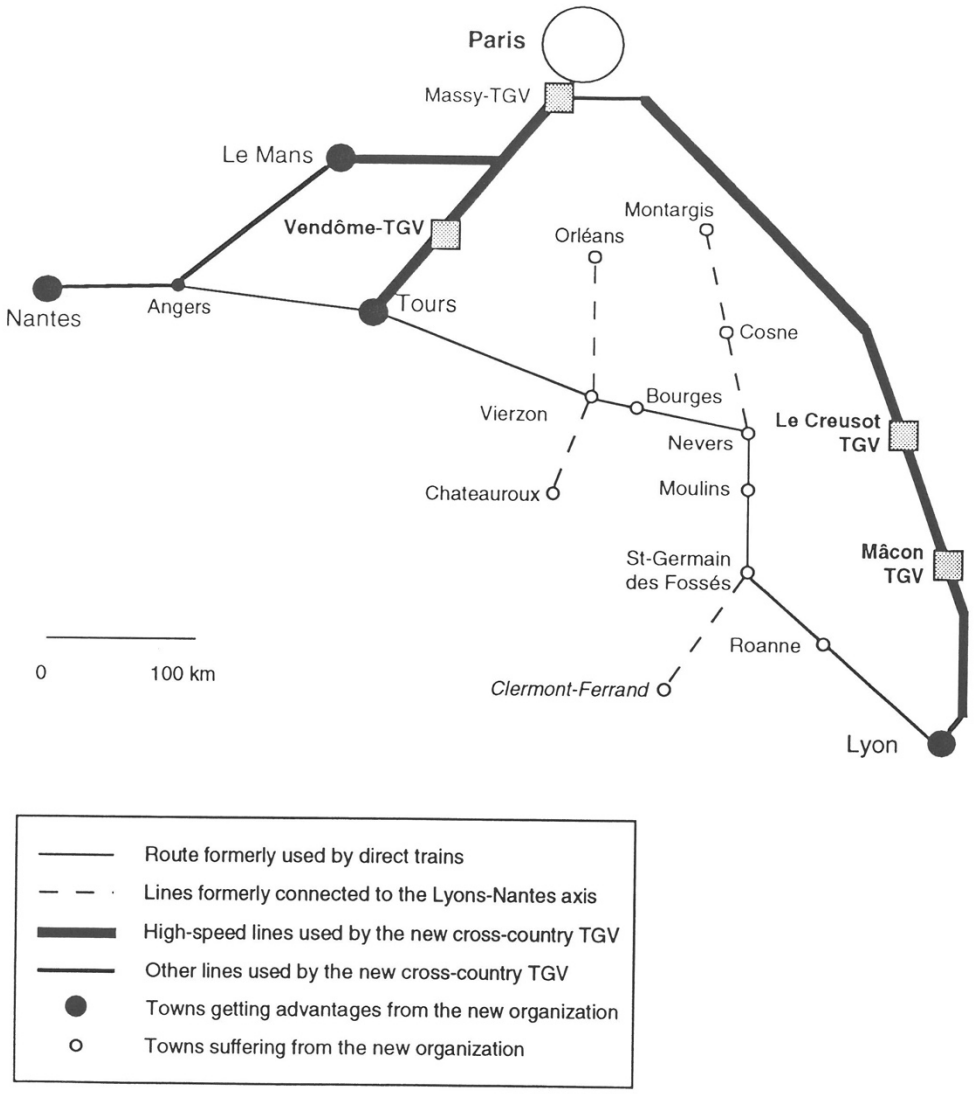
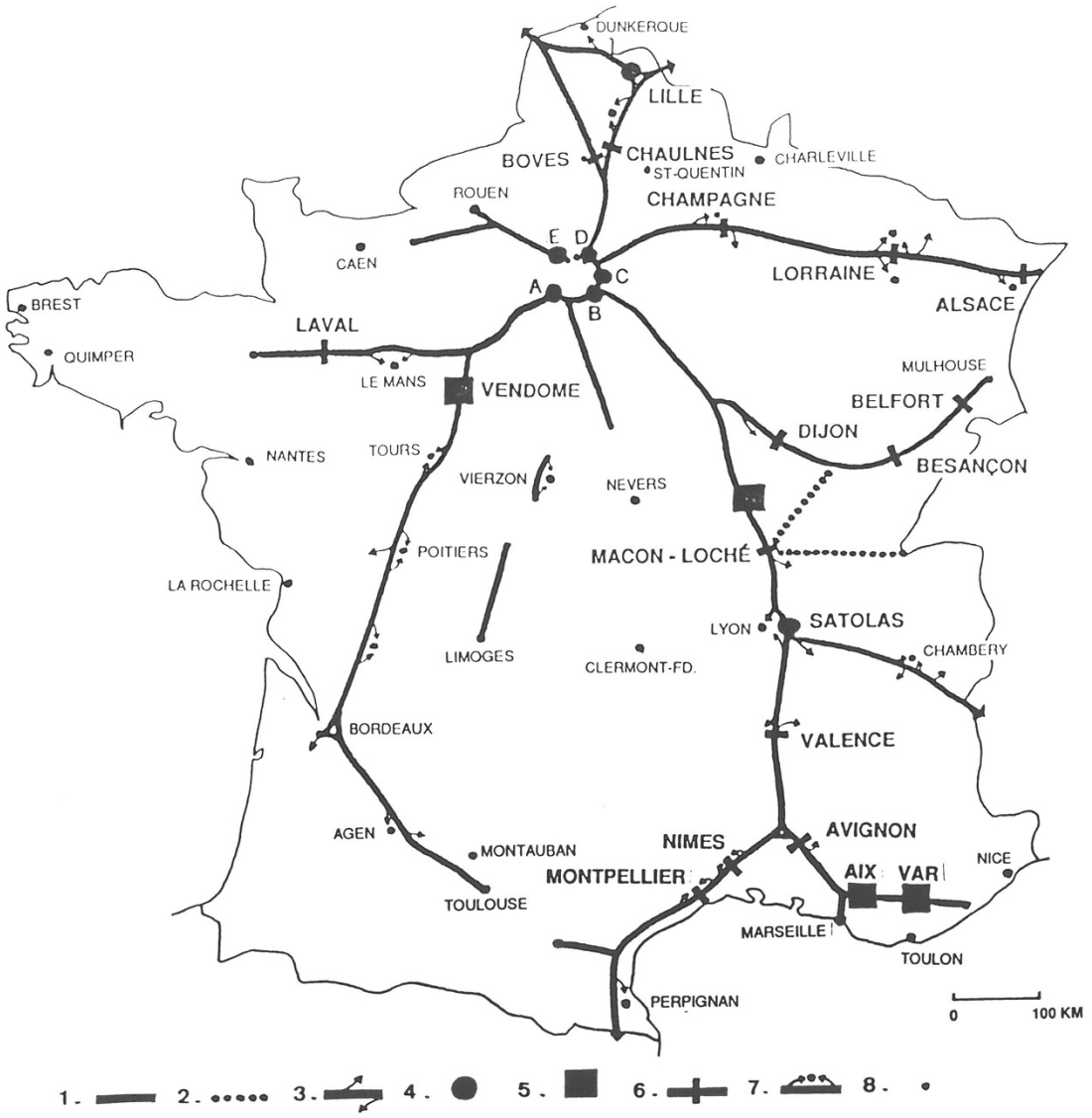


Fig. 3 - Un exemple de concurrence entre infrastructures nouvelles et lignes transversales : Lyon - Tours - Nantes.
An example of competition between new infrastructures and cross-country links : Lyons - Tours - Nantes.



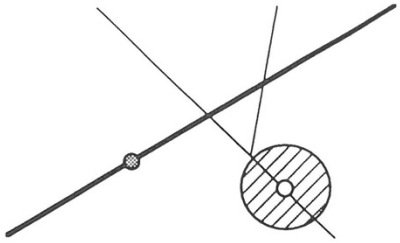
Key : 1. New infrastructures ; 2. New infrastructures, indefinite layout ; 3. links with the existing network ; 4. exchange nodes ; 5. opening up stations ; 6. "Gares-bis" ; 7. links permitting stops in central station ; 8. other towns.

Fig. 4 - Les gares nouvelles prévues en France, classées par catégories
New stations planned in France, classified by categories.

Fig. 5 - Five means of servicing intermediary-located towns in Europe

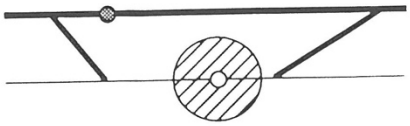
1 - IGNORANCE OF EXISTING RAIL SYSTEM ; PERIPHERAL "OPENING-UP" STATION"

FRANCE : Le Creusot, Vendôme, Lorraine, Aix, ...



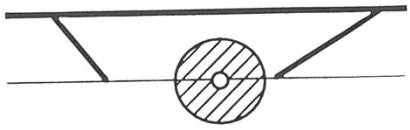
2 - BY-PASS WITH NEW DISCONNECTED STATION ("GARE-BIS")

FRANCE : Besançon, Montpellier, Nîmes, Laval, ...



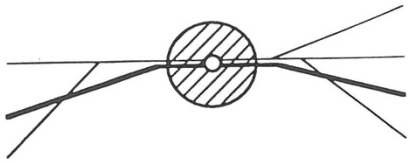
3 - BY-PASS WITHOUT ANY NEW STATION : HIGH-SPEED TRAINS STOP AT CENTRAL STATION.

FRANCE : Tours, Le Mans
ITALY : Arezzo, Chiusi, Orvieto, Orte, ...



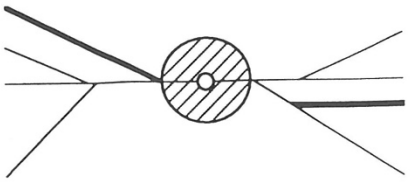
4 - TWINNING NEW AND EXISTING INFRASTRUCTURES ACROSS THE CITY

FRANCE : Lille (partly)
SPAIN : Ciudad Real, Cordoba, Sevilla
ITALY : Brescia, Padova, ...
GERMANY : Göttingen, Fulda, Kassel (Wilhelmshöhe)
BELGIUM : Louvain



5 - INTERRUPTION OF THE NEW HIGH-SPEED INFRASTRUCTURE

BELGIUM : Brussels, Liège, Antwerpen



KEY :

Existing lines

New high-speed lines

Central station

New TGV station