The tram-train concept is based on the use of existing railway lines by urban tramways, in order to connect suburban centres to town centres, with no transfer.

Since 1995, SYSTRA has been at the forefront of research work into the tram-train concept in France. For our company, it has proved a perfect application for its skills in transport planning and engineering in both urban and rail transport. Our in-depth research resulted in the publication in 1997, under the aegis of GART, of the text book «Quand le tramway sort de la ville».

SYSTRA was thus at the root of many peri-urban projects, for example, in Nantes, Lyons and Mulhouse, where the service along the Thur valley is currently one of the most advanced tram-train projects in France.

Overseas, SYSTRA is placing great hope on this efficient and relatively inexpensive concept, both in developed and in emerging countries.

1 «When the tramway leaves town»
2 «Guide for the development of intersections between railway tracks and roads in the context of tram-train projects»
The need to limit the impacts of pollution and to curve down road traffic on the Reunion Island led the Regional Council to put up a tram train project serving the northwest of the island. SYSTRA was a member, from the end of 2005 to the start of 2007, of the project management team for the tram train of the Reunion Island, and has contributed to the completion of the basic design of the first phase of the project. This first phase, 40 km long, of which 10 km are in tunnel, will link the city of Saint-Paul to the airport of Gillot (Sainte-Marie). SYSTRA was particularly in charge of the project management, of the management of low voltage equipments (ticketing, video-surveillance, operating systems, passenger information systems, central control offices, sound system), of the rolling stock, of the operating and maintenance centre and of the security file which should take into account project specificities (tram train, relatively high speed, urban and interurban sequences, level crossings, freight transport issue in city centre). The contract of the consortium was cancelled in March 2007 because of changes in the contractual building of the operation, the Reunion Region deciding to resort to a partnership contract for the financing, the design, the carrying out, the operation and the maintenance of the tram train line.

In this context, SYSTRA won the mission of technical assistance to the owner from the Reunion Region in order to assist the latter in the private partner selection process. This process should last 18 months, from the analysis of candidacies to the partnership contract signature, passing through the conduct of a competitive dialogue.

Reunion Island

Alsace

Mulhouse

Mulhouse was the first urban area to consider interconnecting its light rail network with railway lines, from the very beginning. Back in 1997, SYSTRA was put in charge of the feasibility study for an interconnecting tramway network. In 2000, SYSTRA drew up the application for formal State planning approval for the peri-urban and rural section of the network which serves the Thur valley, north of the Mulhouse urban area. SYSTRA was project manager of the urban tramway system commissioned in May 2007 and, in this quality, assured an interface with the project management of the peri-urban section.

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Val de Loire

Tours
- Appraisal of the potential of the Tours railway system in the context of a global study by the Communauté d’Agglomérations TOURS PLUS for the development of its urban transport plan6.

Rhône-Alpes

Rhône-Alpes Region
Definition of the new regional tram-train rolling stock to be used on the various peri-urban projects in Lyons, St-Etienne and Grenoble (2003-2004).

Lyons
- Preliminary study for improving suburban services in the West of Lyons and along the Lyons-Mâcon line (1997).
- Feasibility study for operating an interconnecting tramway between Perrache and Givors (2001).
- Study for the re-opening of the Sathonay-Trévoux line to passenger traffic (2006).

Geneva
Functional and comparative survey on the organisation of public transport in the Geneva region (French border and canton of Vaud) (2002): this was conducted in the context of the regional public transport development plan7 led by the Région Rhône-Alpes and the Canton of Geneva. The study began with a review of the current organisation of public transport in the area and of future transport requirements (to 2020), and put forward plans for multimodal and cross-border services. The aim was to give direction to the planning of the passenger transport system in the medium and long term. The project was also designed to inform the French partners’ appraisal of the relevance of the CEVA Swiss project for a railway link between Cornavin-Eaux Vives-Annemasse.

Grenoble
- Study of improvements to the Grenoble-Vizille railway service on the putting forward and comparing various proposals for modernisation in terms of infrastructure and rolling stock (rail or tram-train).
- Design of one of the peri-urban services in the Grenoble region (1998).

Saint-Etienne
- Preliminary review of the potential of the urban railway corridors, with a view to improving urban services (1997).
- Several technical studies on the feasibility of interconnecting the urban tramway running on metric gauge track with the Firminy railway line (2000/02). The work included integration design, feasibility of integrated or separate operation; comparative study of investment costs. These studies allowed for a thorough appraisal of the requirements associated with interconnection and provided crucial information to the decision on the choice of extension to the urban railway.

Provence-Alpes-Côte d’Azur and Languedoc-Roussillon

Marseille
In the context of development of the Marseille RER as defined by the CPER8 for 2000-2006, SYSTRA worked with SETEC and AREP on a

Greater Paris region

North Tangent Line
In the perspective of a railway solution on dedicated line using a light and fast vehicle, called the TLN variant (Tangentielle Légère Nord – Light North Tangent Line), SYSTRA was responsible for listing and studying the existing tram-train rolling stock likely to be adapted to match the specifications of the target stock (2003-2004).

«Petite Ceinture»
SYSTRA conducted several studies on the Paris Petite Ceinture, covering overall feasibility of implementing a light rail system and on the technical issues with regard to fixed installations and operation.

Aulnay-Bondy
Basic design for transforming level crossings into crossroads and of the system for managing tram-train right-of-way.

1 Paris inner railway circle line
2 Plan de Déplacements Urbains (PDU)
3 Développement des Transports Publics Régionaux - DTMR
4 Master contract between the State and a Region, for a five year period

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study of the access strategy to the railway network in the Huveaune valley (Marseille-Aubagne). This included, among other aspects, providing effective solutions to improve transfer from all modes to existing stations, or planned connections (park-and-ride, public transport interchange points). These proposals encompassed technical aspects (design, services, etc.) as well as institutional issues (scheme promotion, financing, pricing, etc.), all of which are important in such ventures.

**Nice-Côte d’Azur**
- Comprehensive study to define an investment strategy for the coastal railway line in the Alpes Maritimes, designed to provide the best railway services in the long term and to schedule the resultant investment costs.
- Appraisal of the feasibility in terms of demand and economic and financial viability of the development of three lines: a coastal line between Cannes and Nice, reopening of the line between Cannes and Grasse and modernisation of the Nice-Briant line.
- Technical and economic study of the tram-train interconnection with the Nice-Drap and Cannes-Grasse railway lines.

**Nîmes**
In 2001, SYSTRA completed a study of the possibility of recovering train paths on the Nîmes railway system to set up an urban / peri-urban railway network. The work was undertaken on behalf of the public works services of the Gard départment in the context of construction of the future Nîmes-Montpellier TGV ring line.

**Montpellier**

**Western France**

**Bordeaux**
Study of a transport system in the west of Bordeaux urban area, using the existing railway tracks of the Ring line and the Médoc line, with a view to the commissioning of the second phase of the tramway (2003-2004).

**Basque region**
Feasibility study of a tram-train along the Basque coast between Bayonne-Anglet-Biarritz - Hendaye with a possible extension to San Sebastian, Spain (1999).

**La Rochelle - Rochefort**
Completion of a multi-modal study to define and compare various public transport solutions as an alternative to the planned motorway section between Fontenay Le Comte-Rochefort (A 831 motorway). After assessing the existing situation, the survey defined several supply scenarios integrating different options for inter-modal transport and local and peri-urban services.

**Nantes**
- Study on behalf of the Nantes Metropolitan Authority into the feasibility of connecting lines 1 and 2 of the Nantes tramway across the river Erdre by making use of the existing Joléri rail bridge. Functional analysis of different scenarios aimed at combining investment from several different projects which were likely to use the bridge and which involved various different owners (connecting tramway lines 1 and 2, re-opening the Nantes-Châteaubriant railway line as a tram-train service, providing a rail link to the proposed Notre Dame des Landes airport and maintaining the existing freight service) (2005).
- Technical assistance to the owner, the Pays de la Loire Regional Authority, to manage the Nantes-Châteaubriant tram-train project until its commissioning (2005 - Present).

**Rouen**
- Preliminary study on behalf of SIVOM, on the requirements for the extension of the metrobus onto the railway line to Grand-Couronne, and, later, Elbeuf (1995/96).
- Feasibility study and application for formal State planning approval for the extension of the metrobus to Grand-Couronne (1996/97).
- Study into the creation of a tram-train network linking Yvetot, Rouen and Elbeuf, carried out on behalf of the Joint Syndicate for Territorial Planning and the Regional Council for Upper Normandy. The study was part of an overall review aimed at enhancing the rail network and included an analysis of the construction of a new suburban station (2004).

**Portugal**

**Coimbra**
SYSTRA completed a feasibility study on transforming the Coimbra-Serpins secondary peri-urban railway line into a light metro line (1999/2000).

The scheme comprises a T-shaped network with a main section between Coimbra B-Serpins (urban and peri-urban line over 30 km) and a purely urban section between Bota Aíxa-Hospital over 3.5 km.

The study served to investigate thoroughly the problems arising from the track gauge, vis-à-vis Iberian gauge or standard gauge. The lower cost of the standard gauge and the greater choice in regard to future rolling stock replacement weighed in favour of the standard gauge. The existing track, to be used solely by the tram-train, will be completely renewed and rebuilt to the standard gauge.

**Italy**

**Livorno-Pisa-Lucca**
In the context of projects completed through SYSTRA-SpA on behalf of the town councils of Livorno, Pisa and Lucca, SYSTRA investigated the possibility of creating interconnecting tramway lines between the three town centres.