ERTMS – DELIVERING FLEXIBLE AND RELIABLE RAIL TRAFFIC

A major industrial project for Europe

Directorate-General for Energy and Transport

EUROPEAN COMMISSION

CONTENTS

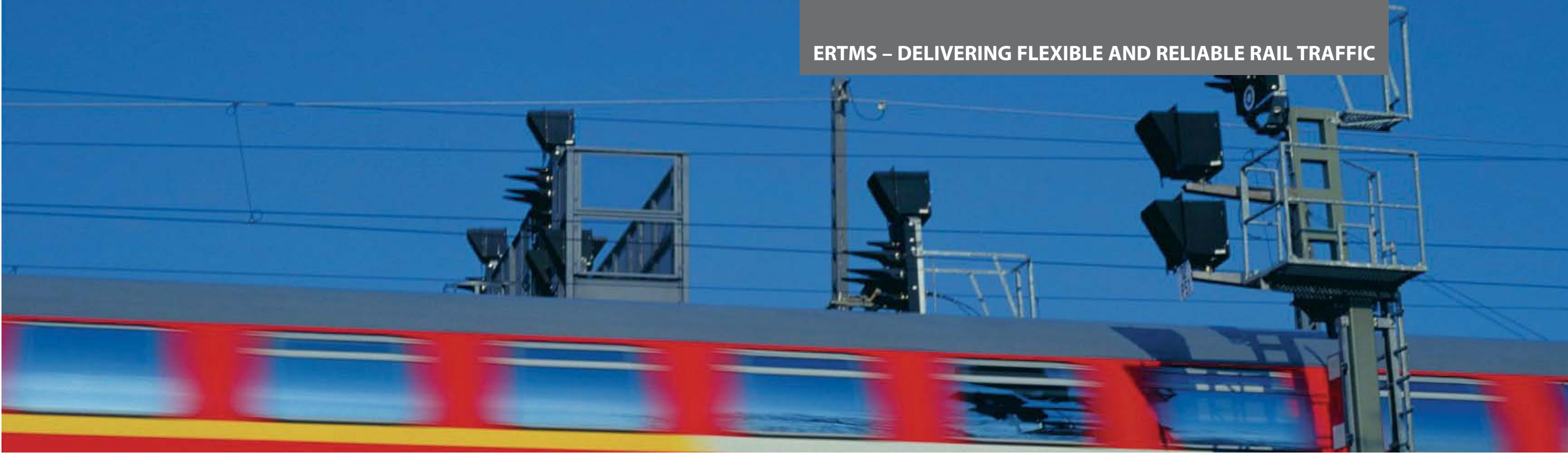
The European Commission's Directorate-General for Energy and Transport develops and implements policy in these closely linked areas. The 2001 White Paper, **'European transport policy for 2010: time to decide'**, sets out 60 practical measures designed to bring about significant improvements in the quality and efficiency of transport in Europe by 2010, and to achieve a rebalancing between the modes of transport. By creating a common transport management system for European rail traffic (ERTMS), it will be possible to improve cross-border passenger and freight movement while improving the overall safety and reliability of rail transport in the EU.

Brochure published by: European Commission, Energy and Transport DG, B-1049 Brussels
http://europa.eu.int/comm/dgs/energy_transport/index_en.html

Luxembourg: Office for Official Publications of the European Communities, 2006
ISBN 92-79-00584-7

Text completed on 13 December 2005.
Photos reproduced with the kind permission of: Bombardier, DB AG/Gärtig/Jazbec/Klee, European Commission, European Railway Agency, Roberto Ferravante, SNCF, Thalys

Printed in Belgium



NO SINGLE MARKET FOR LOCOMOTIVES?

For many years now, lorry drivers have driven across the roads of Europe with few constraints imposed by internal borders; the need to stop for customs checks has now ceased. However, for locomotives, crossing a frontier still remains an exceptional event, and only a few locomotives are equipped with the multiple systems required to easily cross national borders.

Although the European Union continues to work on the legal and administrative issues affecting the railways together with the Member States and the railway sector, there are, however, many technical obstacles still to be resolved for trains crossing internal European borders. The most obvious problem is track gauge (there are no less than four different types of track gauge present in Europe [1]), but other, less visible technical 'barriers' need to be addressed: for example the different types of electrical power supply, the height of station platforms, maximum track gradients, axle weights, etc. The lack of standardisation of these technical areas limits international traffic and leads to significantly higher operational costs.

So, how can this absence of a 'single market' for locomotives be explained? In the railway sector, technical questions have traditionally been resolved based on the assumption that locomotives would never cross national borders. Questions of signalling and speed control, for example, were simply dealt with by one manufacturer for each national railway network. This has resulted in the fragmentation experienced today in the European rail network.

(1) *Ireland, the Iberian peninsula, the Baltic States and Finland each have their own track gauges, which are different from the rest of the European network.*

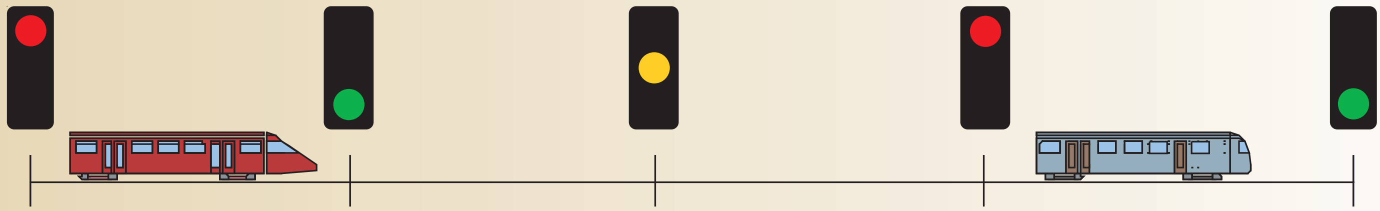
Unifying the European rail sector: a major industrial project

The European rail traffic management system (ERTMS) aims to remedy this lack of unification in the area of signalling and speed control – a major obstacle to the development of international rail traffic. Standardising the multiple signalling systems in use will bring increased competitiveness, better inter-working of freight and passenger rail services, stimulate the European rail-equipment market, reduce costs and improve the overall quality of rail transport. It is clear therefore that the aims of ERTMS fall within the overall scope of the Lisbon strategy.

ERTMS is a major European industrial project (similar to Galileo for satellite navigation or SESAR in air traffic management) and provides increased export opportunities for the EU. Indeed, recently awarded railway contracts – particularly in south-east Asia – have included the use of ERTMS, demonstrating that it is the most effective signalling and speed-control solution on the market. This highlights Europe's strong position in advanced technologies, particularly when research and development efforts are led at European level.

An imbalance between modes of transport, which jeopardises sustainable growth

A total of 72 % of land freight transport and 92 % of passenger transport within the EU is by road, with just 17 % of freight transported by rail. The large difference between road and rail transport volumes constitutes a real danger for European competitiveness as it is estimated that road congestion costs represent approximately 1 % of the GDP of the EU (EUR 100 billion). The imbalance is further reflected in the areas of safety (with more than 43 000 deaths on European roads in 2004), the security of energy supply (the transport sector relies heavily on petrol), and environmental quality (road vehicles are responsible for 84.2 % of the CO_2 emissions attributed to land transport).



BRINGING RAILWAY SIGNALLING
INTO THE DIGITAL ERA

What are the fundamental principles of railway signalling?

The main objective of railway signalling is to ensure the safety of rail transport. This objective represents a real technical challenge as the braking distances of trains are significantly greater than those of cars. At 100–160 km/h, the stopping distance is in the region of a few hundred metres, but at very high speeds this increases to a few kilometres! It is therefore essential, on both conventional and high-speed lines, that the train driver receives as far in advance as possible the necessary information required for controlling the train.

At speeds of up to 160 km/h the driver can generally see trackside signals. The diagram at the top of the page is a simple representation of how train collisions are avoided with the use of trackside signals.

The track is divided into sections, known as 'blocks' and a system detects the presence of trains in each block. Each block is protected by a signal. If it is red, it indicates to the driver that there is a train in the next block. If it is yellow, it indicates that the next signal is red. Consequently, drivers must reduce their speed to be able to stop before the next red signal.

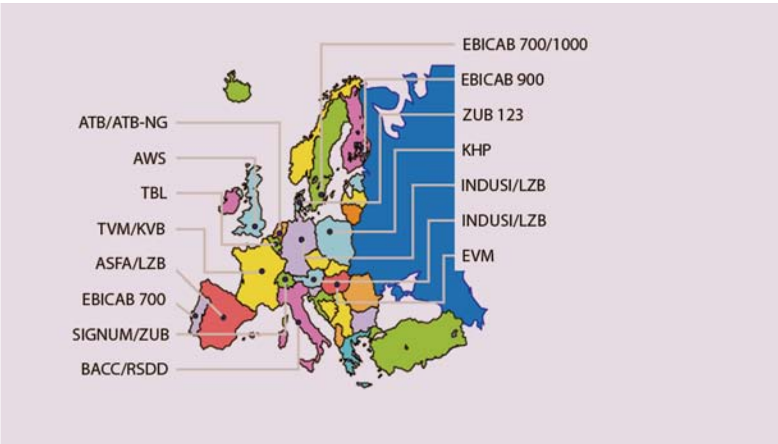
And on high-speed lines?

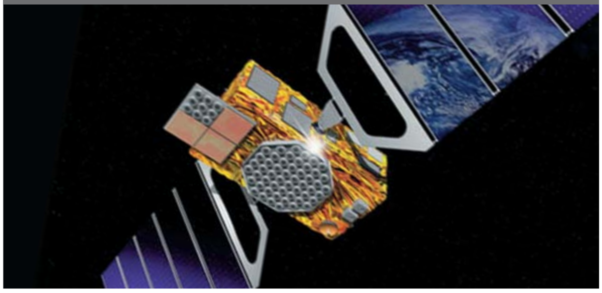
On a high-speed line the same basic principle applies but, due to longer braking distances, there are a greater number of blocks between two trains. However, at higher speeds – and particularly in poor weather conditions – the driver cannot always see the trackside signalling clearly. To ensure the driver can observe the correct signals, a signal is sent from the track to the train, and the maximum speed authorised for a particular block is displayed to the driver within the cab of the locomotive. This system is called 'in-cab signalling'.

Safety depends to a great extent on the driver, who must respect the signalling information. Early in-cab signalling systems simply 'repeated' the trackside signalling information. Through technical progress this has been combined with automatic speed-control systems, which prevent the driver from exceeding a maximum safe speed. Additional information on track characteristics such as gradients and speed limits can also be provided to the driver. Furthermore, the development of radio communication systems between the ground and the train allows drivers to make contact with rail traffic management centres. All of these technical advances have resulted in highly effective, yet complex, speed-control systems.

The incompatibility of signalling systems

Rail-equipment manufacturers have developed specific systems for national clients and today multiple signalling system solutions exist across Europe, particularly in the transmission frequency of the signals and the nature of the information provided. To put this into context, there are over 20 signalling and speed-control systems operating in Europe today, all of which are completely incompatible with each other! Taking the Thalys high-speed train as an example, which connects Paris, Brussels, Cologne and Amsterdam, it must be equipped with no less than seven different systems, including specific sensors and control panels. This complexity leads to additional costs and an increased risk of breakdowns. It also makes the driver's job considerably more complicated.





TOWARDS A COMMON SPEED-CONTROL SYSTEM

The extent and impact of fragmentation in the rail sector makes it necessary for Europe to join forces and to work together at a European level. It is vital that the high costs of the development, testing and validation of incompatible systems which serve similar needs in each Member State are reduced.

At the beginning of the 1990s, research projects were launched in several Member States, with the objective of designing a new generation of signalling and speed-control systems. The objective was to develop systems that performed better, were less expensive, and took advantage of the major developments in digital telecommunications. At the European Commission's instigation, these various research projects were merged to create the ERTMS.

Today, this project has two main components:

- **GSM-R**: a radio system used to exchange information between the ground and the train. It is based on the GSM mobile telephony standard, but uses different frequencies specifically for the railways and has some additional advanced functions. For example, it allows drivers to speak with the traffic management centres and can be used to transmit the maximum permitted speed;
- **ETCS (European train control system)**: the European system for controlling trains, which not only allows speed limits to be transmitted to the driver, but can also continuously monitor the driver's response to this information. An on-board computer effectively compares the speed of the train with the maximum permitted speed and automatically applies the train's brakes if it exceeds the limit.

A third 'component', which relates to traffic management, will be added to GSM-R and ETCS. This component is currently in demonstration on the Rotterdam–Milan axis within the 'Europtirail' pilot project.

The contribution of satellite navigation and Galileo to ERTMS

Satellite navigation is set to revolutionise the rail sector, and ETCS will make it possible to monitor the exact location of each train in real time. Today, the task of location tracking is undertaken by extremely expensive ground-based equipment. In particular, at level 3 of ETCS (the highest technical level of the system and which has the potential to be the most advantageous), the control room needs to know, as accurately as possible, the position of each train in real time. This technical challenge could be solved by satellite techniques, and Galileo is currently running several projects in this area.

AND THE PASSENGERS?

Passengers taking the Thalys high-speed train between Paris and Brussels will not notice that seven signalling systems have had to be installed on board the train. For each train or locomotive, the multiplication of systems poses problems for driver ergonomics, electromagnetic compatibility, space and system-to-system compatibility – not to mention the additional expense and the risk of breakdown. The current situation is, therefore, an obstacle to the rapid development of international freight and passenger traffic.

Although hidden to public perception, ERTMS is an important contribution to the development of international rail traffic. However, the GSM-R element of ERTMS can be used in applications that provide direct benefits to passengers, such as in the provision of journey information.

In consideration of safety, current trends suggest that the costs of the European train control system will decrease sufficiently, allowing many non-signalled lines to be gradually equipped with ETCS. Such progress is vital, as unfortunately signalling-related accidents still occur far too frequently on lines without speed-control systems.

ERTMS will facilitate an increase in the market share of European rail transport. This in turn is expected to create a more competitive market of suppliers, and to reduce the costs of railways in the long term. The Italian railways (RFI) have decided to adopt this system for all their new high-speed lines and the ERTMS-fitted Rome–Naples line – some 204 km – entered its pre-operational phase on 12 September 2005, with the intention to enter full commercial operation before Christmas 2005. Further, the Turin–Novara line entered the pre-operational phase in November 2005. RFI also plans to use this system on part of its conventional network, initially starting with three corridors: Rotterdam–Genoa, Stockholm–Naples and Spain–Slovenia. These corridors, mainly devoted to interoperable freight traffic, constitute the first stage of migration towards ERTMS, and will be followed by installation on other major conventional lines.

***Mauro Moretti**,*
Chief Executive, Italian Rail Network (RFI)

Guaranteeing interoperability

To ensure that trains equipped with ETCS and GSM-R equipment made by one manufacturer are able to operate on a network equipped by another manufacturer, engineers work on the basis of common specifications which have been adopted at EU level. The common specifications are subject to modifications in order to keep pace with technological evolution and changing requirements.

It is essential that prototypes are tested prior to commissioning in order to check their compliance with the interoperability specifications. It has been recognised by the railway sector that, in order to confirm compliance, the use of environmental simulators are vital.

The point of view of a Spanish infrastructure manager (ADIF)

From 1986, Spain opted for interoperability by deciding to build its first high-speed line – 471 km between Madrid and Seville – with a track gauge in line with the UIC standard (2), rather than the gauge traditionally used on the Iberian peninsula. This new line has operated with LZB signalling (3), a system that has been entirely satisfactory in delivering a train service for speeds of up to 300 km/h. In spite of this success, Spain has now committed itself to the implementation of ETCS on all future high-speed lines. As part of that commitment, ETCS has been fitted to over 443 km of track between Madrid and Lerida, and the commercial operation of this route will shortly commence. Five different manufacturers have been involved in the development of systems on this route; this represented a major challenge, requiring strict adherence to the interoperability specifications in order to ensure that the trains of one manufacturer could circulate on tracks fitted out by another. Adherence to the interoperability specifications, together with the compatibility of the subsequent versions of ETCS, will be key to the success of ETCS in general and especially to the link with France via Perpignan. From 2009, high-speed trains capable of reaching a speed of 350 km/h, as well as freight trains, will be using this line. We rely on ETCS to help make this possible.

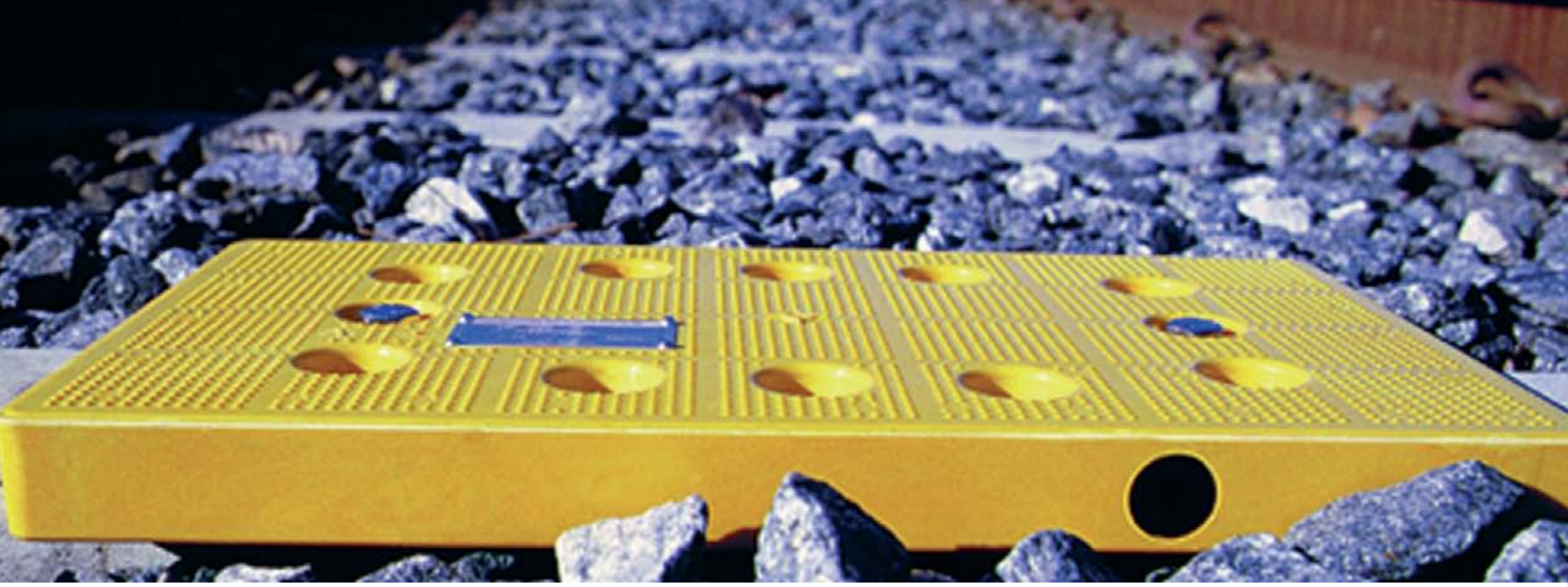
(2) *International Union of Railways.*

(3) *This signalling system is mainly used on high-speed lines in Germany.*

Tests of the ERTMS are now completed and the European deployment of the system, across different rail routes, represents a major step forward in the history of international rail traffic. ERTMS enables improved performance and reduced costs, whilst facilitating access to the trans-European network. The introduction of ERTMS is therefore considered to be an important and necessary step for the railways.

Today, the rail sector is faced with the challenge of migration: the advantages of ERTMS will not be achieved until all the major routes – and the trains travelling on them – are equipped. A rapid migration clearly requires a significant budget. To deliver this the European Commission, rail operators and infrastructure managers must work together.
This is why we fully approve of the Commission's initiative to launch studies, corridor by corridor, to examine, in close cooperation with the infrastructure managers, all aspects of ERTMS introduction.
Only intensive cooperation between all the players will allow successful deployment of ERTMS.

***Bert Klerk**, Chairman of Prorail (the Netherlands)*



HOW ETCS WORKS

The different levels of ETCS

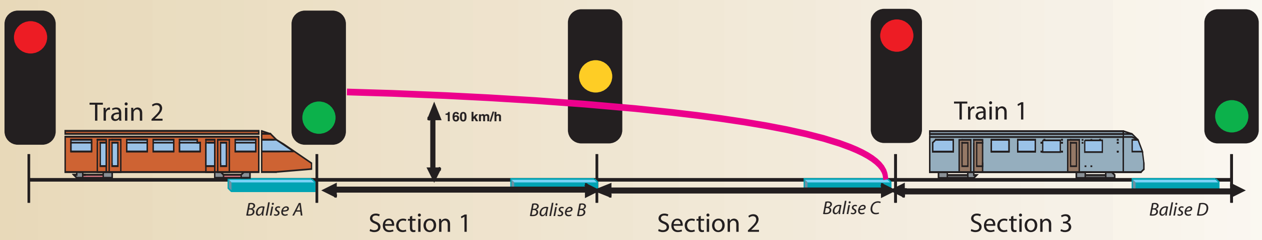
ETCS enables ground-based equipment to transmit information to the train. This enables equipment on the trains to continuously calculate the maximum permitted speed. Information is transmitted by standardised beacons – Eurobalises – which are placed along the length of the track and connected to the existing signalling system. This is 'ETCS level 1' (ETCS-1). The technology is now tried and tested, and Eurobalises can be purchased from several manufacturers.

- In principle, at **level 1** (see A), a 'switchable' ETCS balise is placed at each signal. The situation is shown in the diagram on page 7. Train 2, when passing over balise A at the 'green' signal, receives authorisation to run to the end of section 2. In principle, this authorisation allows it to run at the maximum line speed (in this example, 160 km/h) until balise B, located at the next signal. In the absence of new information, having passed balise B, the train should brake to stop before the signal at balise C.
- In 'normal' situations (see B), when train 2 passes over balise B, train 1 will already have left section 3. As shown in the diagram on the opposite page, train 2 will therefore receive new authorisation to continue, this time until the signal at balise D. The train will therefore be able to continue to run at the maximum line speed.
- However, if for some reason (see C), train 1 has not left section 3, then balise B will indicate that trains are prohibited from crossing the signal that is located at balise C. This means that the train will have to reduce speed gradually to come to a halt before balise C. This scenario is represented in the diagram on page 7. The driver will only cross balise C when the signal has changed from red to yellow, allowing the train on-board system to obtain a new authorisation from the balise to proceed.

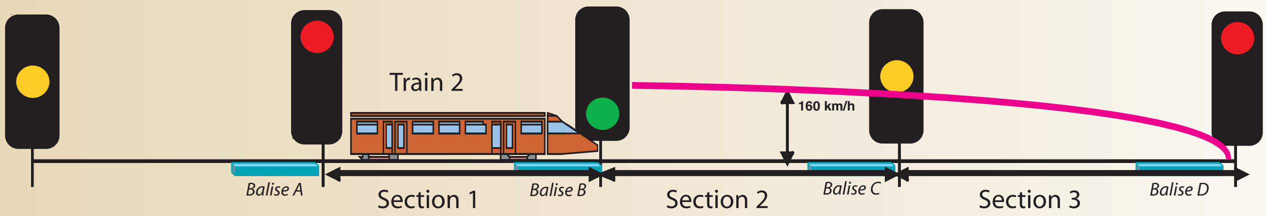
All of the balise information can also be transmitted by radio (GSM-R), which is the basis for 'ETCS level 2' (ETCS-2). In this case, it is no longer necessary to have trackside signals, allowing for substantial savings in both installation and maintenance. The detection of the position of the trains is still carried out on the ground. An ETCS train, if equipped with a GSM-R radio, can run on both level 1 and level 2 lines.

- At **level 2** (see D), the ETCS train can receive a new 'authorisation to proceed' (movement authority) at any time via the GSM-R system. With reference to the previous diagram, as soon as train 1 leaves section 3, the Radio Block Centre receives this information from systems on the ground (axle counters, track circuits, etc.) and immediately transmits a new authorisation to train 2 to allow it to proceed to the end of section 3. In ETCS-1 this new information would not be received until the end of section 2, thereby obliging the train to travel at low speed for a significant part of section 2. At level 2, this information is immediately available, contributing to increased traffic fluidity.
- Finally, at **level 3** (see E), trains are able to transmit their exact position themselves. This makes it possible to optimise the capacity of the lines and to further reduce ground equipment. 'ETCS level 3' is still in the experimental stage, but will bring major long-term benefits in terms of maintenance and operational capacity.

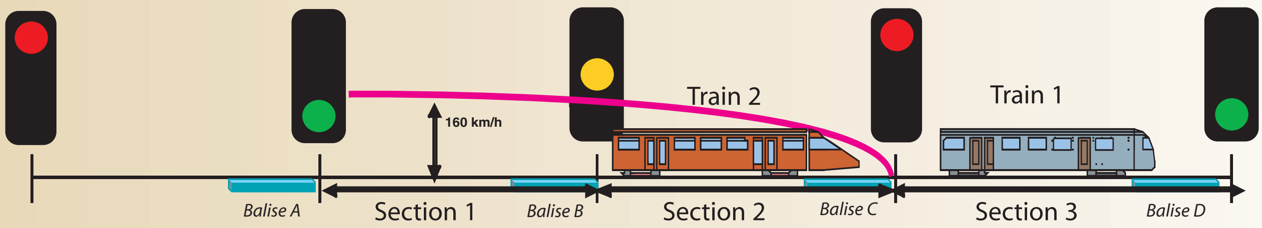
A


Train 2
160 km/h
Train 1
Balise A
Section 1
Balise B
Section 2
Balise C
Section 3
Balise D

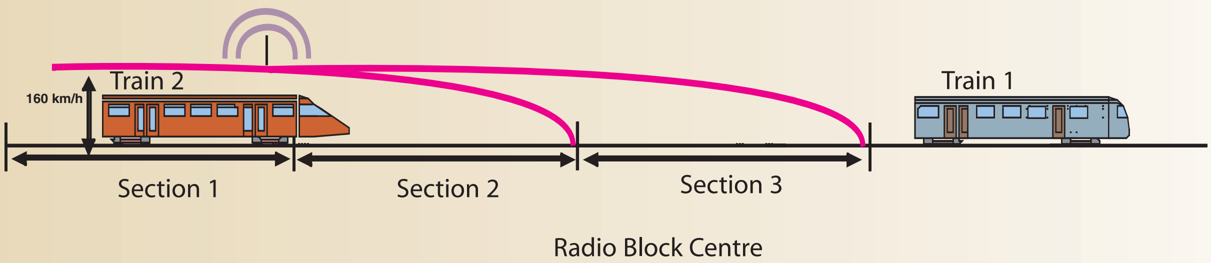
B


Train 2
160 km/h
Balise A
Section 1
Balise B
Section 2
Balise C
Section 3
Balise D

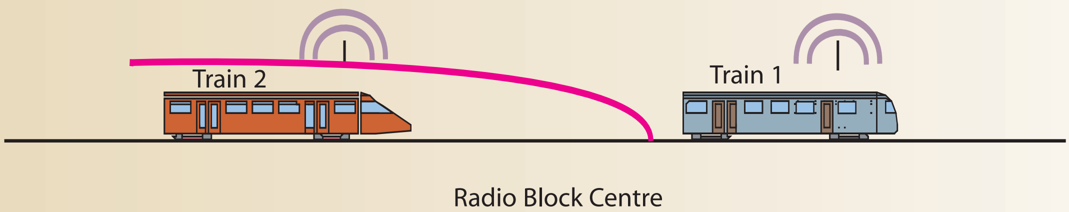
C


160 km/h
Train 2
Train 1
Balise A
Section 1
Balise B
Section 2
Balise C
Section 3
Balise D

D


Train 2
160 km/h
Train 1
Section 1
Section 2
Section 3
Radio Block Centre

E


Train 2
Train 1
Radio Block Centre

The European Railway Agency and interoperability

The European Railway Agency, based in Valenciennes/ Lille (France), is chiefly responsible for the creation, revision and completion of the technical specifications for interoperability (TSIs) in the rail sector. It will therefore act as the 'system authority' for ERTMS. The TSIs will specify, amongst other requirements, the exact format of the messages exchanged between trains and the ground-based systems. The development of message formats is a complex task, as it is important to ensure that modification requests to the messages made by one stakeholder do not put investments made by other stakeholders into jeopardy. Each request for change to the specifications must be supported by an analysis of the costs and benefits involved.

In addition to ERTMS, the Agency is also responsible for developing TSIs for other technical aspects of the railways (e.g. infrastructure, rolling stock or types of electrification). The European Commission is able to call upon the technical expertise of the Agency to help evaluate, in terms of interoperability, EU-funded projects. The Agency will also report on the progress of interoperability every two years, and this report may be used to revise deployment plans or funding methods.

In the field of safety, one of the responsibilities of the Agency is to gather accident reports and to promote the exchange of experience following accidents, drawing up a report on the safety level of the network itself, including proposals for new measures if necessary.

Putting an end to fragmentation

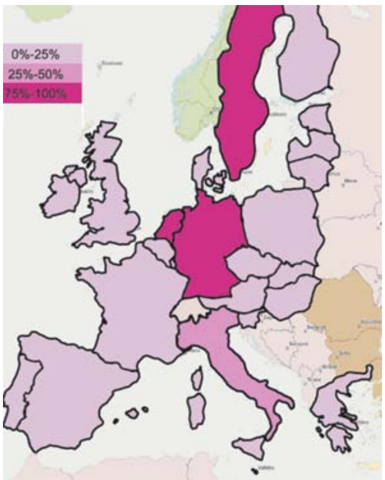
The decision to set up a European Railway Agency is a key element in the revitalisation of the sector and reflects the determination of the Commission to put an end to the fragmentation of the past, which damages the sector's competitiveness and jeopardises large parts of its activity.
The Agency has its own legal personality and is the first Agency to be created following adoption of new EU rules in this area. Now completely operational, it will eventually have a workforce of approximately 100 people of different nationalities, three quarters of whom will be experts in the different areas of the Agency's operations. Furthermore, it will create a network for cooperation between the European organisations representing the rail sector and national safety authorities. The transparency of our working methods and the support from the different parties involved will be fundamental to ensuring the success of our mission.

***Marcel Verslype**, Executive Director of the European Railway Agency*

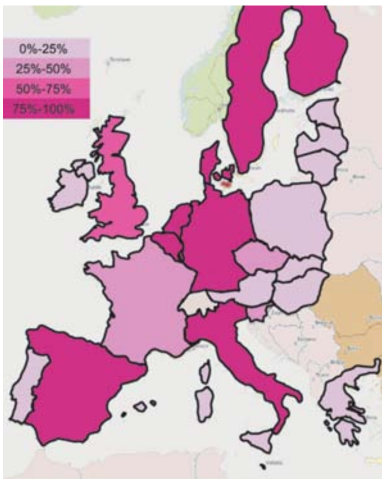
Signature of the memorandum of understanding by the Commission – represented by Vice-President Jacques Barrot – and representatives of the rail sector, on 17 March 2005.

A gamble that is paying off: GSM-R

The deployment of GSM-R in Europe is already well under way. The German, Dutch and Swedish networks are now almost fully equipped with GSM-R, and practically all Member States are currently replacing their virtually obsolete analogue radio technology with GSM-R. Based on public GSM standards, this system effectively offers a quality and a cost which surpasses previous systems, most of which were developed at national level. The maps below show the extremely rapid deployment of GSM-R in most of the 'old' Member States. The Commission is now supporting a number of projects for the deployment of this system in the 'new' Member States: by 2010, perhaps even sooner, the main railway routes in the EU should be fully equipped with GSM-R.



EU-25: Percentage of main lines equipped with GSM-R by mid-2005



EU-25: Percentage of main lines equipped with GSM-R by the end of 2008

The paradox of ETCS deployment

ETCS deployment is, on the other hand, less rapid. As numerous trains travel on any given line, limiting access to a line to only those trains fitted with the ETCS on-board equipment is generally considered to be too restrictive, and even economically unacceptable whilst the number of trains fitted with ETCS is still small. Furthermore, in order to operate across lines undergoing renewal or upgrade, locomotives must be able to continue to operate with existing signalling systems until ETCS is fully in place.

The economic analysis of equipping existing lines with ETCS is unlikely to be favourable if the lifetime benefits associated with interoperability and its effects on the whole of the network are not taken into consideration. An isolated, short-term economic analysis will be overshadowed by the costs of maintaining the existing trackside systems until such time as they can be decommissioned.

Furthermore, if a substantial part of the network is not equipped with ETCS, there is a risk that it will be seen to be a non-vital, or complementary, system by railway operators, as existing national systems will need to be maintained for a transitional period.

This can result in a strong divergence between the collective interest of the sector – which is to migrate quickly to benefit from all the advantages of the system – and the specific interest of the operators, who must often wait until other stakeholders have completed their migration to the new systems.

Despite this, the rail sector has committed itself to shortening the migration period by fitting a sufficient number of traction units over a period of 10 to 12 years and forming an ETCS network, parallel to the development of major international interoperable corridors. This should allow for substantial reductions in the costs associated with the coexistence of different systems and make it possible to take rapid advantage of the ETCS benefits. This type of 'rapid' and coordinated migration strategy is desired by all stakeholders in the rail sector: this is demonstrated by the memorandum of understanding signed by key rail stakeholders and establishing the fundamental principles of this implementation strategy. This memorandum was signed by Vice-President Jacques Barrot on behalf of the European Commission on 17 March 2005.

TOWARDS COORDINATED DEPLOYMENT OF ERTMS

The decision by an infrastructure manager to install ETCS on a line, or part of a network, often depends on the signalling strategy of their neighbouring infrastructures. Taking this into consideration, one stakeholder cannot deploy ERTMS in isolation. Moreover, a railway operator will not commit to a migration strategy without receiving certain guarantees on the strategy of the infrastructure managers on whose networks it operates. Vice versa, the migration strategy of railway operators will have an important influence on the strategy of infrastructure managers. It is therefore clear that coordination in the deployment of ERTMS is of paramount importance.

For this reason the Commission appointed Mr Karel Vinck (who previously headed Belgian Railways) as European Coordinator for ERTMS. His task is to define, in consultation with the various stakeholders, the lines or corridors to be equipped with ERTMS as a matter of priority, and to ensure that the economic viability of these corridors can be guaranteed. He will have to ensure that the deployment of the system is carried out in the most cost-effective way possible by working closely with the other stakeholders responsible for coordinating Europe's priority rail projects.

Karel Vinck: 'Achieving the common ambition of a quality rail service'

There is a very close relationship between economic growth and increased transport needs. An efficient European-level rail network is a key factor in the economic and social development of the European Union. That is why the ERTMS project has to be seen in the framework of a broader rail sector mission. This mission is to ensure a quality pan-European service characterised by:

- *effective competitiveness compared with other modes of transport;*
- *excellent levels of safety, punctuality and reliability, supported by:*
  - *a programme of investment in infrastructure and rolling stock, focusing on the coordinated introduction of ERTMS on selected corridors;*
  - *a systematic drive for best performance at optimum cost;*
  - *a multiannual plan for the financing of investments, split fairly between Member States, infrastructure managers, railway operators and the European Union.*

This huge programme is a tremendous opportunity as well as an enormous challenge, and can only be made possible by effective cross-border cooperation between the different stakeholders, including railway-equipment manufacturers. To achieve this, the rail industry will have to integrate the best national initiatives into a long-lasting European transport network. Barriers to interoperability – such as the existence of more than 20 signalling and speed-control systems – must be removed. To achieve the shared ambition of a quality rail service, coordination of these complex efforts is essential.

Commercial lines equipped with ETCS by the end of 2008

Reconciling collective and individual interests

The European Commission has made it clear that it will do its utmost to ensure that individual decisions regarding the deployment of ETCS are made in the collective interest. This will mean:

- strict supervision of the implementation of ERTMS in cases where it is mandatory under European legislation (e.g. new high-speed lines and trains);
- significant financial support for projects intending to deploy ERTMS, for both infrastructure and rolling stock. Additionally, the Commission has proposed to the Council and the European Parliament that this support should provide for up to 50 % of the costs involved in the system deployment. These provisions could be effective from 2007 onwards and concentrated over several years;
- increasingly strict conditions in the granting of EU financing to railway infrastructure projects. The European Union has a duty to concentrate its budget on actions or projects with significant added value for Europe. From now on, the evaluation of project applications for EU funding will consider the failure to take ERTMS into account as a negative factor. In effect, a project which does not include ERTMS will represent a barrier to interoperability for the whole of the operational life – 30 years, perhaps more – of the signalling equipment.

And the costs?

The ETCS system is made up of two 'elements': those based on the ground and those on board the train (computer). The ground systems transmit information which allow the on-board computer to calculate the maximum permitted speed at all times. The on-board systems automatically slow the train when this speed is exceeded.

The cost of the on-board elements depends on the type of locomotive or train. To establish an order of magnitude, the cost of fitment to a new locomotive is approximately EUR 100 000. However, where there is a need to adapt the installation to existing trains, estimates must be made on a case-by-case basis. For example, for high-speed trains costs are greater – almost double – as two ETCS modules are required, one at each end of the train. However, these costs decrease according to the number of locomotives or trains of the same type that need to be equipped. On existing rolling stock, the main problem is finding enough space to fit the on-board elements, such as new antennae or new screens in the drivers' cabs. Furthermore, to ensure that one electromagnetic system does not interfere with another, complex compatibility tests are required to ensure that existing systems are not degraded.

The cost of the ground elements depends on the traffic density and the manner in which project expenditure is managed. Recent contracts demonstrate that, at level 2 on a new high-speed line, the cost could be less than EUR 40 000 per kilometre of double track (without GSM-R). However, these costs should be treated with caution as fitment to existing lines requires the ETCS ground-based elements to be connected to existing ground-based systems (signal boxes, for example), which do not have standard interfaces. This greatly complicates installation and enormously increases cost. Nevertheless, recent invitations to tender show that costs are dropping considerably, especially where competition between manufacturers is fierce, and fixing technical specifications – a task which has now been achieved – should contribute to further cost reductions.

DEPLOYING ETCS OVER THE WHOLE TRANS-EUROPEAN RAILWAY NETWORK

The obsolescence of current signalling systems will gradually force all networks to migrate to new-generation technology. For some networks, there is an urgent need to replace obsolete systems, whilst in other cases lines could continue to operate for another 20 to 25 years with existing signalling systems. However, sooner or later, all networks will be confronted with the need to migrate from one system to another and this will take place regardless of European action or initiatives.

The costs of maintaining existing systems depend upon the age and nature of the equipment, as well as on the size of the network. In fact, the smaller the network, the harder it becomes to bear the costs of maintaining small volumes of equipment. For this reason, a large number of small and medium-sized networks (e.g. Belgium, Luxembourg and Austria) already have plans in place for the deployment of ETCS over the whole of their main networks, and the Nordic countries are also considering this step.

The question now is how to reduce the cost of this migration for the whole of the rail sector. Detailed surveys are required which must identify the best possible scenarios for the installation of new systems, corridor by corridor. At present, to provide a basic order of magnitude, initial estimates are around EUR 400–500 million per year for ETCS deployment. The fitment to a substantial portion of the trans-European network would therefore represent approximately EUR 5 billion over 10 to 12 years, with the main expenditure occurring in the 2007–13 period [4].

But it is important to remember that the greater the scale of deployment of the system, the greater the reduction in terms of overall costs. Furthermore, the sooner trains are equipped with ETCS, thus allowing them to travel on the major interoperable corridors, the sooner it will be possible to make savings in maintenance costs, and eliminate costs associated with the use of multiple systems.

It is important that an optimum cost/benefit ratio is found. One of the objectives of the memorandum of understanding of 17 March 2005 is to define, with the help of the European Coordinator, this optimum strategy. This work requires an analysis of the situation, corridor by corridor, to determine the best way of migrating technology and the best timescales within which to do this. Expert evaluations, to be carried out under the direction of the Coordinator, will specify the costs and advantages for all stakeholders.

([4]) *The exact costs will naturally depend on the speed of migration and the technological choices made. One of the tasks of the European Coordinator will be to refine these forecasts.*

KO-72-05-273-EN-C

Whereas lorries and coaches on our roads are able to cross national borders within the European Union without stopping, it is still uncommon for trains to travel beyond the border stations of their Member State. In addition to legal and administrative issues, differences in technical railway standards are hampering the development of rail transport at European level. For example, more than 20 different signalling systems exist in the European rail system and this is clearly a major obstacle to the free flow of rail traffic. Only the deployment of a single, common system, ERTMS (European rail traffic management system), can remove this obstacle and improve the competitiveness of the rail sector. The deployment of this system is ongoing. EUR 5 billion of investments are planned over the coming years. These investments are expected to strengthen the safety of the rail network whilst improving its competitiveness. The European Commission, in close cooperation with the rail sector and Member States, will ensure that the deployment of ERTMS will be achieved rapidly and effectively through coordination at a European level.

http://europa.eu.int/comm/transport/rail/interoperability/ertms_en.htm

Publications Office

Publications.eu.int

ISBN 92-79-00584-7

9 789279 005848