



**Economic and Social  
Council**

Distr.  
GENERAL

TRANS/SC.2/2000/16  
25 July 2000

Original: ENGLISH

---

**ECONOMIC COMMISSION FOR EUROPE**

**INLAND TRANSPORT COMMITTEE**

Working Party on Rail Transport  
(Fifty-fourth session, 3-5 October 2000,  
agenda item 13)

INFORMATION ON DEVELOPMENTS IN VARIOUS RAILWAY FIELDS

Transmitted by the Governments of Armenia, Bulgaria, Czech Republic, Denmark, Finland, Germany, Hungary, Latvia, Lithuania, Macedonia, Slovakia, Slovenia, Sweden and United Kingdom

At its fifty-third session, the Working Party asked Governments and international organizations to provide information on new relevant developments in the following items (TRANS/SC.2/192, para. 65):

- (a) Environmental questions related to railway operations.
- (b) Safety in railway transport, particularly in the following areas: railway accidents, methodologies for risk assessment, and use of railway infrastructure for transport of dangerous goods.
- (c) Use of computers in rail transport operations, in particular in the management of rail goods traffic.
- (d) Introduction of new transport technologies and application of modern techniques to railway operations, in particular regarding the interface between rail transport and other transport modes.

The information received by the secretariat is reproduced below for consideration by the Working Party.

\* \* \*

## **1. ARMENIA**

- (a) Environmental questions related to railway operations.

In this respect no works have been implemented in the Railway system.

- (b) Safety in the railway transport

Safety in railway system is carried out by implementation of prophylactic and rehabilitation works during freight and passenger transportation and by strict keeping of operating orders and rules of the railway system.

The reconstruction trains operate within the system for the deletion of consequences after accidents which have necessary techniques, equipment and well experienced staff for implementation of reconstruction works.

The transportation of dangerous freight by Armenian Railway was being implemented according to USSR instructions. The normative/instructive documentation concerning the transportation of dangerous and toxic freight is being prepared now and will be ready in the near future.

- (c) Use of computers in railway transport operations, in particular in the management of rail goods traffic

In the railway system the informatization-calculating service is operating. With the help of a computer connected to such service and installed computer system in the Ayrum border station the necessary data about freight and passenger transportation is received in time and the transport operation handled on the basis of these data. The establishment of a global computer system is in a developing stage. Informatization and calculating computers are connected to the same network of railway system of CIS countries.

## **2. BULGARIA**

- (a) The safety issues, transportation of dangerous goods

The Draft Railway Transport Act envisages mandatory following of the International Regulations concerning the Carriage of Dangerous Goods on Rail (RID) and the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

## **3. CZECH REPUBLIC**

- (a) Environmental issues relating to railway operations

Environmental policy issues embrace a wide range of system measures that must be gradually, but urgently, implemented into all the management, organization, operating,

technological and sales activities of individual departments, executive and operating units at Ceske Drahy, while exploiting the generally acknowledged advantages of railway transport from the point of view of negative impacts on the environment. These aspects of the economical conduct a business entity in respect of the environment are generally contained in the internationally acknowledged implementation of the environmental management system (EMS) under the series of ISO 14000 standards.

The environmental protection plans of Ceske Drahy for the year 2000 involve two-tier management, a reduction in the adverse effects on the different elements of the environment due to railway operations, a restriction in ecological risks, and the elimination of sources of environmental pollution; it also plans to create organizational and system conditions for the preparatory phase of EMS implementation (initial environmental tests).

(b) Safety in railway transport

Ceske Drahy actively takes part in a number of International Union of Railways (UIC) projects concerning railway safety, especially the projects on the EIRENE digital radio, the Backbone digital transmission network, and the European train safety system ETCS. It is also active in harmonizing the functional requirements regarding security systems and interoperability. Safety and reliability in railway transport are the basic conditions for economic prosperity in running railways and railway transport for Ceske Drahy. The transportation of hazardous goods is dealt with in a Communiqué of the Ministry of Foreign Affairs on the adoption of changes and additions to Schedule 1 - Rules for the International Regulations concerning the Carriage of Dangerous Goods by Rail (RID) Connection B - Uniform Legal Regulations for the Agreement on the International Railway Transportation of Goods (CIM) to the Treaty on International Railway Transportation (COTIF) of 9 May 1980, which is promulgated in Section 25 of the 1999 Book of Statutes of the Czech Republic.

(c) Implementation of new transport technology and the application of new techniques in railway operations, especially as regards interfaces between railway transport and other types of transport

The focus in passenger transport is the development of current and the creation of new integrated transport systems in urban and suburban passenger transport. Also the expansion of the system of interval-based transport while ensuring the concurrence of interval transport systems on individual routes. A programme to coordinate railway and bus transport is also being developed.

The focus in freight transport is the development of accompanied and unaccompanied combined transport in collaboration with combined transport operators. Also a range of transportation in a system of preferential load transport, a concentration of train formation at major train-forming stations and the ensuring of the smooth flow of international loads over the Ceske Drahy network.

In terms of the application of modern techniques and technology in railway operations, the focus is on installing self-returning points, reconstructing station safety equipment, implementing radio-controlled operations, introducing diagnostics, reconstructing crossing equipment, and implementing simplified transport management in line with remote-controlled safety equipment.

#### **4. DENMARK**

(a)-(c)

DSB has recently published a report describing various incidents in the year of 1999 and setting out future objectives and criteria in the field.

(d)

For the border-crossing passenger traffic between Denmark and Sweden after the opening of the fixed link between Denmark and Sweden on 1 July 2000 DSB and SJ will be introducing a new type of railcar train being prepared for operation with Danish as well as Swedish Automatic Train Control systems and power supplies.

To facilitate the border-crossing freight traffic, during the year of 2000, DXB will also be introducing a new freight locomotive, the so-called EG-locomotive, prepared for operation on the networks of Denmark, Germany and Sweden.

#### **5. FINLAND**

(a) Environmental questions related to railway operations

- VR Cargo (the Freight Service Unit of the VR Group) was awarded an ISO 14001 certificate for its environmental management system in May 1999.
- VR Passenger Services was awarded an ISO 14001 certificate for its environmental management system in December 1999.
- The share of electrified traffic rose up to 70 % in comparison from 69 % in the previous year. The target is 80 % in the year 2012.
- Upgrading and renewal of the rolling stock resulted in savings in energy consumption. The new city trains have the ability to feed back into the grid the energy generated when braking. Last year ten city trains were purchased.
- Real estate of the VR Group were surveyed in order to estimate the risks of ground pollution.

(b) Safety

VR-Group has launched an extensive safety programme for the coming years. The programme consists of various measures and analyses. Risk analysis and international safety benchmarking have already been completed. A study on safety culture (organizational and behavioural aspects of Finnish railway safety) is currently ongoing.

(c) Use of computers in rail transport operations

The RailTrace Project: The specification of the RailTrace project started in September 1997. It is carried out as a part of a larger-scale telematics program TEDIM (=Telematics in Foreign Trade Logistics and Delivery Management). RailTrace is an information system that

integrates, processes and disseminates delivery management information - waybill information about wagons, multimodal transportation and container consignments - to different parties and operators globally via the Internet. The system is already in its testing phase and is expected to be fully in operation in September 2000.

(d) Introduction of new transport technologies

TelemArk – the National Architecture for Passenger Transport Telematics: TelemArk project was initiated by Ministry of Transport and Communications Finland and chaired by VR-Group Ltd (Finnish Railways). TelemArk started in 1998 and the first phase has now been completed. TelemArk describes roughly what the telematic services industry will look like in the next decade. The actors within the industry (travellers, road users, transport operators, authorities, service providers, etc.), major IT systems and the inter-relationships between them are shown by TelemArk. Moreover, TelemArk attempts to point out strategies and policy measures that will enable the telematic services industry to get rooted and flourish. TelemArk covers all transport modes (road, rail, air, water), excluding each mode's internal management systems, though, and attempts to create full service chains especially for the public transport passenger using different modes on one trip.

## 6. GERMANY

(a) Environmental questions related to railway operations.

*Anti-noise measures:*

Since 1999 DM 100 million have been appropriated every year from the federal budget for “anti-noise measures along the existing infrastructure of the federal railways”. It is planned to provide amounts in the same order in the years to come. The installation of anti-noise screens or barriers and anti-noise windows as well as the “especially monitored track” are planned as measures along sections with high noise levels

DB AG moreover pursues the aim to reduce the noise at its source by retrofitting the existing goods wagon pool with quieter brakes with composite brake blocks. Europe-wide operational testing of these brake blocks is currently under way, with the objective of obtaining approval by the UIC in September 2000.

In addition, the development of a composite brake block is being worked on which may be installed with only little expenditure in existing wagons during the normal exchange of brake blocks. This development is expected to take about two years.

*Vegetation control:*

DB AG has commissioned a comprehensive study to investigate the behaviour of herbicides along tracks, in consultation with experts from responsible authorities and industry. The method of this study can also be used for examining other herbicides during the approval procedure.

Most importantly, the study has shown that in the case of controlled application of the herbicides Glyphosate and Diuron (a soil herbicide) there is no indication that these herbicides,

or metabolites thereof, penetrate the ground water. In the light of this result it is being considered to readmit Diuron for application in track areas.

(b) Safety in rail transport

The Federal Ministry of Transport, Building and Housing has formed the Steering Committee on the Improvement of Safety in Rail Transport with representatives from the Ministry, the Federal Railway Office and Deutsche Bahn AG. It investigates and analyzes the causes of accidents occurring in rail operation.

After having taken stock of management and public-sector rules and regulations and of the existing safety technology, the possibilities of further reducing the number and effects of accidents, and their practical application, will be examined.

Working groups on operational safety and tank and vehicle technology as well as a study group on organizational response measures for accidents carry out these studies under various specific aspects and in co-ordination with the Steering Committee. The preparation of the final report of the working group on operational safety is currently under way.

Statistical analyses of DB AG show that — despite a few spectacular incidents - safety in rail transport and the number of rail accidents continue to decrease.

From 1989 (1.4 accidents per 1 million train-kilometres) the number of accidents decreased to 0.81 in 1999.

The carriage of dangerous goods by rail is also decreasing slightly. In 1998, DB Cargo carried 38.5 million tonnes and in 1999 36.9 million tonnes of dangerous goods.

In order to determine the selection of a low-risk train paths, the timetable information for dangerous goods traffic (HAFAS - pilot test) takes into consideration the classical “railway risks”, e.g. during marshalling and change of locomotives, and possible risks to the environment (waters, etc.) in a corridor stretching 500 m to the left and right of the track and makes a corresponding risk assessment. Another factor taken into account in this risk assessment is the population density in this corridor. In this respect, this programme differs considerably from the ROUTIG programmes used up to now.

(c) Introduction of new transport techniques and application of modern techniques to railway operations, in particular regarding the interface between rail transport and other transport modes

1. DB AG intends to introduce in the next few years the digitalized radio technology GSM-R (Global System for Communications — Rail) which makes it possible to transmit data for an effective control and protection of rail traffic and transport operations and to improve customer information. The GSM-R technology is tested on pilot sections. The aim is to put GSM-R into operation in 2003.
2. Selective use of positioning systems by applying the GPS and GSM-R technologies to inform customers in freight traffic about the individual stages of transport operations.
3. Radio-assisted operation (FFB). FFB is an operational procedure for train protection and continuous train control. By means of modern computer

technology and GSM-R cellular radio the entire range of services required in rail operation on low-traffic lines is to be covered. By shifting train protection functions onto the trains, permanent-way installations are to be reduced. Commissioned firms are currently equipping two lines for FEB pilot testing.

4. Automatic driving. Within the framework of the KOMPAS/intermobil projects DB AG engages in the issue of “automatic running of trains”. The aim of the project is to define the fundamental requirements for running trains without drivers and/or personnel, to develop the necessary components and to realize, test and demonstrate automatic driving on a section of about 18 km of the rapid transit system in Dresden.
5. Flexible operational processes (FlexPro). Within the framework of the project related to flexible operational processes in passenger and goods traffic the Research and Technology Centre (FTZ) currently develops new, and also automatic, techniques of train formation and division. In particular, development activities are oriented towards automatic approaching and coupling with trains standing. The advantages of this procedure are:
  - enhanced safety by excluding human failure;
  - making use of this technique for
    - entering dead-end tracks and termini,
    - target stopping at platforms or loading and unloading facilities easing the strain on personnel;
  - more comfort and better protection of freight by means of system-controlled coupling speed (<5 km/h).

This development is planned to be completed by the end of 2003.

## **7. HUNGARY**

(a)

- The programme of 1996 at the Hungarian State Railways, MÁV Co. Ltd. to eliminate the environmentally detrimental technological pollutions accumulated before the social and economic transformation, continued in 1999. Out of 427 action spots altogether, 54 actions have been launched 34 of which finished until now. They included exemptions of soils and of subsoil waters from oil pollutions i.e. transposition of soils and muds polluted with metal compounds and with unhalogenous oils. The rehabilitation programme was extended till 2007 with 1.5 billion HUF, US\$6 million cost per year.
- As for the protection of the environment in the future, a long-term development programme was elaborated to modernize pouring the liquid fuels. The actions of this programme are coupled with those of the rehabilitation programme, where appropriate.
- Further on, the instructions to protect the environment in the course of railway technologies were put into force in 1999 at MÁV CP. The most difficult environmental problem to the railway now is the deposit of communal debris illegally along the tracks and in other railway territories.

(b)

At Hungarian State Railways, MÁV Co. Litc. the number of extraordinary events diminished by 17% in 1999. However, the number of personal consequences (deaths and injuries) did not reduce from 1998. The value of damages emerging was 30% over the previous years (the rate of inflation was 10%). Since even this value is fragmentary and since MÁV closed a contract on general insurance of its passengers, the risk assessment contract for certain categories of railway employees.

(c)

Being able to trace all wagons and consignments on the national railway network, Hungarian State Railways, MÁV Co. Litd. Put its online Transport Management Information System (TMIS) in operation with open access for its clients on a contractual basis in 1997.

Using up its TMIS, MÁV built up a HERMES based data exchange with the Slovakian railway in 1999 and will do so with the Austrian railway in 2000.

(d)

A Hungarian licence of 1994 was the so-called basket wagon for old type semi-trailers unable to be lifted on/off and carried in a regular wagon otherwise but by the help of an accessory device Abasket@. With the aim of utilizing the construction in the entire central and eastern European region, the Slovakian railway company made 60 basket wagons fabricated from 1998.

## **8. LATVIA**

(a) Environmental questions related to railway operations.

10 diesel trains have been modernized in the last two years. Economical engines and hydraulic gears have been set up to decrease and influence the atmosphere and do not to pollute the earth.

(b) Safety in railway transport, particularly in the following areas: railway accidents, methodologies for risk assessment, and use of railway infrastructure for the transport of dangerous goods.

The Railway Technical Inspection has been established on 1<sup>st</sup> June 1999 to improve the safety of traffic on railway. It controls the safety of traffic on private tracks and private railway companies as well. At present, work is ongoing on the developing methodologies of risk assessment.

Dangerous goods carriage by railway are performed by requirements of the Organization for Co-operation between Railways (OSZhD). "Treatment about the international traffic of



freights" commonly like the international carriage by rail is regulated by reference to Regulations (RID) emanating from the Convention concerning International Carriage by Rail (COTIF).

- (c) Use of computers in rail transport operations, in particular in the management of rail goods traffic.

The informative system is well developed on the railway branch, it helps to follow the movement of rolling stocks on the territory of Baltic States and CIS to ensure a message of refusal of freight to their receivers by electronic mail as soon as the freight crosses the border of Latvia.

- (d) Introduction of new transport technologies and application of modern techniques to railway operations, in particular regarding the interface between rail transport and other transport modes.

The centralisation of microprocessors will be set up on Riga and Tornkalns stations to improve the management of train movement in 2000.

Ship agents and stevedore companies receive news about the incoming freight on harbour using the informative system. It helps to plan the ships' loading work.

## **9. LITHUANIA**

- (a) Environmental questions related to railway operations.

According to the 1999 agreement between the Lithuanian Ministry of Transport and Communications and the Danish Ministry of Transport at the current time the transport projects to be launched under the Environmental Sector Programme of the Danish Government's aid to Central and Eastern Europe are under preparation. The projects will be carried out in 2001 and in the years to come.

The Project Identification Programme is currently under preparation and six railway projects (from 15) were proposed for identification:

1. Installation of rain and industrial water cleaning facilities at Claimed Railway Station
2. Installation of areas for storage and cleaning of polluted ballast and soil
3. Technological and ecological control posts for diesel locomotives
4. Modernization of coach heating systems and installation of sewage water collectors
5. Installation of rolling stock washing house with washing equipment
6. Railway infrastructure Maintenance Management System in Lithuania

The process of selection transport projects will be finalized before the end of June 2000 and will have to be approved by the Lithuanian Ministry of Transport and Communications

(b) Safety in railway transport

In order to secure traffic safety, the capital rehabilitation of tracks is being carried out (256,1 km was reconstructed during the years 1994 – 1999). Signalling, telecommunications and energy supply installations are under modernisation: in 1998 telecommunication line in the section Kaisiadorys – Radviliskis was modernised, using interest free loan granted by the Government of Denmark; in the meantime telecommunication line in the section State border - Sumskas – Vilnius is under modernization. Modernization of the telecommunication installations on the whole Corridor IX is envisaged using ISPA funds. For safety reasons, the rolling stock pool is also being modernized.

(c) Use of computers in rail transport operations, in particular in the management of rail goods traffic.

Lithuanian Railways (LG) has in total 460 computers. Two mini computers HP-9000 and 40% of all of LG computers are being used for the management of wagons and containers traffic.

(d) Introduction of new transport technologies and application of modern techniques to railway operations, in particular regarding the interface between rail transport and other transport modes.

Upgrading of the infrastructure is being carried out according to Western standards using modern materials and equipment. Modern track repair machines (bought from “Plasser and Teurer”), rails (“British Steel”) and concrete sleepers by (“Abetong Technik”) are being used for the reconstruction of the track.

Telecommunications and signalling equipment and power supply systems are being modernized using modern technologies.

In order to improve rail services on Corridor 1, an automatic gauge change facility in Mockava station has been installed. Operational tests of this facility are planned for the nearest future.

## **10. MACEDONIA**

(b)

Automatic stop devices , modern SS safety level crossing devices at the main lines are foreseen - 2000/2003.

(c)

Provided funds as part of the loan from IBRD 2000/2001.

## 11. SLOVAKIA

(a) Environmental issues related to railway transport operation.

The following measures can be introduced to lower an adverse impact of Slovak railways on the environment:

- Implementation of haulage system for hazardous wastes in compliance with current legislation in waste economy.
- Purchase of special technology for waste economy (storage facilities, containers).

(b) Safety in railway transport.

Inspection of observance of safety precautions is ensured by the railway staff. Inspections are focused on observance of provisions of safety precautions, work technological procedures and observance of job discipline by the staff of railway operations as well as personnel of other legal entities operating on the workstations of railways.

In the context of long-term development of accidents, a comparison of the last 5 years is as follows:

Accidents for the period 1995 – 1999					
Total / ŽSR					
Category	1995	1996	1997	1998	1999
A	28/18	23/6	24/10	20/4	14/2
B	12/2	9/1	12/3	13/5	15/7
C	115/53	106/38	102/36	100/36	92/37
D	1097/869	1060/818	949/736	836/625	915/685
<b>Total</b>	1252/942	1198/863	1085/785	969/670	1038/729

From the above table it is obvious that the status of accidents is fluctuating despite decrease of operation work on ŽSR. Accidents are at 37 % caused mainly by the failure of a human operator.

Total summary of job accidents – development in comparison with the average of the last 5 years:

Year	Total accidents	Lethal accidents	Serious Accidents	Mass accidents	Number of accidents per 100 employees
1994	272	4	5	1	1.02
1995	417	5	1	0	0.79
1996	431	5	2	0	0.82
1997	342	4	8	1	0.69
1998	343	5	2	0	0.69
<b>Total</b>	2105	23	18	2	-
<b>Average</b>	421	4.60	3.60	0.4	0.802
1999	282	2	1	0	0.58
<b>Variance</b>	- 139	- 2.60	- 2.60	- 0.60	- 0.22

An analysis of job accidents for the period of 1999 showed that the total number of job accidents has been considerably lowered by 139 accidents, which represents 33.05 % in comparison with the average for the last 5 years. This condition is reflected in the most objective evaluation – to its calculation per 100 employees. This evaluation shows a decrease by 0.22 accident, which represents a decrease of accidents by 27.50%.

(c) Use of computers in railway transport operation, especially in management of railway freight service.

The area extension of the SAP R/3 system, implementation of SAP R/3 OTŽ system and creation of conditions for replacement of SIS BEVOZ were priority tasks in the field of development and implementation of information technologies in 1997. In addition, this year work on ZBIS projects (in-creased safety of IS ŽSR) and CAIS (net-wide administrative ISŽSR) has been initiated. With regard to financial resources of ŽSR, to a limited extent work on Infrastructure information system and some other tasks continued.

In 1997 the Slovak Railways operated two net-wide information systems – SIS BE-VOZ (Network information system for balancing and reporting of wagons) and KVC (Complex servicing of passengers). Moreover, several local information systems in the freight service were operating and closely co-operating with SIS BEVOZ (MIS, INF VSP).

IRIS-N information system (management information IS for freight service) is distinctly focused on substantial improvement of communication in exchange of data with clients and neighbouring railway administrations. It enables, on a higher qualitative level, to replace SIS BEVOZ, which is operated on out of date technical equipment.

At present 171 railway stations are connected to the system. Out of 153 railway stations, which have no lines, 65 railway stations will be, after termination of extended construction Terminal IRIS-N network and connecting selected railway stations through State lines, directly connected to IRIS-N. With respect to integration into UIC projects, data from international and domestic bills of freight were so far collected throughout the year in an alternative way.

The IS VSP information system (information system of East Slovakia area) is resolving a specific transport-freightage issue in Èierna nad Tisou (INF, ŠR, MIS ÈnT), in Ma• ovce (MIS NR Ma• ovce, transloading of wagons) and on wide railway gauge (OIS ŠRT). MIS NR subsystems (normal rail-way gauge) is being resolved, transloading of wagons Ma• ovce and Codex – monitoring of import and export of goods in East Slovakia region, from SMEP platform to equivalent SW and HW platform.

## 12. SLOVENIA

The Republic of Slovenia allocates State funds for the research and development of implementation of more effective and more modern modes of transport in a way that is fully adjusted to the law order in the European Union (Council Directive 1107/70/EEC).

One of the most important environmental successes has been the gradual increase of combined transport during the recent years. This should contribute towards a reduction in the transport of goods by road, thereby reducing environmental pollution.

Furthermore, the computer application BRAVOZ, that is a modified Austrian RUF information system, and the information system (it embraces the control of all shipments, including danger and flammable ones) have been used for many years.

The Traffic Institute of Slovenia has also prepared two computer programmes:

- Computer application VAGON for management of technical conditions and costs of maintenance of traction vehicles.
- Computer application RAGIS, which is being filled up with data from rail infrastructure (about the geometry of the railway line, lower and upper structure of the line and the whole equipment of the line).

### **13. SWEDEN**

Extensive work is going on within the environment area, traffic safety, computerization, and co-ordination of inter-modular traffic systems. Further information will be made available in the near future.

### **14. UNITED KINGDOM**

#### **(a) Environmental questions related to railway operations**

Ministers have now made an order under the Environmental Protection Act 1990, requiring that railway operators clear litter and rubbish from their land. The duty applies to train operating companies who lease stations and to Railtrack PLC, all of which are required to keep their public land free of litter or face being taken to court by the public or the local authority. The duty has also been extended to some types of land to which the public is not allowed access. In general the train operators are responsible for keeping the stations free of litter, but Railtrack PLC have the responsibility for the track and other railway lands, including bridges.

A revised Code of Practice on Litter and Refuse under the Environmental Protection Act 1990) has been issued, which gives practical guidance to local authorities and other bodies, which are subject to litter duties. Railtrack and the train operating companies are now subject to the code which sets out how quickly differing types of railway land should be tidied of litter and rubbish to a set standard of cleanliness.

#### **(b) Safety in railway transport**

##### *Railway accidents*

In its annual report for 1998-99 HMRI reported that overall rail safety continued to show a gradual improvement year on year. Fatalities (excluding trespass and suicides) fell by 11 to 31, and in 1998-99 no passengers were fatally injured in a train accident. However, railway safety was dominated by the tragic crash at Ladbroke Grove on 5 October 1999 in which 21 people died and 245 were injured. Lord Cullen was appointed to head a public inquiry into both the immediate causes of the accident and more generally into rail safety management, culture and regulation. The inquiry began on 10 May 2000.

The Deputy Prime Minister appointed Sir David Davies, President of the Royal Academy of Engineering, to make an assessment of train protection systems. His report was published in February 2000 and recommended that the train protection and warning system (TPWS) be installed across the network as soon as possible, with an upgraded version (TPWS4) to extend protection from 75 to 100 mph and automatic train protection (ATP) fitted to all high-speed lines as they are upgraded.

The report of the public inquiry into the rail crash at Southall in 1997, conducted by Professor Uff, was published in February 2000 and made 93 recommendations to improve safety, all of which were accepted by the Health and Safety Commission.

Following the Ladbroke Grove accident, the Deputy Prime Minister held two summits on rail safety, attended by all sections of the industry. An action plan of measures was agreed covering matters such as driver training, signals passed at danger, train protection and a national confidential safety reporting system.

#### *Methodologies for risk assessment*

Specific guidance for taking safety decisions on the Railtrack-controlled infrastructure is set out by Railtrack in its Railway Safety Case, which is accepted by Her Majesty's Railway Inspectorate (HMRI). In summary, where risks lie in the "as low as reasonably practicable" (ALARP) region, decisions on whether to implement further safety measures are guided by balancing safety benefits (i.e. reductions in risk) against the cost of undertaking those measures.

Safety benefits are measured in terms of fatalities and injuries avoided, which are converted to an index of equivalent fatalities (with 10 major injuries equivalent to one fatality, and 200 minor injuries equivalent to one fatality). The number of equivalent fatalities avoided is valued by applying an appropriate value of preventing a fatality (VPF). In 2000/01 these values, which are calculated by using the Department of the Environment, Transport and the Regions (OETR) formula for road safety expenditure, are £1.15m per equivalent fatality avoided for single fatalities, and £3.22m for multiple fatalities or where risks are close to intolerable.

In May 1999 the Health and Safety Executive (HSE) published a discussion document, *Reducing Risks, Protecting People*, which provided further guidance on taking safety decisions.

#### (c) Use of computers in rail transport operations

Railtrack's Total Operation Processing System (TOPS) continues to be developed: recent improvements allow container data to be held within the system, and TOPS data is used to produce the CIM international consignment note. Links with continental railways allow the exchange of traffic monitoring messages.

#### (d) Introduction of new transport technologies and application of modern techniques to railway operations

New £20 million state-of-the-art signalling system offering improved reliability along the Dorset coast area of the Waterloo to Weymouth line.

Employment of modern techniques on a £1.30m contract to provide overhead line electrification on the West Coast Main Line which will bring much improved journey times. Modern methods include:

- High Output Wiring Train The train removes and installs wire as it travels along the track. Conventional methods allow approximately one tension length of wire (between 1330-1700 metres) to be installed on a single night possession. The new method will increase this to two tension lengths. The overhead line system will be upgraded to the latest Mark III system.
- Auto Transformer Technology: This is the first time that the auto transformer (AT) is being used over a 4-track layout. Until now, AT has only been used (in the United States of America and internationally) over a two-track layout.

New high output track renewal techniques to provide greater passenger comfort, longer lasting track and less maintenance intervention. New machine renews 800 metres of track in a typical eight-hour possession and will remove old sleepers and rails and replace them with new at the rate of 10-15 sleepers per minute - four times faster than conventional methods.

Most TOCs now make use of the Internet to advertise their services and some to sell train tickets. Increasingly, train operators are also posting real time train running information on their sites.

All passenger trains can now receive information from a central point by radio, mobile phone or pager, and nearly every station provides customers with access to audio or visual information on how trains are running. The most sophisticated systems provide on-screen messages generated by trains' progress past signals on their route.

New digital public address systems automatically adjust the volume of announcements in reaction to ambient noise levels.

Around one third of stations and station car parks are covered by closed circuit television surveillance, contributing to a reduction of 8.5% in motor vehicle crime - the most common category in the rail environment - in just 12 months. In some instances CC1V systems at a number of stations are monitored at a single control centre: in other cases they are linked directly to neighbouring community surveillance systems.

Virgin Trains has ordered two fleets of active tilting trains, electric-powered for use on the West Coast main line and diesel-powered for Cross-Country services that operate extensively on non-electrified routes.

The industry has developed technology to provide quicker, more accurate and more comprehensive information to customers, drawing data simultaneously from three very large databases. This Rail Journey Information System will provide the source for all telephone and computer generated train enquiries. Further developments will enable it to provide real time information and to generate sales of tickets and reservations.

---