

Strategic Rail Authority Improving passenger rail services through new trains

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL HC 263 Session 2003-2004: 4 February 2004



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Summary

- 1 This report focuses on the work of the Strategic Rail Authority (SRA) in overseeing the introduction of new passenger trains. Since privatisation of the railways in 1996, the Train Operating Companies (TOCs) that provide passenger train services under franchise agreements with the SRA have ordered over 4,500 new vehicles - equivalent to about a third of the fleet in operation at privatisation - worth some £4.2 billion. Orders have been in response to a 1999 statutory requirement to take all (about 1,950) Mark 1 slam-door vehicles that were then on the network out of service by December 2004, or reflect TOCs' commitments under their franchise agreements with the SRA to improve the guality of service to passengers, or have been placed for commercial reasons. Rolling stock leasing companies (ROSCOs) fund the purchase of new vehicles and TOCs pay them leasing charges out of their fare income and the £1 billion annual subsidies they receive from the SRA. Under Directions and Guidance set for it by the Secretary of State for Transport, the SRA is required to ensure that rolling stock is available so that passengers travel in appropriate modern standards of comfort and safety.
- 2 New trains generally provide a better journey experience for passengers. But there are exceptions. Most have been late entering service and are not as reliable as they should be; often, they are less reliable than the old trains they have replaced. There are six key factors contributing to these problems:
 - A lack of steady demand in ordering new trains, contributing to manufacturing and managerial difficulties
 - A lack of organisational coherence within the rail industry hinders getting new trains into service
 - A lack of standardisation of the network, and of the trains that run on it
 - A lack of information about the network
 - A lack of clearly defined pass/fail criteria when assessing safety risks
 - A lack of testing capacity

Source: National Audit Office



New trains are bringing significant benefits to passengers

3 Fit for purpose when designed, the oldest trains on the network do not meet modern standards of safety and construction and generally provide a poor quality environment for today's travelling public. Over 2,000 new vehicles ordered since privatisation have now entered service. Passenger groups told us that these vehicles were providing greater safety and security, a better travel environment, improved facilities for passengers with disabilities and, on some routes, shorter journey times and reduced overcrowding. Passengers should see a significant improvement in the services they receive as more new vehicles enter service over the next few years. The average age of the passenger train fleet has fallen and is expected to fall further, to around 14 years by 2005.

New trains are not, however, bringing all of the passenger benefits that they should

- 4 Passenger groups have complaints about the layout of some new vehicles and that new rolling stock is not always fully accessible to passengers with disabilities. They also consider that manufacturers and TOCs have failed to consult sufficiently early with passengers regarding the features and facilities that passengers require.
- 5 The capacity of new vehicles is restricted by the requirement for larger toilets that allow access for passengers with disabilities, and a 'crumple zone' at the ends of each carriage to improve crashworthiness, while the interior design of a train varies between vehicles. On some routes, passenger numbers have grown faster than the number of vehicles ordered and the infrastructure's ability to accommodate more frequent or longer trains. The introduction of new trains has therefore not kept pace with the growth in demand.
- 6 Nor are new trains as reliable as they should be, and they are often less reliable than the old trains they have replaced. Most new vehicles have experienced multiple problems that take time to rectify or eliminate. The most common problems have concerned mechanical failure, on-train computers and air conditioning. Poor reliability has been a particular problem in the first few months after entry into service, while TOCs' adoption of different measures of train reliability has hampered accurate comparisons and the measurement of trends over time.
- 7 Many new vehicles have been late entering service. Of the 15 TOCs that had introduced new trains at the time of our survey in Spring 2003, 12 had not brought their vehicles into service by the due dates set in the manufacturing contracts. Delays ranged from one month to more than two and a half years, with an average delay of over seven months. Delays are expected to continue for new vehicles not yet in service.
- 8 The Health and Safety Commission, which ensures that risks from work activities, including on the railways, are properly controlled, accepted the Secretary of State's request that the proposed statutory deadline for removing all Mark 1 slam-door vehicles be brought forward by three years, to 31 December 2004. This was upon advice from the SRA's predecessor bodies the Office of Passenger Rail Franchising (OPRAF) and the Shadow SRA that the earlier date would be achievable if all remaining Mark 1 replacement vehicles were ordered by December 2001. We were unable to find any evidence, however, that either OPRAF or the Shadow SRA did any work to check that removal by that date was feasible. On average, it takes two and a half years between placing an order and bringing new vehicles into service. Four orders, for almost 1,000 new vehicles to replace Mark 1 slam-door vehicles, were not placed until 2002 or 2003, more than two and a half years after the December 2004 statutory deadline was set. Planning to deliver many of the new





vehicles - together representing 54 per cent of the Mark 1 replacement programme - in the six months leading up to, or shortly after, the statutory deadline is high risk. On-site work to upgrade the power supply and other aspects of the infrastructure on Network Rail's (previously Railtrack's) Southern Region to enable new trains to run did not start until mid-2002 and is unlikely to be completed in time to allow the statutory deadline to be met. The SRA and the Health and Safety Executive have recognised that it might be necessary for the three relevant TOCs - South West Trains, South Central and Connex South Eastern¹ - to apply for an exemption from the deadline. In the meantime, many passengers continue to travel on older trains.

The process for introducing new trains is complex, bringing delay and contributing to reliability problems once trains enter service

- 9 Bringing new trains into service is a complex task, involving many organisations and many different and re-iterative stages, which may vary from train order to train order (Figure 11 on page 26). There is a lack of strategic direction or design of the process by a single body with, at least, nine organisations and 60 key stages involved. It is difficult to believe that the process would have been so complicated and drawn out had it been designed from scratch.
- 10 There are several key problems in the current process and, although the current process has started to change for high speed routes, and is expected to change for other routes, in response to European legislation, we found that there was considerable confusion in the industry about what impact the legislation will have. The SRA represents the UK on the European Committee that approves common technical specifications under the legislation. The Health and Safety Executive, which has a role in protecting everyone in Great Britain against risks to health and safety in the work place, is responsible for enforcing compliance with the legislation. The Executive told us that it recognises that the changes are likely to be perceived as complex, and that its role will be helping the rail industry through the transition. The Executive believes that the new European process will ultimately deliver a simpler, easier to operate system for the industry.

Lack of steady demand for new trains

11 Manufacturing and managerial problems, such as delays to sub-contractors' supplies and faulty parts, have delayed the delivery of many new vehicles, which are much more technically sophisticated than the old ones they are designed to replace. The paucity of orders for new trains in the two to three years leading up to privatisation in 1996 contributed to a shortage of manufacturing and managerial expertise within the UK railway industry. When this was followed by a surge in orders following the first round of TOC franchises and the introduction of the statutory deadline for the replacement of all Mark 1 slam-door vehicles, there was insufficient expertise to deliver the orders on time. Expertise has gradually returned to the UK industry, but the SRA does not expect there to be a business case for any further public investment in new vehicles until 2005 at the earliest. There will still be a need, however, for vehicles to be refurbished and possibly cascaded² between TOCs. Much of the expertise acquired during the building and introduction of new trains will therefore still be relevant.

¹ The SRA terminated Connex South Eastern's franchise in November 2003 over concerns about the TOC's financial management. The franchise is now being run by South Eastern Trains, a wholly owned subsidiary of the SRA.

² Making best use of vehicles over their whole life requires older, but still useable, stock to be cascaded between TOCs, or between different routes operated by the same TOC, when new trains are introduced. Stock cascaded between routes has to go through acceptance procedures in the same way as new stock.

Lack of organisational coherence within the rail industry hinders getting new trains into service

- 12 There has been a lack of common understanding and agreement within the industry about the current process and this, together with a lack of clarity in some key parts of the process, has contributed to delays in new vehicles' entry into service, increased costs and poor reliability of new vehicles in service. There is a lack of organisational coherence within the railway industry; not all of the key public and private sector parties involved have common interests in, or have been sufficiently incentivised for, the smooth introduction of new trains. Nor do the various organisations involved have a collectively agreed programme, route map or timetable for trains' introduction.
- 13 In a statement to Parliament in January 2004, the Secretary of State acknowledged that, more generally, the structure and organisation of the industry was a serious problem. There were too many organisations, some with overlapping responsibilities, which got in the way of effective decision-making. He announced a review, intended to examine how the industry works together and streamline the structure of the railways, making it as simple and as straightforward as possible and with clear lines of responsibility and accountability. The review will include railway safety, currently the responsibility of the Health and Safety Commission and Executive and the Rail Safety and Standards Board. The SRA will be advising the government, based on industry views, and the government will publish its proposals in the summer of 2004.

Lack of standardisation of the network, and of the trains running on it

14 There is a lack of standardisation in the 20,000 miles of track and signalling, the height and length of the platforms at the 2,500 stations and the height and width of the 65,000 bridges and tunnels that make up the network. There are also 46 designs of rolling stock on the network, with 13 new designs ordered since privatisation. Trains have to be individually tailored to fit the route or routes on which they will run, complicating and delaying the process of bringing new trains into service and limiting the flexibility with which TOCs can deploy their stock. Railway Group Standards setting out the safety requirements that railway assets and equipment must meet are not, nor were they ever intended to be, prescriptive and comprehensive for procuring new trains. As a result, they do not cover all eventualities, such as how new vehicles might affect the network. There is also a range of other standards and specifications, ranging from mandatory legislation to good practice guidance, set by a number of bodies including Network Rail, the Department for Transport and the Health and Safety Executive. Much of the infrastructure on the network is over 100 years old and does not comply with current Railway Group Standards, so a train designed to meet the Standards might still be unable to run on the network.

Lack of information about the network

15 Network Rail does not yet have a complete database of its infrastructure, making it difficult for manufacturers to build trains that are compatible with the network without some adjustment either to the infrastructure or to the vehicles before the trains can enter service. In particular, there has been a lack of attention at a sufficiently early stage to the way in which new rolling stock will affect, and be affected by, the infrastructure on which it runs. Network Rail is now required



under its network licence to establish and maintain a comprehensive and reliable register of the condition, capacity and capability of its assets and provide manufacturers and TOCs with timely and accurate information as necessary. Network Rail told us that it had put most of the register in place by the end of 2003, and that it expects the remaining information to be in place by June 2005.

Lack of clearly defined pass/fail criteria for assessing safety risks

16 Acceptance of new trains onto the network is governed by the Health and Safety at Work Act 1974 and other more specific regulations. The Act requires employers to carry out their activities in such a way as to ensure that, so far as reasonably practicable, their employees and other people are not exposed to risks to their health or safety. In applying the Act, the Health and Safety Executive regards 'so far as reasonably practicable' as having the same meaning as 'as low as reasonably practicable' ('ALARP'). It therefore advises TOCs that, when introducing a new train onto the network, they should reduce the safety risk to 'as low as reasonably practicable'. As part of their applications for approval, TOCs submit evidence from Network Rail that the risks associated with a new train are, in its view, 'ALARP'. Although this approach leads to incremental improvement in standards, the method for assessing 'ALARP' is subjective, lacking clear criteria or thresholds that new trains must pass. The Health and Safety Executive expects the 'ALARP' principle to be applied at the train design stage; in practice, it is not always carried out until a new train has been built. Given the incremental improvement in standards inherent in the process, views on what is 'ALARP' might have changed since the time that the new train specification and design were developed. The way in which 'ALARP' is implemented therefore leads to a lack of certainty of outcome on the part of TOCs and manufacturers. It also produces the perverse outcome of delaying the introduction of safer new trains while keeping less safe older trains running longer than necessary. In some other European countries new trains need only be as safe as existing trains to be accepted onto their networks. A European Railway Safety Directive, which is close to adoption under the Department for Transport's lead, will require Member States to ensure that railway safety is generally maintained and, where reasonably practicable, continuously improved. The Health and Safety Executive interprets this requirement as consistent with the 'ALARP' principle.

Lack of testing capacity

17 There is no national facility for testing new trains off the network and there are difficulties in gaining access to the network for testing because parts of the network are running at full capacity, while the need for essential maintenance and renewal of the infrastructure further reduces the opportunities for testing of new trains on the network. Moreover, until a new vehicle has been shown to be safe, it is usually necessary for Network Rail to impose restrictions in order to ensure that the safety of the network is not compromised and that other train services are not put at risk. Limited access to test trains on the network has meant that new vehicles have entered service without sufficient testing, contributing to reliability problems. Some manufacturers have tested their new vehicles in other countries.



CASE STUDY

South West Trains and Siemens

South West Trains placed the biggest order for new trains - 785 vehicles to replace its Mark 1 stock - with the manufacturer Siemens. The trains (Desiros) had not previously been supplied to the UK market and therefore needed to undergo significant amounts of testing in accordance with UK requirements before they could be accepted on to the network. Siemens told us that, due to uncertainty in obtaining sufficient access to the UK network to test the new trains, it decided to undertake more testing at its own test facility at Wildenrath in north west Germany. The condition of the facility was not, however, an accurate proxy for the condition of the tracks in the UK Southern Region where the new trains would run. Siemens therefore spent £10 million simulating the condition of the Southern Region at its test centre, including adding a third rail (with associated gaps) in order to create power supply conditions more representative of those in the UK.

Source: South West Trains and Siemens

18 An industry-led working group that reported to the SRA in February 2001 concluded that lessons could be learned from the airline industry and other European countries, where there was more thorough testing. Although SRA studies have concluded that a national test facility could be justified, the Department for Transport, Local Government and the Regions - the sponsoring Department at the time - did not approve the SRA's case for a £50 million government grant to build such a facility because it was deemed to be insufficiently well founded. The Department for Transport considers that the need for such a UK test facility has now reduced.

Although the SRA is taking action to address these problems, more needs to be done to protect passenger and taxpayer interests

19 Where new trains enter service late and have a materially adverse effect on passenger services in breach of a TOC's franchise agreement, the SRA is required under its Directions and Guidance to seek from the TOC compensation for passengers, such as the provision of additional new rolling stock. In most such cases, however, the SRA has sought to work with the various parties to secure the earliest introduction of new trains rather than seek compensation. The SRA and its predecessors have secured compensation for only two of the 23 fully completed orders where trains have been late entering service. In other cases, the SRA considered that TOCs had done everything they could to facilitate trains' timely entry into service, or that seeking compensation would be counter-productive to the main aim of getting trains into service as early as possible. In these cases, the SRA and TOCs have negotiated revisions to new trains' entry into service dates in TOCs' franchise agreements. The SRA and its predecessors have not always been able to prove that TOCs have been in breach of their franchise agreements, where those agreements have required TOCs to make 'reasonable' or 'best' endeavours to bring new vehicles into service by the due dates, because there is uncertainty about courts' potential interpretation of the meaning of these terms. The SRA considers that it is unlikely that TOCs would accept stronger obligations in their franchise agreements for the delivery of new trains, unless the costs of such obligations were reflected in higher franchise subsidies.

- 20 The SRA has paid, or has a commitment to pay, additional subsidies of some £760 million to four TOCs to offset additional costs associated with the introduction of new trains. In addition, because of infrastructure problems, the SRA expects that a backlog of new vehicles, ready to enter service but unable to do so, might build up to a peak of some 300 vehicles in the first quarter of 2004 before receding. The SRA has been working, and continues to work, with the industry to reduce the level of liabilities that might arise as a result of the backlog of vehicles. It currently estimates that it might have to pay TOCs up to £7.2 million to cover their costs until the infrastructure work is complete and the new vehicles are able to enter service, and to cover the costs of modifications that might be required to Mark 1 vehicles to enable them to remain in service beyond the statutory deadline of 31 December 2004. As most of the SRA's income comes from grants from the Department for Transport, taxpayers are likely to have to meet most of these liabilities. The SRA has also underwritten Network Rail's costs by £400 million to allow Network Rail to progress the infrastructure work through track access charges that TOCs pay for using the network, which is the usual approach in such cases. As TOCs' principal sources of income are subsidies from the SRA and fares, ultimately taxpayers and passengers will pay for the work.
- 21 The government established the SRA in February 2001 to deliver the strategic leadership to the railway industry that the government considered was previously lacking. The SRA's Directions and Guidance of April 2002 stated that the Authority needed to address vigorously the difficulties affecting the delivery of new trains. The SRA has little direct involvement in the process of introducing new trains. Nor does it have powers to direct, manage or control the process or other organisations' involvement in it. It cannot therefore by itself take the action required to improve the process or ensure that new trains enter service on time and provide a reliable service. The SRA is therefore required to guide the industry through dialogue and persuasion, set priorities for action by itself and others and address the problems caused by the fragmentation of the industry, ensuring in particular that incentives and commercial interests are properly aligned to achieve common goals.
- 22 The SRA initially took action to progress particularly difficult cases involving the delivery of new trains, while industry working groups set up by its predecessor to tackle problems on a strategic and process-wide basis fell into abeyance. As well as getting to grips with the impact of the Hatfield derailment and Railtrack's year in administration, the SRA has been involved in establishing Network Rail in place of Railtrack, developing its new franchising policy and tackling cost escalation in the industry. Most of the TOCs that responded to our Spring 2003 survey considered that the SRA had made little or no progress against its rolling stock objectives. Nor did we find any evidence of the SRA exploiting its strategic position to identify and disseminate best practice across the industry to help new train introduction.
- 23 The SRA has been encouraging partnership working in the introduction of new trains since August 2002 through an Industry Plan for Mark 1 replacement agreed with the other key stakeholders, and is taking other action to bring about improvement. It also published a Rolling Stock Strategy in December 2003, which includes how it would address some of the key problems associated with the introduction of new trains. It is too early to assess the impact of these recent initiatives and progress has been slower than the SRA would ideally have liked, given the problems in the rail industry. Several key problems - particularly the lack of organisational coherence within the industry and the lack of testing capacity - remain to be solved.

RECOMMENDATIONS

- 24 To smooth new trains' entry into service and deliver the expected benefits to passengers on a timely basis, we make the following recommendations:
 - (i) As a condition of its direct agreements with ROSCOs and its franchise agreements with TOCs, the SRA should require ROSCOs and TOCs to work more closely with manufacturers and passenger representatives to take account of the features and facilities that passengers, including those with disabilities, need in the design of new trains (paragraphs 4 and 2.14).
 - (ii) The SRA should include in its franchise agreements with TOCs the requirement for new trains to meet specified levels of reliability, and establish the expectation that reliability targets will be included in TOCs' agreements with the ROSCOs, manufacturers or other organisations responsible for maintaining their new vehicles (paragraphs 6 and 2.24).
 - (iii) The SRA should assess the need for any further new passenger trains, in the light of the likely future demand for passenger services, the age of trains on the network and likely changes in the train manufacturing base. The SRA should make indicative information available to the industry, to be reviewed on a periodic basis, so that the industry may better plan for the future provision of new trains (paragraphs 11, 3.5 and 3.6).
 - (iv) The SRA should take the lead in establishing, with the Office of the Rail Regulator and the rest of the industry, protocols for sharing essential information and service level agreements on completing key stages within an agreed period of time, as means of aligning the various bodies' incentives and commercial interests to facilitate the timely introduction of new trains (paragraphs 12 and 3.7).
 - (v) Under its franchise agreements with TOCs, the SRA should specify the requirement that TOCs agree, with all of the parties involved in

introducing a new train fleet, a robust and realistic programme and timetable for the trains' introduction (paragraphs 12 and 3.8).

- (vi) The Department for Transport should work with the SRA, the Office of the Rail Regulator, the Rail Safety and Standards Board and other relevant stakeholders to bring the range of railway industry specifications, standards and guidance under a single body responsible for rationalising them within a single, comprehensive and coherent set of requirements (paragraphs 14, 3.15 and 3.16).
- (vii) The SRA should work with the Office of the Rail Regulator and Network Rail to improve the availability of the network for testing new trains and, in consultation with the Department for Transport and the industry, re-assess the case for a national test facility in the light of the likely future demand for passenger services and new trains (paragraphs 17, 18 and 3.27 to 3.29).
- (viii) The SRA should establish clear, consistent and robust obligations in all of its franchise agreements with TOCs to bring new trains into service on time, to strengthen its ability to secure compensation for passengers in cases where TOCs bear some responsibility for the late entry of new trains into service. Otherwise, the SRA and the Department for Transport should consider whether the requirement in the SRA's Directions and Guidance to secure compensation in cases of late delivery of new trains is appropriate and, if not, revise the Directions and Guidance where necessary (paragraphs 19 and 4.3).
- (ix) The SRA should more actively exploit its strategic position to identify and disseminate best practice across the industry to help new train introduction (paragraphs 22 and 4.21).
- (x) The SRA should bring this report to the attention of all of the parties involved, to develop a common understanding across the industry of the current processes and issues involved in bringing new trains into service.

- (xi) Using the map developed as part of the National Audit Office study (Figure 11 on page 26) setting out the current process involved in bringing new trains into service, the SRA, in partnership with the Health and Safety Executive, the Department for Transport and the Office of the Rail Regulator, should take the lead in assessing how the various stages in the process will be affected by European legislation and make those changes, and their timing, clear to the industry. As part of this, the SRA should also take the opportunity to work with the industry to rationalise and streamline the process where possible (paragraphs 9, 10 and 3.24 - 3.26).
- (xii) In looking at railway safety, and as it considers how European legislation will change the process of introducing new trains, the Health and Safety Commission should review, in consultation with all of the key stakeholders in the industry, how the requirement of "continuous improvement where reasonably practicable" should operate for the approval of new trains (paragraphs 13,16, 3.12 and 3.23 to 3.26).
- (xiii) In the meantime, the Health and Safety Executive should work with the SRA to promote greater understanding within the industry of how the 'ALARP' principle for assessing train safety risks should be applied at the train design stage, and what TOCs need to do in applying it through the build and acceptance stages in order to demonstrate that the risks of their new trains are acceptable (paragraphs 16, 3.20 and 3.22).









Part 1

Why new trains are being introduced

Old trains do not meet modern standards of safety and provide a poor service to passengers

1.1 Many vehicles³ on Britain's railway network are over 30 years old. The oldest, with passenger-operated slam doors, are known as 'Mark 1'⁴ trains. Although fit for purpose when designed, in many respects these trains do not meet the needs or expectations of today's travelling public:

They do not meet modern standards of safety and construction

Carriage bodies are relatively weak and, in a collision, there is a tendency for one carriage to over-ride another, increasing the risk of death and serious injury. Slam doors can be opened while trains are moving, compromising the safety of both the passengers on the trains and those waiting to board at stations.

Old trains generally provide a poor quality environment for passengers

Although many passengers comment favourably on the comfort of the old trains' seats and the generous amount of legroom they provide, old trains are dirty, bumpy and noisy, have poor heating in winter and no air conditioning in summer. Their toilet facilities are primitive and were not designed to be accessible to wheelchair users. Access to slam-door trains for passengers with disabilities is restricted due to the width of doors and the step arrangements. They also have no dedicated seating space for wheelchair users, who have to travel in the guard's van.

1.2 On some parts of the network, rolling stock capacity has not kept pace with the growth in passenger numbers, contributing to passenger overcrowding. Poor reliability, with broken down trains and reduced numbers of carriages, further diminishes the quality of service.

High profile accidents highlighted the need to replace old trains

1.3 In recent years, several accidents on the railways, including those at Clapham Junction, Southall and Ladbroke Grove, have emphasised the need for improved passenger safety. The Hidden inquiry into the 1988 Clapham Junction accident concluded that there was a need to minimise the risk of deaths and injuries in railway accidents by improving trains' collision resistance. It also recommended the introduction of Automatic Train Protection (ATP)⁵ across the network. Subsequent inquiries have recommended that the standard for crashworthiness should be reviewed and that there should be adequate measures for safeguarding survival space⁶.

3 A vehicle is a car, or carriage.

⁴ The term 'Mark 1' denotes passenger trains manufactured between 1951 and 1974 with a steel frame and underframe and a steel-panelled body. 5 Automatic Train Protection intervenes automatically to slow an over-speeding train, and prevents trains from going through a signal at red.

It involves the installation of computerised equipment in both the train and at key points along the track.

⁶ Survival space is that part of a rail vehicle that retains its structural integrity in the event of an accident, and where the chances of escaping death or serious injury are therefore greatest. The maintenance of survival space is the primary aim of a crashworthy design.

In response, the government introduced statutory requirements to modify and replace the oldest slam-door trains

1.4 Since the railways were privatised in 1996, 25 Train Operating Companies (TOCs) have been responsible for providing passenger rail services. Under the Railway Safety Regulations 1999, the government set TOCs a statutory requirement to remove from service all the remaining Mark 1 slam-door trains (which, at that time, consisted of about 1,950 vehicles) by December 2002, unless the trains were modified to improve crash resistance. Any modified trains were to be taken off the network by December 2004.

New trains are also being introduced to meet franchise agreement requirements, and for commercial reasons

1.5 Many TOCs are also required under their franchise agreements⁷ with the Strategic Rail Authority (SRA) to bring new rolling stock into service by specified dates. In particular, some Mark 1 slam-door trains were already due to be replaced under franchise agreements. Some TOCs are also introducing new and additional trains to their existing services in order to increase capacity and patronage and thus fare revenue, believing that they will attract onto the railways long-distance leisure and business travellers who might otherwise travel by car, coach or air.

Train Operating Companies have ordered over 4,500 new vehicles

1.6 Since privatisation, 17 of the 25 TOCs have placed a total of 47 orders for 4,542 new train vehicles. These vehicles have an estimated capital value of over £4.2 billion (Figure 1). Some 45 per cent of the new vehicles ordered are replacements for Mark 1 slam-door trains and 55 per cent are for franchise agreements or commercial reasons. Once they are all in service, the new vehicles will have replaced about a third of the passenger train vehicles in operation at privatisation.

Number of orders for new train vehicles, and their value, by November 2003

Since privatisation, TOCs have placed a total of 47 orders for 4,542 new vehicles, worth some £4.2 billion.

	Number of orders	Number of vehicles	Estimated capital value (£ million)
Mark 1 replacement/ enhancement	11	2,025 ¹	1,659
Other	36	2,517	2,570
Total	47	4,542	4,229

NOTE

1 This figure is more than the about 1,950 Mark 1 vehicles that had to be replaced under the 1999 Railway Safety Regulations (paragraph 1.4) for two reasons: some Mark 1 replacement orders were made in 1997 and 1998, when more than 1,950 Mark 1 vehicles remained in service; and the number of vehicles ordered reflected the need for new trains to provide an equivalent amount of passenger seating capacity as the old trains they would replace - because some new vehicles have lower seating capacity than the Mark 1 vehicles, more new vehicles are therefore needed.

Source: National Audit Office analysis of SRA data

The Strategic Rail Authority is responsible for ensuring that passengers travel in appropriate modern standards of comfort and safety

1.7 When the railways were privatised in 1996, the Office of Passenger Rail Franchising (OPRAF) was the principal supervisory body for rail passenger services. In 1998, the government published its Integrated Transport White Paper proposing the establishment of the Strategic Rail Authority (SRA) in place of OPRAF, to bring the strategic leadership to the railway industry that it considered was at that time lacking. Having operated as the Shadow SRA from 1999 to 2001 with OPRAF's existing powers and responsibilities, the SRA was set up in February 2001. The government had already published its 10 Year Plan for Transport in July 2000, setting out its aims for improving punctuality and reliability, reducing overcrowding and bringing about a modernisation of the UK's passenger train fleet, whilst at the same time aiming to increase passenger rail use by 50 per cent by 2010. Under Directions and Guidance set for it by the Secretary of State for Transport in April 2002, replacing those set for OPRAF in 1999, the SRA is required to ensure that rolling stock is available so that TOCs are able to accommodate expected passenger growth in appropriate modern standards of comfort and safety.

Several organisations are involved in getting a new train into service

- 1.8 Several public and private sector bodies are involved in getting a new passenger train into service. Figure 2 shows the contractual and quasi-contractual relationships that exist between the bodies involved.
- 1.9 In the past TOCs have mostly led the procurement and operation of new trains, while rolling stock leasing companies (ROSCOs) finance the purchase of new trains and own them. Increasingly, procurement is a joint approach with considerable input from the ROSCOs. There are three ROSCOs, all owned by banks. The contract for building a new train is between the ROSCO and the train manufacturer and, sometimes, the TOC, while the TOC enters into an operating lease agreement with the ROSCO to enable it to use and operate the train.

The contractual and quasi-contractual relationships between organisations involved in getting a new passenger train into service

There is a range of contractual and quasi-contractual relationships between the several public and private sector bodies involved in getting new trains into service.



NOTES

- 1 In the event of the termination of a franchise agreement, and in view of the SRA's statutory obligation to act as operator of last resort, direct agreements allow the SRA to take over the rolling stock lease agreements between TOCs and ROSCOs.
- 2 Track access agreements set out how much network capacity a TOC may have to run its trains, as approved or determined by the Rail Regulator. See glossary at Appendix 2.

part one

1.10 Before the ROSCO and the train manufacturer enter into a contract, the TOC, ROSCO and manufacturer agree on the train specification. In the design of the new train, the manufacturer should consult with Network Rail to take account of, for example, power supplies, signalling, heights and widths of bridges and tunnels, and station platform heights and stepping distances. Before it can enter service, a new train must obtain approval that it is, for example, crashworthy and operates within a satisfactory stopping distance (vehicle acceptance) and is fit and safe to operate on the specified routes (route acceptance). It must also comply with the Health and Safety Executive's⁸ 'safety case' requirements in order to gain approval to run on the network.

What we examined

1.11 We examined:

- whether new trains were delivering the expected benefits on time to passengers;
- the difficulties involved in getting reliable new trains into service; and
- whether effective action was being taken to address these difficulties in order to protect the interests of the passenger and the taxpayer.

The main methods used to obtain evidence for our report are set out at Appendix 1. A glossary of the key organisations involved in the process of bringing new trains into service, as well as the bodies we consulted for our report, is at Appendix 2.



Part 2

Delivering benefits on time to the passenger

Many new trains have entered service late

2.1 At the time of our survey, 15 TOCs had introduced new train vehicles into service (we refer to these as new train TOCs). Twelve of them, however, had not brought their trains into service by the due dates set in the manufacturing contracts⁹. We analysed the SRA's data as at November 2003 on the 47 new train orders placed since privatisation. Each order was for multiple train vehicles, but data were not available on the planned entry into service date for each individual vehicle. We therefore compared the date that the first vehicle under each order entered service with the date that the first vehicle in the fleet was expected to enter service under the manufacturing contract. For the purpose of our analysis, if the first vehicle entered service late, we treated the whole fleet as being late into service, although the SRA told us that this might not reflect the true position as, in some cases, subsequent vehicles

entered service early or on time. The number of train vehicles entering service late might therefore be lower or higher than the numbers appearing in **Figure 3**, which shows that by November 2003:

fully delivered train orders

 of the 30 fully delivered orders, 23 - for 1,305 vehicles - were late in delivering their first vehicle into service;

partially delivered train orders

a further six out of the eight partially delivered orders - for 1,010 vehicles - were late in delivering their first vehicle into service. South West Trains placed one of these orders in May 1997; over six years later, the fleet has still not fully entered service; and

Extent to which new trains have entered, or are expected to enter, service on time

Most of the new train orders placed since privatisation have been late, or are expected to be late, in delivering their new vehicles into service.

	Number of orders	Number of train vehicles
Fully delivered train orders with vehicles that:	30	1,524
entered service early or on time	7	219
entered service late	23	1,305
Partially delivered train orders with vehicles that:	8	1,495
entered service early or on time	2	485
entered service late	6	1,010
Train orders where entry into service has not yet started, with vehicles that are:	9	1,523
expected to enter service early or on time	5	616
expected to enter service late	4	907

Source: National Audit Office analysis of SRA data as at November 2003

15

train orders where entry into service has not yet started

- of the remaining nine orders where entry into service had not started by November 2003, four - for some 907 vehicles - were expected to be late in delivering their vehicles into service.
- 2.2 We found that delays in introducing the first new train vehicle under each fully delivered order ranged from one month to more than two and a half years. The average delay was over seven months. We found a very similar pattern on the six partially delivered orders that entered service late and on the expected late delivery dates for four orders that have yet to deliver their first vehicles into service.

The December 2004 statutory deadline for removing all Mark 1 trains is unlikely to be met

- 2.3 The Health and Safety Commission, of which the Health and Safety Executive is effectively the operational arm (paragraph 1.10), ensures that risks from work activities are properly controlled. The Commission consulted the rail industry and others in May 1998 about the proposal to modify and subsequently remove from the network all Mark 1 trains (paragraph 1.4). The Commission proposed removal by 1 January 2007. In July 1999, however, OPRAF and the Shadow SRA advised the Secretary of State that removal by 31 December 2004 would be achievable if all remaining Mark 1 replacement stock were ordered before the end of 2001. In view of this advice, the Health and Safety Commission agreed to the Secretary of State's request that the statutory deadline for the removal of all Mark 1 stock be brought forward to 31 December 2004. The Secretary of State then introduced the necessary regulations.
- 2.4 We were unable to find any evidence, however, that either OPRAF or the Shadow SRA did any work with the TOCs and Network Rail's predecessor, Railtrack, to check that earlier removal was feasible and realistic. Half of the TOCs that responded to our survey considered that the statutory deadline was reasonable, and half did not. The latter cited several reasons, including that power supply upgrade work on the network to allow new trains to run had not advanced as necessary and that the delivery schedules for later train orders were very ambitious. They also pointed out that there had been insufficient time to absorb and apply the lessons learned from earlier orders, although other industry stakeholders told us that, at the time the Mark 1 replacement deadline was set in August 1999, problems with the introduction of new trains had only then started to surface.

- 2.5 The elapsed time between placing the order for new vehicles and the vehicles' entry into service varies widely. Data from the SRA show that the time taken has ranged from 12 months to five and a half years. The average time taken has been 32 months. Seven of the 11 orders to replace and enhance Mark 1 trains covering 1,115 vehicles - were placed by the end of 2001. The other four orders - covering 910 vehicles were not placed until 2002 or 2003, however, over two and a half years after the statutory replacement deadline was set. South Central and South West Trains, two of the TOCs that needed to replace significant numbers of Mark 1 trains, told us that they delayed placing their orders because of difficulties in finalising the terms of their new franchise agreements, which underpinned the requirement to order Mark 1 replacement vehicles, and the decision of the SRA and its predecessor to start its own procurement process for Mark 1 replacement stock. The SRA told us that this parallel procurement was started in order to provide assurance that new vehicles would be available to replace Mark 1 vehicles in the event that franchise agreements were not finalised in time to meet the statutory deadline.
- 2.6 Three TOCs in the Southern Region South West Trains, South Central and Connex South Eastern¹⁰ - operate all of the Mark 1 rolling stock remaining in service. There are 1,647 new train vehicles yet to enter service in place of the Mark 1 trains run by these TOCs or to enhance their services. The infrastructure on Network Rail's Southern Region needs to be upgraded before these trains can run on the network. Railtrack, Network Rail's predecessor, started on-site work to improve the infrastructure in mid-2002. The work involves:
 - upgrading the track-side power supply. New train vehicles are heavier than older ones, accelerate faster and have power doors and air conditioning, and therefore require more power to operate; and
 - improving other parts of the infrastructure. This work includes the provision of storage and maintenance depots for new trains and the lengthening of some station platforms to accommodate longer trains.
- 2.7 The SRA launched an industry project in January 2002 to minimise the number of new vehicles that will be unable to enter service because of inadequate power supply and other infrastructure work, and to meet the December 2004 statutory deadline. The SRA considers, however, that even if all of the new vehicles are ready to enter service on 1 January 2005, they are unlikely to be able to run on the network because the power supply work will not be completed by then. In November 2003, the SRA expected 817 (45 per cent of the 1,805) Mark 1 replacement vehicles to enter service in the six months

leading up to the statutory deadline of December 2004. A further 164 (9 per cent of the 1,805) replacement vehicles are not expected to enter service until 2005. All of the new vehicles are expected to be in service by mid-2005 (Figure 4). The SRA expects infrastructure work essential to the new trains' introduction to be completed in time to enable all the new trains to enter service by mid-2005, although it does not expect the full programme of upgrade work, including lengthening some platforms, to be completed until 2010.

- 2.8 The SRA estimates that TOCs will have to continue to run up to 300 Mark 1 vehicles for up to six months after the December 2004 statutory deadline to maintain passenger services at the current level. The SRA and the Health and Safety Executive recognise that it might be necessary for the three relevant TOCs to apply for an exemption from the deadline, if it cannot be met.
- 2.9 Stakeholders told us that the power supply problem on Network Rail's Southern Region was well known early on and that this, and other infrastructure improvements, should have been tackled sooner. South West Trains discussed with Railtrack platform extensions for its new trains in early 2000. Railtrack first approached the SRA in Summer 2001 expressing concern about the network's ability to accommodate the introduction of modern rolling stock in place of the old Mark 1 slam-door vehicles. The SRA told us that action had not been taken sooner because Railtrack did not have comprehensive or reliable information on the condition of its infrastructure, including the available power supply.

All Mark 1 trains were modified, but not in the way originally expected

- 2.10 In the absence of an established rail research facility after the railways were privatised, and with the agreement of its then-sponsoring Department (the Department of the Environment) and HM Treasury, the Health and Safety Executive started to develop a method of modifying Mark 1 vehicles to improve their crashworthiness as required by statute (see paragraph 1.4). This was to involve fitting each vehicle with a 'cup and cone' device to lock together adjacent carriages so that one could not over-ride the other. Further analysis indicated, however, that 'cup and cone' devices would not bring Mark 1 vehicles up to the latest standards for crashworthiness, and that such modifications might increase the safety risks to passengers and staff compared with unmodified trains.
- 2.11 In May 2002, the three TOCs operating all of the Mark 1 train vehicles in the Southern Region therefore applied to the Health and Safety Executive for an exemption from the requirement to modify them. The Executive granted the exemption on the condition that all remaining Mark 1 trains would be fitted by 31 March 2003 with a train protection system¹¹ to reduce the likelihood of collision. This action accelerated a legal deadline of 31 December 2003 for fitting such a system to all trains on the network. The TOCs met the March 2003 deadline on all of the 1,738 Mark 1 vehicles that were then still in service. The train protection system is aimed at trying to prevent crashes from occurring, whereas the original requirement for modifying trains was aimed at limiting the risk of injury in the event of a crash. The SRA told us that a higher level of safety had therefore been achieved sooner than required.

Progress with the replacement of Mark 1 rolling stock, as at November 2003

The December 2004 statutory deadline for removing all Mark 1 trains is unlikely to be met.

	Replacement vehicles	Enhancement vehicles
Number of vehicles ordered	1,805	220
Vehicles in service by November 2003	378	0
Vehicles due to enter service by June 2004	446	0
Vehicles due to enter service between July 2004 and December 2004	817	0
Vehicles due to enter service during 2005	164	220
Vehicles due to enter service during 2005	164	220

Source: National Audit Office analysis of SRA data

part two

Although new trains are providing a range of benefits to passengers, there is scope for improvement

- 2.12 Of the 4,542 new vehicles ordered since privatisation, 2,019 (44 per cent) had entered service by November 2003. These trains are improving the journey experience for passengers in several ways (Figure 5).
- 2.13 Since 1999, the SRA has carried out a twice-yearly National Passenger Survey, which measures passengers' satisfaction with rail services across a range of measures. The survey covers rolling stock but does not measure passengers' views on new trains separately from the rest of the passenger train fleet, but four of the 15 new train TOCs had assessed passengers' views by the time we carried out our study. Their surveys showed that most passengers were fairly or very satisfied with new trains, although some were dissatisfied with the amount of legroom. A survey for one of the TOCs c2c showed that new trains had had a positive impact on passenger satisfaction.

CASE STUDY

Passenger satisfaction with c2c's new trains

Following c2c's introduction of new trains, customer satisfaction increased from:

- ✓ 61 per cent to 83 per cent on seating comfort;
- 54 per cent to 78 per cent on the exterior cleanliness of trains;
- ✓ 60 per cent to 77 per cent on information given on train; and
- ✓ 51 per cent to 76 per cent on the interior cleanliness of trains.

Source: c2c (results of passenger surveys in April and August 2001)

5 The passenger benefits of new trains

New trains provide a range of benefits to passengers.

- Improved safety: new trains offer better internal and external crash resistance. They are also fitted with automatic sliding doors that cannot be opened when the train is in motion, reducing the risk of injury to passengers on the trains and to people waiting on platforms.
- ✓ A better travel environment: the interiors of new trains are generally quieter, brighter and cleaner. New trains also have an improved suspension to give a smoother ride and are often fitted with air conditioning and public address and passenger information systems. Wider doors offer easier entry and exit for passengers with disabilities and those with heavy luggage.
- Improved facilities for passengers with disabilities: new trains provide (often designated) space for passengers in wheelchairs, who no longer have to travel in the guard's van. Where toilets are provided they are fully accessible, in accordance with the Rail Vehicle Accessibility Regulations 1998¹.
- ✓ Improved security: new trains are often fitted with CCTV, sometimes on the outside of the train as well as inside.
- Reduced journey times: on some routes, journey times have been reduced due to faster acceleration and deceleration, and higher speeds. However, stopping times at stations are longer because of the need to provide audible warnings that the doors are closing in accordance with the Rail Vehicle Accessibility Regulations; and because there are fewer doors through which passengers can leave and board the train.
- Reduced overcrowding: on some routes additional carriages can be, and are, made available where infrastructure has been upgraded through, for example, lengthened platforms.

NOTE

1 These Regulations introduced statutory requirements on accessibility for passengers with disabilities on all new trains entering service after 31 December 1998.

Source: National Audit Office, based on information provided by the Rail Passengers Council and the SRA

2.14 Surveys by passenger groups have found, however, that some new trains built after the 1998 Rail Vehicle Accessibility Regulations came into force comply with the Regulations but are still not as accessible to passengers with disabilities as they might be, because the Regulations are not detailed or prescriptive enough. The surveys have identified poor signage on some new trains and a lack of consistency in the position of door controls. Passenger groups also have complaints about the layout of some new trains, such as cramped seating that does not always align with the windows and insufficient luggage room, as well as about the failure to provide sufficient space for cyclists on new trains that lack a guard's van. Space for, and the conditions for allowing, cycles on trains varies widely between TOCs, as does the space for people using wheelchairs and those travelling with pushchairs. In addition, on most types of new vehicles, passengers cannot pass between all the carriages on longer trains. This makes it more difficult for passengers to make full use of the available space, and reduces personal security as passengers in the rear carriages might not be able to reach on-board staff. The Rail Passengers Council considered that manufacturers and TOCs had failed to consult passengers early enough about the features and facilities that they required, and that consultation at an early stage would result in better trains, in most cases at no additional cost (see recommendation (i)).

The average age of passenger trains has fallen, and is expected to fall further

2.15 At the time of privatisation in 1996, the average age of the passenger fleet was 22.7 years. The government aims to reduce the average age of rolling stock over the 10 years up to 2010 as an indicator of the quality of stock on the network, although it has not set a target age to be achieved. It formally started measuring average age in June 2001, when the average age was 20.34 years. The average age fell to 19.35 years by June 2003 (Figure 6). This compares with a typical design life of trains in Britain of around 30 years, although the oldest passenger trains in service are between 40 and 50 years of age. The SRA has calculated that, once all Mark 1 slam-door vehicles have been withdrawn from service, the average age will fall to around 14 years by 2005.





The average age of passenger rolling stock in Britain has fallen steadily since 2000.

Source: SRA

New trains have increased capacity, but not by enough to keep pace with demand

- 2.16 Several train orders include an element of growth as well as replacement. Of the 4,542 vehicles ordered since privatisation, some 1,005 (22 per cent) have been for growth rather than replacement. Our survey of TOCs showed that new vehicles have increased, or are expected to increase, the total capacity of the train fleets operated by 11 of the 16 TOCs that had ordered new vehicles at the time of our survey in Spring 2003. Three TOCs told us that their total capacity has fallen, or is expected to fall. This is in response to the requirements of the Rail Vehicle Accessibility Regulations, such as the provision of toilets for passengers with disabilities and wheelchair access, rather than any reduction in demand for train services. Two other TOCs expected capacity to remain unchanged. The capacity of new trains is restricted by the requirement to provide larger toilets that allow access by passengers with disabilities, and to incorporate a 'crumple zone' at the ends of each carriage to improve crashworthiness. The interior train design, the seating density per vehicle, and the amount of seating and standing room available, vary according to whether the trains are for commuter, leisure or business passengers.
- 2.17 The train procurements required under franchise agreements, with few exceptions, provided for steady state demand for rail services or were in line with expected demand. In practice, passenger journeys have increased by a fifth since privatisation. Capacity has therefore not kept pace with passenger demand, particularly on commuter routes. On some parts of the network, demand has grown faster than the ability of the infrastructure to accommodate more frequent or longer trains. As well as the capacity of the network, signalling systems and the length of platforms can prevent the running of longer trains at peak times, while the capacity of stations to handle passenger volumes can be a further constraint. As TOCs have operated more trains and the network has become more congested, train reliability has declined. With rolling stock being used more intensively, the effects of any reliability problems become more noticeable and, in some cases, TOCs have had to short-form their trains exacerbating passenger overcrowding.

Many new trains suffer from reliability problems and some are less reliable than the old trains they have replaced

2.18 Passenger groups told us that the most important factors in determining passengers' satisfaction with rail services are reliability, punctuality and affordability. Reliability problems that stop a service from operating affect passengers more than problems that make a journey unpleasant, such as lack of heating during the winter. Until recently, there has been no industry-wide standard definition of rolling stock reliability. TOCs have historically used a variety of measures, with 'miles per casualty' being the most common, but have used a variety of definitions of a 'casualty'. 'Miles per casualty' measures the distance that a train travels before encountering a technical fault. There is no standard definition of a technical fault: TOCs define it as a problem causing a delay of a certain period of time, which might be more than 0, 2, 3 or 5 minutes. The measure sometimes excludes train failures caused by human error and by external factors such as vandalism, and cases where no fault is subsequently found with the vehicle. These factors make comparisons difficult. In October 2002, the Association of Train Operating Companies (ATOC), TOCs' representative trade body, introduced a standard definition of a casualty that is now used across the industry for the purpose of comparing reliability between TOCs on a consistent basis.

CASE STUDY

Reliability problems with First North Western's new rolling stock

First North Western started introducing their new trains from June 2000 but they suffered from technical problems including overheating of the coolant system, which caused the engines to shut down in hot weather, air conditioning failures, excessive wear of the wheels and brake discs, and over-sensitivity of the door mechanisms. The manufacturers (Alstom) gradually modified the fleet, replacing all of the wheels and brake discs. The final train entered service in November 2001 but continuing modifications mean that a maximum of 47 of the 70 new vehicles have been in service on any one day, and many passengers are continuing to travel in older trains.

Source: First North Western

- 2.19 Figure 7 shows that the reliability of new trains was significantly below the target levels set at the time that the manufacturing contracts were signed for all six of our case studies, where trains have entered service. In each case, at least part of the new fleets had been in service for over a year. In some cases, TOCs and manufacturers have agreed that the target reliability levels were unrealistic and have since revised them.
- 2.20 In response to our survey, all of the 15 new train TOCs told us that they had had reliability problems with their new trains. TOCs have had major reliability problems on 11 new train orders covering 388 vehicles, and minor problems under a further 16 orders, covering 865 vehicles. The most common problems have concerned mechanical failure, on-train computer software and air conditioning (Figure 8 overleaf). Most of the orders have had multiple problems and many problems are on-going: 10 TOCs had continuing reliability problems, requiring manufacturers to make modifications to at least five new fleets.
- 2.21 Eight of the 15 new train TOCs provided us with data comparing the reliability of their new vehicles with the old ones that they had replaced. Figure 9 overleaf shows that, in half of the new train TOCs, the reliability of new trains compared poorly with that of old trains in the first few months after the new vehicles entered service. New trains' reliability had improved by September 2003 to the extent that, for four of the eight TOCs, the new trains were more reliable than the old ones. In all but one case, however, reliability levels remained very poor.

Reliability of new trains compared with target levels set at the time that the manufacturing contracts were signed for six case study orders

The new trains in five of our six case studies failed to meet the target levels for reliability set at the time that the manufacturing contracts were signed.

тос	Reliability target when the manufacturing contract was signed (miles per casualty) ¹	Reliability achieved by date of NAO survey in March 2003 (miles per casualty)	Reliability achieved by September 2003 (miles per casualty)
c2c	62,500	50,000 (after 39 -50 months in service)	43,700
Connex South Eastern	40,000	8,000 (after 10 months in service)	12,000 ²
South West Trains	54,000	Not applicable (trains not yet in service)	Not applicable (trains not yet in service)
First Great Western	31,000 ³	1,800 (after 15 months in service)	2,400
First North Western	43,500	5,500 (after 32 months in service)	4,200
Virgin CrossCountry	28,000	9,400 (after 22 months in service)	11,200

NOTES

- 1 The Figure reflects reliability targets set at the time that the contracts for manufacturing new trains were signed. In some cases targets represent the level of reliability to be built up and achieved over a period of time. For some orders, targets have since been revised.
- 2 Average of July, August and September 2003 data.
- 3 Angel Trains, the ROSCO for this order, told us that there was no 'miles per casualty' reliability target set for this order at the time that the manufacturing contract was signed. The target of 31,000 miles per casualty was subsequently agreed between the ROSCO, the TOC and the manufactuer.

Source for reliability targets: National Audit Office analysis of data checked with the relevant ROSCOs and manufacturers, the key parties to the manufacturing contract. Source for levels of reliability achieved: National Audit Office analysis of data provided by the TOCs that operate the new trains.

8 Reliability problems with new trains

Mechanical failure, and problems with on-train computer software and air conditioning, have been the most common reliability problems with new trains.



Source: National Audit Office survey of TOCs

Reliability of old and new trains

In half of the new train TOCs, the reliability of new trains compared poorly with that of old trains in the first few months after new trains entered service. In all but one case, reliability levels remain very poor.

тос	Reliability achieved by old trains (miles per casualty)	Reliability achieved by new trains 3 months after entry into service (miles per casualty)	Reliability achieved by new trains by date of NAO survey in March 2003 (miles per casualty)	Reliability achieved by new trains by September 2003 (miles per casualty)
South Central	30,000	10,500	9,000 (after four months in service)	19,000
Connex South Eastern ¹	25,000	N/A ²	8,000 (after 10 months in service)	12,000 ³
c2c	15,000	1,000	50,000 (after 39 -50 months in service)	43,700
First Great Western	3,500	1,700	1,800 (after 15 months in service	2,400
Virgin CrossCountry	3,000	4,000	9,400 (after 22 months in service)	11,200
Central Trains	3,000	2,800	6,500 (after 39 -50 months in service)	6,500
Virgin West Coast	3,000	N/A ²	N/A ²	2,000 (after 3 months in service)
Arriva Trains Northern	2,500	1,000	5,000 (after 25 months in service)	7,000

NOTES

- 1 The reliability of Connex South Eastern's new trains fell over the period because Connex initially used a more generous definition of 'miles per casualty' and later adopted a stricter one.
- 2 New vehicles' mileage was too low to present a reasonable picture of reliability.
- 3 Average of July, August and September 2003 data.

- 2.22 Industry stakeholders, including members of our expert panel, told us that there was a general acceptance that new trains were not as reliable as they should be. ATOC produces its own reliability data, based on its definition of a train 'casualty' (see paragraph 2.18). The data for April to September 2003 show significant variation in the reliability of both old and new rolling stock and that most new electric trains are less reliable than older ones, although some new diesel trains are more reliable than older diesel rolling stock (Figure 10). Reliability levels vary considerably between TOCs, even for the same type of rolling stock, and for both new and old trains. ATOC is examining the reasons for the poor and variable reliability of old and new trains and ways of improving rolling stock reliability, including management of the industry supply chain. ATOC told us that it is also working with the industry to tackle issues that affect train reliability. In addition, the SRA has introduced, with ATOC support, performance improvement plans for each TOC focusing on causes of delays to passenger services, including rolling stock faults. Under these plans, TOCs will seek to tackle the five main causes of delay and aim to achieve 'best in class' performance compared with their TOC peers.
- 2.23 In December 2001, an industry-led group presented a report to the SRA on the poor reliability of new trains. The group noted that none of the new fleets provided an acceptable level of reliability when it entered service and expressed concern that, unless reliability could be improved, services would suffer significantly when a large number of new trains were introduced

onto congested parts of the network to replace Mark 1 trains. The group also expressed concern that the industry did not have an agreed measure of reliability. The group concluded that lessons could be learned:

- from the airline industry, where reliability levels were much higher because of more thorough testing, closer partnership working between organisations and customers' purchasing of generic, rather than customised, products; and
- from other European countries, where prototypes were tested more thoroughly before major new build programmes were begun.
- 2.24 Contracts for train manufacture commonly include a reliability target, but few train leasing contracts currently have a reliability element. The SRA considers that, if more leases had reliability clauses, the incentives to manufacturers and ROSCOs to deliver reliable stock might be strengthened. Through its Franchising Policy Statement, published in November 2002, the SRA sought to promote the inclusion of reliability targets in TOCs' lease agreements with ROSCOs. More recently, in its Rolling Stock Strategy of December 2003, the SRA considered that TOCs were well placed to ensure that new trains performed satisfactorily, straight 'out of the box'. The SRA supports TOCs in their efforts to require guarantees or penalties from manufacturers for late delivery or poor initial reliability of new rolling stock (see recommendation (ii)).

10 Reliability of different types of rolling stock

The reliability of both old and new rolling stock varies significantly.

Type of train	Range of reliabilit (miles per	Range of reliability levels achieved (miles per casualty)		/ levels achieved casualty)
	Old trains	New trains	Old trains	New trains
Diesel trains				
Pacers	2,900 - 4,600		4,000	
Sprinters	3,300 - 9,700		5,300	
Super Sprinters	4,600 - 18,300		6,600	
Diesel Multiple Units		3,800 - 15,900		8,800
Electric trains				
Electric Multiple Units (Mark 1 trains)	13,800 - 78,000		27,600	
Electric Multiple Units (Non-Mark 1 trains)	2,800 - 38,900	3,200 - 38,000	11,700	9,400
Intercity trains	3,200 - 10,400	2,300 - 9,300	6,000	7,400

Source: National Audit Office analysis of ATOC data for the period April to September 2003

6.1

C

Part 3

Getting new trains into service

3.1 Part 2 showed that many new trains have not been delivered on time and have been unreliable. This Part examines the reasons why.

The process for introducing new trains is complex, and the industry has not had a clear or consistent understanding of it

- 3.2 During our preliminary work we found that there was no industry-agreed map of, or common understanding and agreement about, the processes involved in bringing new trains into service. The SRA had produced a map in December 2002 as part of its work overseeing the replacement of Mark 1 rolling stock. This map had not, however, been fully developed or validated by the industry. We therefore convened an expert panel of senior figures from across the rail industry made up of representatives from the SRA, Network Rail, TOCs, train manufacturers, ROSCOs, the Office of the Rail Regulator, the Health and Safety Executive and the Rail Safety and Standards Board (Appendix 1) to develop and agree a definitive map, building on the SRA's map.
- 3.3 Our panel of experts worked with us to develop the agreed map, identifying the many organisations involved, the complexity of the process and the many different and reiterative stages that parties have to go through to introduce a new train vehicle into service (Figure 11 overleaf). Acceptance into service is not a clearly defined process under a single body that starts and ends at particular points in time. Rather, there are different types of acceptance at different stages in the process, involving several organisations. The details of the process may also vary from order to order.

There are numerous problems with the existing process

3.4 Our expert panel helped us identify the key factors that cause delay, contribute to reliability and operational problems and increase the costs of bringing new trains into service (Figure 12). We also drew on our consultation of stakeholders within the rail industry, our survey of TOCs and our case studies of six individual train orders. The SRA considers that some of the problems, particularly those associated with train acceptance procedures, also create barriers to the effective cascade of rolling stock between TOCs, as new trains provide opportunities for the redeployment of the existing fleet and eventually push the oldest vehicles into retirement. Making best use of vehicles over their whole life requires older, but still useable, stock to be cascaded between TOCs, or between different routes operated by the same TOC, when new trains are introduced.

12 Problems with the existing process of bringing new trains into service

There are numerous problems with the existing process of bringing new trains into service.

- A lack of steady demand in ordering new trains, contributing to manufacturing and managerial difficulties
- A lack of organisational coherence within the rail industry, hindering getting new trains into service
- A lack of standardisation of the network, and of the trains that run on it
- A lack of information about the network
- A lack of clearly defined pass/fail criteria when assessing safety risks
- A lack of testing capacity

Source: National Audit Office

Figure 11: Map of the process for introducing new train vehicles



part three

11 Map of the process for introducing new train vehicles¹

The process for introducing new train vehicles is complex, involving a range of organisations.



NOTES

1 Figure 11 shows the current process for introducing new trains, except for rolling stock using designated high speed lines, which since 2002 have been governed by the Railways (Interoperability) (High Speed) Regulations. Many of the processes are iterative and might need to be repeated several times. This is a broad indication of the process, which will vary from order to order.

2 Once production of vehicles has commenced, the ROSCO will monitor the time, cost and quality aspects of design, manufacture, safety and documentation.

3 The Rolling Stock Acceptance Board (RSAB) handles Network Rail's internal processes for taking a new vehicle through the route acceptance process. A System Review Panel (SRP) within Network Rail's internal processes for taking a new vehicle through the route acceptance process. A System Review Panel (SRP) within Network Rail's internal processes for taking a new vehicle through the route acceptance process. A System Review Panel (SRP) within Network Rail's internal processes for taking a new vehicle through the route acceptance process. A System Review Panel (SRP) within Network Rail's internal processes for taking a new vehicle through the route acceptance process. A System Review Panel (SRP) within Network Rail reviews the vehicle systems safety case to ensure that in the Panel's view, the risks of introducing a new train onto the network are 'as low as reasonably practicable' ('ALARP') (Paragraph 3.19).

4 The TOC that carries out testing can be different from the eventual train operator.

Source: National Audit Office

Lack of steady demand in ordering new trains has contributed to manufacturing and managerial difficulties

3.5 Very few new trains were ordered between 1993, when rail privatisation started, and 1996, when restructuring of the industry was completed: no new vehicles were ordered in 1994 or 1995 and only 12 were ordered in 1996 (Figure 13). The lack of orders for new trains contributed to shortages of manufacturing and managerial expertise within the UK railway industry, as experienced engineers and managers sought work in other sectors. There was then, however, a surge in the number of new vehicles ordered, to 458 in 1997 and 937 in 1998, after the first round of TOC franchise agreements. The number of vehicles ordered climbed further to over 1,000 in both 2001 and 2002, following the introduction of the statutory requirement to replace Mark 1 slam-door trains. There was insufficient manufacturing and managerial expertise, however, to handle these orders. Twelve of the 15 new train TOCs told us that manufacturing problems were one of the main reasons for their vehicles' late entry into service, and seven told us that managerial problems had contributed to delays. Problems have included delays in sub-contractor supplies, faulty parts and problems with on-train computer software. The SRA told us that, to win the orders, some manufacturers promised delivery times that they could not meet and accepted that liquidated damages might have to be paid. New train vehicles are more technically sophisticated than the old ones they are intended to replace, incorporating electronic doors, air conditioning and on-train information systems. This increases the difficulty of manufacturing and testing them and the risk that they will be more unreliable in the initial phase of service as more equipment is available to fail.

3.6 Expertise has gradually returned to the industry. The SRA does not expect there to be a business case for any further public investment in new vehicles until 2005 at the earliest. Alstom, one of the two train manufacturers with a factory in the UK, announced in May 2003 that it plans to cease production of new trains at its Birmingham factory in 2004. There will still be a need, however, for trains to be refurbished and possibly cascaded, and therefore much of the expertise acquired during the building and introduction of new trains will still be relevant (see recommendation (iii)).

There is a lack of organisational coherence within the rail industry

3.7 The various public and private sector bodies involved in the introduction of new trains have different business objectives and interests that are not always aligned to support new trains' introduction. For example, as owner of the network, Network Rail is critical to the process of introducing new trains: it must be satisfied about the safety of new vehicles before allowing them onto the network. Yet, Network Rail is not a party to the manufacturing contracts or lease agreements for new trains (and nor was its predecessor, Railtrack), and has had insufficient incentives to facilitate the smooth introduction of new trains. Network Rail's primary motivation in respect of new trains is to minimise the level of risk brought onto the network, and this has been re-inforced since the Hatfield derailment in October 2000.

13 Numbers of new train vehicles ordered, 1988 to 2003



There has been a lack of steady demand in the ordering of new trains.

Network Rail has now put in place, under its licence with the Office of the Rail Regulator, a code of practice on dealing efficiently with other organisations that depend on it for information. It has also submitted for approval by the Rail Regulator an additional section to the code, covering its dealings with other bodies specifically in respect of rolling stock acceptance (see recommendation (iv)).

- 3.8 There is a lack of strategic direction or design of the process by a single body; there are, at least, nine organisations and 60 key stages involved in the process. The different bodies involved do not have an integrated and consistent approach to train introduction. In particular, the various parties involved do not have a collectively agreed programme, route map or timetable for trains' introduction (see recommendation (v)).
- 3.9 There are no service level agreements between the various parties, for sharing the necessary information within a certain timescale to facilitate timely and successful introduction of new rolling stock. Responsibilities rest with organisations that are not always aware of, or able to deliver, what is required of them. Railtrack/Network Rail has often not been involved early enough in the process, on such issues as:
 - whether target dates for the introduction of new trains were achievable;
 - whether the infrastructure needed to be altered to accommodate new trains; and
 - who would pay for any infrastructure work required.
- 3.10 The Rail Regulator told us that TOCs' track access agreements with Network Rail incorporate provisions from the Network Code¹² that TOCs may invoke to obtain Network Rail's approval for new trains to run on the network. These provisions have not, however, always been used or applied effectively. The Regulator is consulting the industry on reforming the Code, including the insertion of new measures dealing with timely provision of full and accurate information about trains and infrastructure, better to meet the needs of the industry.
- 3.11 Lack of consultation between parties has hindered the delivery of many new trains, particularly on the Southern Region, where Network Rail needed to upgrade the infrastructure, including the power supply, to allow new vehicles to run. There has been one significant exception, however, concerning Network Rail's relationship with Virgin Trains, where the two organisations entered into contractual agreements in May 1998 known as Vehicle & Route Acceptance Contracts (VRACs), which included requirements for the provision of information. The Office

of the Rail Regulator told us that VRACs should ensure proper co-operation between Network Rail and TOCs, including provision for access to the network for testing, and that TOCs, ROSCOs and train manufacturers have been able to apply to the Regulator for a VRAC since the Virgin Trains order in 1998. They have not taken up such contracts on later orders, however, despite the Rail Regulator's encouragement for them to do so. The Regulator has developed a model VRAC for general application, to be released later in 2004. VRACs would further incentivise Network Rail to facilitate the smooth introduction of new trains, if they were taken up (see paragraph 3.7).

3.12 In a statement to Parliament in January 2004, the Secretary of State acknowledged that, more generally, the structure and organisation of the industry was a serious problem. There were too many organisations, some with overlapping responsibilities, which got in the way of effective decision-making. He announced a review, intended to examine how the industry works together and streamline the structure of the railways, making it as simple and as straightforward as possible and with clear lines of responsibility and accountability. The review will include railway safety, currently the responsibility of the Health and Safety Commission and Executive and the Rail Safety and Standards Board. The SRA will be advising the government, based on industry views, and the government will publish its proposals in the summer of 2004.

There is a lack of standardisation of the network, and of the trains that run on it

- 3.13 Britain's rail network consists of around 20,000 miles of track and signalling, 2,500 stations and 65,000 bridges and tunnels¹³. The majority of stations, structures and tunnels are over 100 years old and were not built to a standard design. The height and width of tunnels and bridges vary, for example, as do the height and length of station platforms. Vehicles need to be individually tailored to fit the route or routes on which they will run. Vehicles running on one part of the network cannot always run on other routes without modification, while route acceptance approval is always required (paragraph 1.10). The flexibility with which rolling stock may be redeployed in response to changing patterns of demand, including for cascades of stock between TOCs, is therefore limited.
- 3.14 The types of train vehicles running on the network also vary significantly, with 46 designs in existence and 13 different designs ordered since privatisation. The

SRA told us that almost every new order, even of the same class of train, has had variations that have made them incompatible with one another. Total train compatibility will never be feasible, given the infrastructure variations on the network, while rolling stock procurement on a TOC-by-TOC basis has benefits, given TOCs' proximity to their customers. The SRA has emphasised, however, the importance of common operational characteristics of vehicles on a particular route, and plans to quantify the costs and benefits of an appropriate degree of standardisation.

- 3.15 Railway Group Standards, intended to prevent an increased safety risk being introduced onto the network, set out the safety requirements that railway assets and equipment must meet. Much of the network infrastructure is old, however, and does not comply with current Standards. A vehicle might therefore need a derogation against one or more Standards to be permitted to run along a particular route. The application of Standards therefore varies across the network, and trains designed to meet the Standards might still be unable to run on the network. Further, these Standards are not, nor were they ever intended to be, prescriptive or comprehensive for procuring new trains. New train specifications prepared to meet only the Railway Group Standards would not necessarily take account of all aspects of a vehicle's interface with the network. TOCs and manufacturers therefore need to do further additional work, over and above compliance with the Standards, for their train designs to work on the network and be accepted by Network Rail.
- 3.16 In responding to our survey, nine of the 15 new train TOCs told us that inadequate and multiple standards were a main cause of delay in new trains entering service. There is a range of specifications and standards relevant to the introduction of new passenger trains, ranging from mandatory legislation to good practice guidance. These specifications and standards are set by several bodies including the Department for Transport, the Rail Safety and Standards Board, Network Rail and the Health and Safety Executive (Figure 11). TOCs also referred to lack of clarity in standards for electromagnetic interference (where the electric fields generated by a train's electric traction system interfere with trackside signalling and telecommunications) and for clearance with, for example, bridges and tunnels. Five TOCs told us that delays in introducing their new trains arose when the vehicles were found not to comply with all of the standards. The Rail Safety and Standards Board is reviewing the role of, and need for, Railway Group Standards, although the Board is not rationalising standards more widely. In his statement to Parliament in January 2004, the Secretary of State emphasised that safety is of paramount importance on the railways. He pointed out, however, that there is a plethora of industry standards, some of which are over-cautious or are being applied in an over-cautious way (see recommendation (vi)).

There is a lack of information about the network

- 3.17 Network Rail does not yet have a complete and reliable database of its infrastructure. It is therefore difficult for manufacturers to build trains that are compatible with the network, and that comply with current standards, without some adjustment either to the vehicle or the infrastructure before they can operate. Nor does Network Rail know the extent to which the network complies with existing Railway Group Standards. Changes needed to achieve compatibility with the infrastructure might have to be made after the train has been built, causing delay and increasing costs. Eleven of the 15 new train TOCs told us that network infrastructure problems contributed to the late entry of their new trains into service. Five TOCs mentioned signalling problems and four mentioned poor information about physical features such as platforms and bridges. These problems were evident in all six of our case studies. The lack of information about Network Rail's infrastructure is a key issue, which is being addressed by Network Rail and the Office of the Rail Regulator.
- 3.18 In October 1999, the Rail Regulator received a formal complaint from two train manufacturers, Bombardier and Alstom, alleging that Network Rail's predecessor, Railtrack, was in breach of its network licence due to inadequate provision of information necessary for the acceptance of new vehicles onto the network. In December 2001, the Regulator concluded that certain Railway Group Standards were not fit for purpose because they did not require Railtrack to provide the information necessary for the efficient design and manufacture of new trains. He issued directions to Railtrack to propose a Railway Group Standard that was fit for purpose, while Railtrack provided the two manufacturers with information they needed.
- 3.19 The Rail Safety and Standards Board brought into effect new and revised Railway Group Standards in April 2003, requiring Network Rail to provide timely and accurate information as necessary. In addition, in March 2001 the Regulator set Network Rail the requirement in its network licence to establish and maintain a comprehensive and reliable register of the condition, capacity and capability of its assets. Network Rail told us that it had put most of the register in place by the end of 2003, and that it expects the remaining information to be in place by June 2005.

There is a lack of clearly defined pass/fail criteria for assessing safety risks

- 3.20 Acceptance of new trains onto the network is governed by the Health and Safety at Work Act 1974 and the Railways and Other Transport Systems (ROTS)14 regulations 1994. The Act requires employers to carry out their activities in such a way as to ensure that, so far as reasonably practicable, their employees and other people are not exposed to risks to their health or safety. The ROTS regulations require TOCs to obtain approval from Her Majesty's Railway Inspectorate (HM Railway Inspectorate, or HMRI), the arm of the Health and Safety Executive responsible for regulating health and safety on the railways, before bringing a new train into service. In applying the Act, the Health and Safety Executive regards 'so far as reasonably practicable' as having the same meaning as 'as low as reasonably practicable' ('ALARP'). It therefore advises TOCs that, when introducing a new train onto the network, they should reduce the safety risk to 'as low as reasonably practicable'. The Executive has set this out in its Railway Safety Principles and Guidance. Some other European countries have a requirement that depends on the operation of 'grandfather rights', where a new train need only be as safe as existing trains to be accepted onto their networks.
- 3.21 HM Railway Inspectorate approves new trains into use. As part of their applications for approval, TOCs submit evidence from Systems Review Panels made up of staff from Network Rail that the risks associated with a new train are, in their view, 'ALARP'.
- 3.22 Although the 'ALARP' approach leads to incremental improvement in standards, and assessment criteria are set out in HSE guidance, it brings a subjective element into the approvals process as Panels have not, as a matter of course, applied clear criteria or thresholds that new trains must pass to show that their risks are acceptable. A new Railway Group Standard was introduced in April 2003 to bring greater clarity to the acceptance criteria. The Panels do not, however, refer to similar cases in reaching their judgements. Moreover, although the Health and Safety Executive's guidance advises that the 'ALARP' principle should be applied at the vehicle design stage, in practice the 'ALARP' assessment is not always carried out until a new train has been built. Given the incremental improvement in standards inherent in the 'ALARP' process, the Systems

Review Panel's views on what is 'ALARP' might have changed since the time that the new train specification and design were developed. The way in which 'ALARP' is implemented therefore leads to a lack of certainty of outcome on the part of TOCs and manufacturers. The process also involves several iterations and is therefore less efficient than it otherwise might be. The process of Panel approvals produces the perverse outcome of delaying the introduction of safer new trains while keeping less safe older trains running longer than necessary (see recommendation (xiii)).

- 3.23 Some members of our expert panel considered that the Health and Safety at Work Act 1974 and the ROTS were inappropriate for governing the introduction of new trains and a primary source of much of the uncertainty and delay that characterises the industry's current approvals process. Other stakeholders told us, however, that the problem was not with the legislation and regulations themselves, but with the way in which they were interpreted and applied.
- 3.24 The European Directives under which Technical Specifications for Interoperability (TSIs) are being introduced are intended to make it easier for train operators to run services uninterrupted across different EU networks and to promote free trade in rail products between EU Member States by harmonising acceptance processes and technical specifications. The Department, the SRA and the Health and Safety Executive are translating the Directives' requirements for new checking and approval processes in the UK, while industry working groups under the auspices of the European Commission are responsible for developing the TSIs. The SRA represents the UK on the European Committee that approves the TSIs, while the Health and Safety Executive is responsible for checking compliance with them.
- 3.25 The Department for Transport told us that the full suite of TSIs is unlikely to be in place before the end of 2008. The TSIs are expected to have a considerable impact on the requirements for the design, construction, operation and maintenance of Britain's railways. In particular, they are introducing a new authorisation procedure. We found, however, that there was considerable confusion in the industry about how the TSIs will affect the new train acceptance process, particularly whether the principle of 'ALARP' is being superseded or retained.

EU Directive 96/48/EC required Member States to introduce common checking and approval processes - in place of the ROTS regulations - and Technical Specifications for Interoperability (TSIs) for high speed routes and the trains using them. Directive 2001/16/EC will require corresponding changes to be introduced for conventional trains when it is implemented in the UK later in 2004.

3.26 The Health and Safety Executive recognises that the industry is likely to regard any change in the acceptance process as complex. It is also aware of confusion about the impact of TSIs and their relationship with the principle of 'ALARP'. A European Railway Safety Directive, which is close to adoption under the Department for Transport's lead, will require Member States to ensure that railway safety is generally maintained and, where reasonably practicable, continuously improved. The Health and Safety Executive interprets this requirement as consistent with the 'ALARP' principle. It recognises, however, the need to clarify this area and, together with the Department for Transport and the SRA, is consulting the industry on the new checking and approvals process. The Executive believes, however, that the new European process will ultimately deliver a simpler, easier to operate system for the industry (see recommendations (xi) and (xii)).

There is a lack of testing capacity

- 3.27 There is no national test facility available to all train manufacturers in the UK. There is a 14 mile test track and associated testing facilities at Old Dalby in the East Midlands. These are of limited capacity, however, and are leased to just one manufacturer, Alstom.
- 3.28 Most new vehicles have to be tested on the live network at off-peak times, although some train manufacturers test their new vehicles in other countries. TOCs and manufacturers have had difficulty gaining access for testing. Growth in passenger and freight services has meant that parts of the network are running at full capacity, while the need for essential maintenance and renewal of the infrastructure further reduces the opportunities for testing of new vehicles on the network. Moreover, until a new vehicle has been shown to be safe, it is usually necessary for Network Rail to impose restrictions in order to ensure that the safety of the network is not compromised and that other train services are not put at risk. Limited access to test trains on the network has meant that new vehicles have been put into passenger service without sufficient testing in all conditions, often completing testing 'in service', contributing to reliability and performance problems when trains have entered service.

CASE STUDY

South West Trains and Siemens

South West Trains placed the biggest order for new trains - 785 vehicles to replace its Mark 1 stock with the manufacturer Siemens. The trains (Desiros) had not previously been supplied to the UK market and therefore needed to undergo significant amounts of testing in accordance with UK requirements before they could be accepted on to the network. Siemens told us that, due to uncertainty in obtaining sufficient access to the UK network to test the new trains, it decided to undertake more testing at its own test facility at Wildenrath in north west Germany. The condition of the facility was not, however, an accurate proxy for the condition of the tracks in the UK Southern Region where the new trains would run. Siemens therefore spent £10 million simulating the condition of the Southern Region at its test centre, including adding a third rail (with associated gaps) in order to create power supply conditions more representative of those in the UK.

Source: South West Trains and Siemens

3.29 In February 2001, the SRA commissioned a feasibility study for a national test facility that concluded there was a case for such a facility. A subsequent study in January 2002 concluded that a facility for testing trains at speeds of up to 100 mph could be justified, and that there would be virtually continuous demand for a test track over the next 50 years. This conclusion was based on the assumption that all trains have a finite lifespan and will eventually need to be replaced. The SRA's bid for £50 million to fund the facility was not accepted by the sponsoring Department at the time, the Department for Transport, Local Government and the Regions, because it was deemed to be insufficiently well founded. With the SRA having indicated no further requirements for new trains until 2005 at the earliest (paragraph 3.6), the Department for Transport considers that the need for such a UK test facility has reduced, and the SRA has not made further representations to the Department about such a facility (see recommendation (vii)).

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Part 4

Protecting the interests of the passenger and the taxpayer

The SRA has rarely secured passenger compensation for late delivery

- 4.1 Where new train vehicles are late entering service, breaching a TOC's franchise agreement and having a materially adverse effect on passenger services, the SRA is required under its Directions and Guidance to seek from the TOC compensation for passengers, such as the provision of additional new rolling stock. The SRA's predecessors were similarly required under their Instructions and Guidance to secure additional benefits as compensation for passengers. However, the SRA and its predecessors have secured compensation from only two of the 23 completed orders where trains have been late entering service. Figure 14 overleaf shows that, in one of these cases, the compensation was less than the value of the passenger benefits lost due to late delivery; in the other case, it was considerably more. In both cases, the compensation related to only part of the delay.
- 4.2 The SRA and its predecessors have not secured additional passenger benefits in the case of the other 20 late deliveries because:
 - it decided that passengers would not always lose out overall from delays in introducing new trains; sometimes they would benefit overall, such as through the eventual provision of higher quality services;
 - it considered that TOCs had mostly done all that they could reasonably do to facilitate the timely introduction of their trains. The SRA told us that delays in introduction have mostly resulted from problems during manufacture, testing and route acceptance, where train manufacturers and Network Rail have a greater involvement than the TOCs; and
 - there were cases where the SRA took the view that it would not be in the best interests of passengers to leave a TOC to breach its franchise agreement. It has therefore replaced new vehicles' entry into service

dates with more realistic dates. The SRA and its predecessors revised the franchise terms in three of our six case studies: there were six successive revisions for c2c, four for First North Western and three for Virgin CrossCountry.

- 4.3 Where there have been concerns about a TOC's performance in bringing new trains into service, the SRA and its predecessors have not always been able to show that the TOC has been in breach of its franchise agreement. The SRA's ability to secure extra benefits is dependent on the wording of the agreements. Some earlier agreements agreed by OPRAF placed on TOCs the absolute obligation to order and/or introduce new vehicles by a certain date, triggering an immediate default if they did not. Breach of contract is easy to identify under these terms. Other franchise agreements, however, required TOCs to make 'reasonable' or 'best' endeavours. The courts have not defined these terms, hence they are open to interpretation. Proving a breach under these terms is therefore less certain. The SRA considers that it is unlikely that TOCs would accept absolute obligations in their franchise agreements for the delivery of new trains, unless the costs of such obligations were reflected in higher franchise subsidies. It recognises, however, that there is a need for clearer and more consistent drafting of franchise agreements, with obligations focused more on delivery of the required outputs (see recommendation (viii)).
- 4.4 The SRA's ability to secure passenger compensation for poor reliability of new trains is more limited, because the SRA's franchise agreements with TOCs do not require new trains to meet specified levels of reliability. The SRA enforces performance regimes for commuter TOCs, a significant proportion of whose passengers have to travel into and out of London at peak times. Under these regimes, TOCs pay penalties to the SRA or the SRA pays the TOCs, depending on TOCs' performance against their advertised timetables and franchise requirements on the number of standard class seats provided. In addition, where a commuter TOC has put in a worse performance

14

Additional benefits secured to compensate passengers for the late delivery of new trains

Compensation has been secured in two cases where trains have been late entering service.

c2c	Breach of franchise agreement:	Failure to introduce new trains by 1 November 1999
	Estimated value of lost passenger benefits:	£850,000 - £900,000
	Value of compensation secured:	£36 million: £3 million a year over the 12 year life of the franchise

OPRAF consulted passenger groups to determine the type of benefits passengers would want. The compensation consisted of:

- a commitment by c2c to introduce 104 additional new vehicles; and
- more immediate benefits including improvements to, and additional staffing at, stations. OPRAF secured these additional benefits because c2c might have introduced more new vehicles anyway, regardless of whether they were required to, and because passengers would not benefit from the new trains for two or three years.

Virgin CrossCountry	Breach of franchise agreement:	Failure to introduce new trains by January 2001
	Estimated value of lost passenger benefits:	£46 million
	Value of compensation secured:	£31 million

The Shadow SRA did not consult with passenger groups over the compensation package. However, negotiations with CrossCountry took place shortly after a nationwide consultation on changes to their Passenger Service Requirement, and the Shadow SRA was therefore aware of issues of concern to passengers. The compensation package comprised:

- additional services;
- more staff at stations; and
- extra leaflets on trains.

The value of the compensation, although high, was less than the valuation of the lost benefits, primarily because £33 million out of the total £46 million of lost benefits related to lack of improvement in journey times, which could not be solely attributed to the delays in introducing the new vehicles; they also stemmed from infrastructure problems, which were the responsibility of Network Rail's predecessor, Railtrack.

NOTE

The SRA and its predecessors have used the same method to calculate the level of compensation due, assigning a monetary value to the loss reflecting the value that passengers placed on the quality improvements brought by new trains. The significant difference in the value of lost passenger benefits between the two cases was due to differences in the length of the delay, the number of trains delayed and the disruption to passengers.

Source: National Audit Office, based on information provided by the SRA

than the previous year, the SRA has limited the TOC's fare increases or reduced its fares to protect passengers, although from 1 January 2004 the SRA has discontinued this arrangement. Further, under their Passenger Charters, TOCs have to give discounts to holders of season tickets on renewal if punctuality and/or reliability fall below predetermined levels.

4.5 Penalties under all of these regimes include cases where services have been poor due to the introduction of unreliable new trains. The proportion of the penalties attributable to unreliable new trains, however, cannot easily be isolated from other factors. TOCs receive income from the SRA in the form of annual subsidies and performance payments, and receive fare income from passengers (Figure 15). Annual subsidies from the SRA are a major source of income for many TOCs. TOC subsidies are, however, fixed and TOCs that provide additional passenger benefits must therefore find other sources of income from which to fund them, such as by cutting dividends to shareholders, retaining smaller surpluses or transferring funds from holding companies.

15 Taxpayer and passenger funding of passenger rail services

TOCs receive income from the SRA in the form of subsidies and performance payments, and fare revenue from passengers.



NOTES

- 1 Franchise agreements between the SRA and TOCs specify the subsidy that the SRA will pay the TOC to support its operations or, in cases where financial support from the SRA is not required, the premium that the TOC will pay the SRA.
- 2 TOCs make payments to, and receive income from, the SRA under performance regimes operated by the SRA.

Source: National Audit Office

New trains have cost some TOCs and the taxpayer more than expected

4.6 In our survey, we asked TOCs whether they were paying ROSCOs higher lease charges than expected for their new trains, which would have to be met by taxpayers and/or passengers or by a reduction in TOCs' profits. In response, TOCs provided us with information about 31 train orders: on 13, they were paying or expected to pay more; on 7 they were paying or expected to pay less; and on 11 they were paying or expected to pay the same. Across all of these orders, TOCs were paying over £36,000 less in annual lease charges per vehicle than expected, in some cases because of the poor availability of new vehicles as

manufacturers modified them, and because interest rates had fallen. Where TOCs were paying higher than expected lease charges, the increase was never more than 6 per cent above the expected charge. The most common reasons for higher charges were changes in the design or specification of the new vehicles. TOCs told us that higher lease charges would cut into their profit margins, rather than lead to increased fares or more subsidy from the SRA.

4.7 The SRA has paid, or has a commitment to pay, additional subsidies of some £760 million to four TOCs to offset additional costs associated with the introduction of new trains:

- the SRA is making on-going payments averaging £58 million a year over the lifetime of each of the new franchises for South Central and South West Trains. The SRA told us that these payments are to cover the costs associated with the replacement of Mark 1 slamdoor trains, where replacement was not included in the original franchise agreements. Over the franchise lifetimes, these commitments total some £290 million and £174 million respectively. South West Trains' increase included £40 million for new vehicle leasing and maintenance charges, and a further £12 million for extra Network Rail charges to pay for increased power consumption, longer platforms and changes to depots for new trains;
- the SRA told us that it increased Connex South Eastern's franchise subsidies by £25 million over the period 2002 to 2005, as the TOC was required to introduce new trains in place of its Mark 1 fleet earlier than previously planned in its franchise agreement and at extra cost; and
- the SRA told us that, as part of additional subsidies to stabilise the TOCs' finances, it is paying Virgin Trains' CrossCountry and West Coast TOCs some £270 million over the period 2003 to 2005 to off-set costs incurred due to the delayed introduction of new trains on the West Coast Mainline.

There is expected to be a cost to the taxpayer as new trains are stockpiled awaiting entry into service

- 4.8 In November 2003, the SRA estimated that a backlog of new vehicles ready to enter service but unable to operate because of infrastructure problems might build up and reach a peak of some 300 vehicles in the first quarter of 2004 (Figure 16). Completion of necessary infrastructure work should allow increasing numbers of the new vehicles to enter service, and the backlog to diminish to zero, in the final quarter of 2004, although there is expected to be a small number of around 10 vehicles unable to enter service in the first quarter of 2005 as manufacturers deliver more new vehicles. The SRA projected that all new vehicles would enter service by the second quarter of 2005.
- 4.9 If new vehicles are available for service but not put into passenger use, TOCs are contractually obliged to pay lease charges to the ROSCOs, who will have paid the manufacturers of the trains. New vehicles also need to be insured, stored and maintained to ensure that reliability is not affected when they eventually enter service. TOCs also need to continue to lease other rolling stock to maintain the same level of services until the infrastructure can support the new vehicles. In the face of uncertainties about the timing of the work to upgrade the power supply in the Southern Region to run Mark 1 replacement trains, the SRA agreed with two of the relevant TOCs (Connex)

South Eastern and South Central) to meet some of these costs if they were to materialise. The agreements were intended to ensure that the TOCs would not lose or gain in the event that their trains could not enter service on time.

- 4.10 Subsequent investigations found that previous upgrades of power supplies in Kent provided sufficient power to introduce all the new vehicles ordered by Connex South Eastern, and that the power supply deficiency affects only South Central and South West Trains. The costs that these two TOCs might incur will be met in different ways:
 - under its franchise agreement with the SRA, South Central is bearing the risk of all such costs. The SRA has, however, agreed to meet the cost of any mandatory modifications that might be required to enable Mark 1 stock to remain in service beyond the statutory replacement deadline of 31 December 2004; and
 - the SRA's franchise agreement with South West Trains allows the TOC to make compensation claims for the additional costs that it might incur because of inadequacies in the infrastructure.
- 4.11 The level of liabilities has reduced considerably since the SRA began working with the industry to identify and manage down the costs associated with the backlog of new trains, and because delivery of some of the new trains has been further delayed. The SRA currently estimates that its total potential liabilities might be up to £7.2 million. This is the SRA's current best estimate, given the complexity of, and uncertainty over, the issues involved; the estimate will change as the situation changes. The actual cost will depend on progress with the manufacture of new vehicles and the work to upgrade the infrastructure, and whether further modifications are required to Mark 1 vehicles that remain in service after 31 December 2004. As some 90 per cent of the SRA's income comes from government grants, taxpayers are likely to have to meet most of these liabilities. The SRA is continuing to work with the industry to reduce the likelihood of these liabilities materialising.
- 4.12 The projected cost of the work to upgrade power supplies, extend platforms, build train servicing facilities and carry out other works to accommodate new vehicles is £1.2 billion, including up to £837 million for power supply work. To allow Network Rail to progress the work while it negotiated financing, the SRA underwrote Network Rail's costs by £400 million until February 2004, whilst Network Rail negotiated private finance arrangements. Network Rail will recover the costs of infrastructure work through track access charges that TOCs pay for using the network, which is the usual approach in such cases. As TOCs' principal sources of income are subsidies from the SRA and fares, ultimately taxpayers and passengers will pay for the work.

16 Projected backlog of new vehicles ready, but waiting, to enter service

A backlog of new vehicles ready but unable to enter service might build up and reach a peak of some 300 vehicles in 2004, before receding to zero in the final quarter of 2004. There might be a small number of around 10 vehicles unable to enter service in the first quarter of 2005, before being cleared in the second quarter of 2005.



Source: National Audit Office analysis of SRA data

The Shadow SRA took some action to speed up the process for introducing new trains

- 4.13 The Instructions and Guidance that the Secretary of State for Transport set for OPRAF, under which the Shadow SRA also operated, did not include any specific objectives or requirements in relation to rolling stock. The Shadow SRA did, however, start to address some of the factors that were causing problems in the process for introducing new trains. In October 1999, at the request of the Deputy Prime Minister, it set up with representatives from across the industry:
 - a Short Term Action Group to clear the backlog of trains already late in entering service. During 1999, only 153 of the 500 expected new trains entered service; and

- a Long Term Steering Group to consider more broadly how to tackle the problems associated with late delivery, acceptance and introduction of new trains. A sub-group, known as the Train Acceptance Group, considered ways of improving the process for ensuring that new trains were compatible with those parts of the network on which they would run.
- 4.14 The Short Term Action Group helped to facilitate entry into service of some of the earlier orders for electric trains, which were particularly problematic. In particular, it helped to limit further delays in train acceptance and testing on some orders by improving communication and understanding between the various parties. The Long Term Steering Group identified several key areas where improvement was needed, including testing facilities and train reliability. The Train Acceptance Group helped to improve the rail industry's understanding of the complex route acceptance process and, in February 2001, issued new guidance on rolling stock acceptance.

The SRA was given clear strategic responsibilities for rolling stock

- 4.15 The government established the Strategic Rail Authority in February 2001 to deliver the strategic leadership to the railway industry that the government considered was previously lacking. In its first year of operation, the SRA worked under OPRAF's Instructions and Guidance until the Secretary of State for Transport issued a set of Directions and Guidance specifically for the Authority in April 2002. These Directions and Guidance placed more responsibility on the SRA than had previously applied to OPRAF and the Shadow SRA to exercise leadership and identify clear priorities for improving the railways. They stated that the SRA needed to address vigorously the difficulties affecting the delivery of new vehicles by manufacturers and vehicles' introduction into service.
- 4.16 Figure 11 on page 26 shows that the SRA has little direct involvement in the process of introducing new trains. Nor does the SRA have any powers to direct, manage or control the process or other organisations' involvement in it. The SRA cannot, therefore, by itself take the action needed to bring new trains into service on time and provide a reliable service. The timely introduction of reliable new trains depends on good partnership working across the industry. The Directions and Guidance therefore emphasised that the SRA needed to:
 - guide the industry through dialogue and persuasion and set priorities for action by itself and others; and
 - address the problems caused by fragmentation in the railway industry. In particular, the Authority was required to ensure that incentives and commercial interests were properly aligned to achieve common goals.
- 4.17 The Directions and Guidance also required the SRA to produce, and keep under review, a strategy for passenger rolling stock, reflecting potential demand for new vehicles and opportunities for the redeployment of the existing fleet as new trains displaced older ones. The Authority was expected to have regard to the desirability of moderating peaks and troughs in the demand for new trains. The SRA had already set itself five key objectives for rolling stock in its January 2002 Strategic Plan (Figure 17).

7 The SRA's five key objectives for improving rolling stock

The SRA set itself five key objectives for improving rolling stock.

- Speed up the process for delivery, testing and acceptance of new rolling stock
- Bring about a step change in the reliability of new rolling stock
- Bring about a significant improvement in the overall quality of stock on the network
- Promote efficiency in the supply chain and facilitate the planning of rolling stock cascades onto different parts of the network
- Promote more competition for new build by identifying barriers for manufacturers to enter the market and determining how the barriers could be reduced

Source: SRA, Strategic Plan January 2002

The SRA initially took action to progress particularly difficult cases involving the delivery of new trains

- 4.18 The Shadow SRA directly intervened in the case of c2c, one of our case studies, where the TOC was concerned about the reliability of its new vehicles and was reluctant to put them into service at the risk of breaching its obligations under its franchise agreement. The Shadow SRA helped to achieve a one-off agreement between the TOC and the manufacturer (Bombardier) that allowed the new trains to enter service and accumulate mileage in order that their reliability could be assessed. The vehicles were to be withdrawn from service, however, if their reliability fell below a pre-determined level set by the SRA and had an unacceptable impact on passengers.
- 4.19 The groups set up by the Shadow SRA to tackle problems on a strategic and process-wide level were, however, short-lived: the Short Term Action Group existed for five months, while the Train Acceptance Group fell into abeyance after 16 months and the Long Term Steering Group after 21 months. The SRA told us that it terminated the groups' work in order to focus on progressing particularly difficult cases involving the delivery of new trains:
 - it took action to stabilise the Virgin West Coast and CrossCountry franchises and safeguard their new train procurements, following reports from Virgin that the franchises could not remain financially stable without additional funding (paragraph 4.7);

- it re-negotiated its franchises with South Central and South West Trains, significantly reducing their lifetimes and stripping out the TOCs' previously agreed investment in infrastructure such as new track and longer platforms in order to concentrate on the delivery of Mark 1 replacement trains (paragraph 4.7);
- it established a Vehicle Acceptance Working Group with Network Rail and the company constructing the Channel Tunnel Rail Link to secure appropriate and timely input from both parties in the procurement of new trains; and
- in the case of Connex South Eastern, one of our case studies, the manufacturer (Bombardier) told us that the SRA assisted them to achieve a relaxation of the acceptance criteria in the contract between the manufacturer and the TOC that allowed new vehicles to enter service. The SRA more recently granted Connex South Eastern an additional £58 million subsidy in order to stabilise the TOC's finances and safeguard services, including the introduction of new rolling stock. It has more recently discontinued the TOC's franchise, over concerns about its financial management.

The SRA has had some success in encouraging partnership working in the introduction of new trains

4.20 Upon its establishment in February 2001, the SRA had to get to grips with the impact of the Hatfield derailment in October 2000 and then, soon after that, Railtrack's year in administration from October 2001 to October 2002. More recently, it has focused its resources on the key priorities of its involvement in establishing Network Rail in place of Railtrack, developing its new franchising policy and tackling cost escalation in the rail industry. In January 2002, however, it launched a project to meet the statutory deadlines for the modification and replacement of Mark 1 slam-door trains and minimise the number of new vehicles that would be unable to enter service because of the inadequate power supply and other infrastructure problems on the network. In August 2002, it produced an Industry Plan with the other main stakeholders, setting out the actions that needed to be taken (Figure 18). The SRA updated the Plan in December 2002, and the project is ongoing.

18 Key actions identified in the Industry Plan for the replacement of Mark 1 slam-door trains

The SRA identified a number of key actions that were needed to ensure delivery of the Mark 1 replacement programme.

	Key actions	Responsibility
Ma	ark 1 vehicles	
	Obtain exemption from requirement to modify stock for crashworthiness	TOCs & HSE
	Fit Train Protection and Warning System	TOCs & Network Rail
Re	placement vehicles	
	Place orders for outstanding replacement vehicles	TOCs
	Complete new vehicles on time and obtain route acceptance	Manufacturers
Po	wer supply upgrade	
	Identify and model power supply upgrade required	Network Rail
	Let contracts for upgrade of power supply	Network Rail
Pla	tform modifications	
	Obtain HSE approval of selective door opening where platforms cannot be lengthened	TOCs & HSE
	Let contract for platform modifications	TOCs
De	pots and stabling	
	Determine need for additional depots and stabling	TOCs
	Let contracts for depots and stabling	TOCs
Op	perational readiness	
	Provide driver training	TOCs
O١	verview	
•	Co-ordinate plans for power supply and vehicle supply to minimise trains in storage and extended use of Mark 1 stock	Network Rail, TOCs & SRA
	Develop contingency plans	SRA
	Develop contingency plans	SKA

Source: National Audit Office, based on the SRA's Industry Plan for Mark 1 replacement

The SRA has recently started to take further action, but its initiatives will take time to deliver improvements

- 4.21 Most of the TOCs that responded to our Spring 2003 survey considered that the SRA had made little or no progress against the rolling stock objectives set out in its January 2002 Strategic Plan (Figure 19). The SRA has little direct involvement in the process of introducing new trains. TOCs and ROSCOs have assumed primary responsibility for sharing good practice through two industry-led initiatives supported by the SRA: the National Rail Performance Plan (NRPP) and the National Fleet Reliability Improvement Programme (NFRIP). Nevertheless, 86 per cent of TOC respondents told us that the SRA did not share good practice or lessons learned to help the industry improve its record on introducing reliable new rolling stock. During the course of our study, we did not identify any evidence of the SRA exploiting its strategic position in the industry to identify and disseminate best practice in the introduction of new trains. The SRA told us, however, that interventions in two of our case studies (involving c2c and Connex South Eastern at paragraphs 4.18 and 4.19 respectively) were examples of where it had helped to improve the industry's understanding of the contractual problems associated with the introduction of new trains (see recommendation (ix)).
- 4.22 Now that Network Rail has been set up to replace Railtrack and the SRA's work on TOCs' re-franchising is progressing, the SRA has started to take action, or put plans in place, to assume more of a leading role in addressing the problems affecting the introduction of new trains and their provision of reliable passenger services:

- the SRA has sought to promote the inclusion of reliability targets in TOCs' lease agreements with ROSCOs since it published its Franchising Policy Statement in November 2002;
- from March 2003, it started to chair a new cross-industry Standards Strategy Group considering safety, technical and economic issues affecting the development of standards and regulations in the rail industry. One of the projects that this Group is taking forward is based on challenging the application of current safety standards, including the 'ALARP' principle, to determine whether they impose unnecessary demands at excessive cost. This work is not considering directly, however, the process for approving new rolling stock;
- In March 2003, it appointed a Technical Director, where previously there had been none, to lead on long term strategic technical and safety issues, including rolling stock. The role of the Director is to provide direction, set an industry-wide technical strategy, build and lead technical development within the industry, and drive implementation;
- in April 2003, it established a Rolling Stock Working Group to co-ordinate rolling stock issues within the SRA, including rolling stock cascade, performance of existing fleets and SRA policy towards new train procurement; and
- in July 2003, it launched an initiative requiring TOCs to deliver performance improvements including the reliability of their old and new rolling stock.
- 4.23 In its Rolling Stock Strategy of December 2003, the SRA set out how it would address several of the problems associated with the introduction of reliable new trains. In particular, it will:

9 Progress against the SRA's rolling stock objectives

Many TOCs told us that the SRA has made little or no progress against its rolling stock objectives.

SRA objective	Percentage of TOCs that considered the SRA had made little or no progress against this objective
To speed up the process for delivery, testing and acceptance of new rolling stock	86
To bring about a step change in the reliability of new rolling stock	91
To bring about a significant improvement in the overall quality of stock on the network	82
To promote efficiency in the supply chain and facilitate the planning of rolling stock cascades onto different parts of the network	95

- develop a high-level specification for the performance of new as well as refurbished stock to facilitate increased compatibility between different types of stock, substitutability of stock on similar routes and standardisation of components where appropriate;
- require TOCs to consult Network Rail and the Health and Safety Executive about new vehicles' interface with the network early in the process of procuring new trains; and
- appoint a Director with responsibility for all aspects of rolling stock, including taking the lead in ensuring that decisions about track and train investment are taken in a co-ordinated way.
- 4.24 All of these initiatives have the potential to help tackle key problems affecting the introduction of new trains, but they are recent in their inception and their impact cannot yet be assessed. Other parts of the rail industry

are seeking to address some of the problems. Industry stakeholders, led by the Railway Industry Association, the trade association for UK-based suppliers to the rail industry, are working to improve the supply chain. Progress has been slower than the SRA would ideally have liked, however, given the problems encountered in the rail industry over recent years. Several key problems in the new train process set out in Part 3 - in particular, the lack of organisational coherence within the railway industry and the lack of testing capacity remain to be solved.



Appendix 1 Study methodology

Expert panel

We convened an expert panel, consisting of senior representatives from the key organisations involved in bringing new trains into service, to:

- develop an agreed map of the process; and
- identify and assess the key factors that cause delay in bringing new trains into service and contribute to reliability problems once trains are in operation.

We used process and cognitive mapping techniques facilitated by Phrontis Ltd, and captured the results on QPR Process Guide software.

The panel met twice, first in January 2003 to document the process and then in February 2003 to critique it. Part 3 of this report, and the process map (Figure 11), are based primarily on our work with the panel.

The panel consisted of the following experts:

Organisation	Name and position
Alstom Transport UK	Nick Hughes, Commercial Director
Angel Trains Ltd	Peter Rigby, Operations and Sales Director
Association of Train Operating Companies	Richard Lockett, Director of Systems and Standards
Bombardier Transportation	Per Staehr, Chief Country Representative, UK
First Group plc	Clive Burrows, Rail Division Engineering Director Martin Costello, Head of Engineering Projects
Health and Safety Executive	Steve Gaskill, formerly HM Principal Inspector of Railways
HSBC Rail (UK) Ltd	Richard Carrington, Customer Service and Operations Manager
Network Rail	Keith Watson, Head of Acceptance Services and European Safety Ian Marlee, National Passenger Manager
Office of the Rail Regulator	Peter Griggs, formerly Head of Operations and Standards
Porterbrook Leasing Co Ltd	Paul Francis, Managing Director Tim Gilbert, Engineering Director
Railway Safety (now the Rail Safety and Standards Board)	Rod Muttram, formerly Chief Executive Brian Alston, formerly Controller, Railway Group Standards
Siemens Transportation Systems	David Wilson, General Manager Charles Wheaton, Senior Project Manager
Strategic Rail Authority	Richard Horton, Performance and Contracts Director

Case studies

We selected a sample of six new train orders for detailed review. The main issues we addressed concerned:

- the involvement of the Train Operating Companies (TOCs), and the lessons learned from the orders;
- the support provided by the SRA in helping to ensure that the orders ran smoothly;
- the incentives for TOCs to get new trains into service quickly; and
- the reliability of new trains.

We chose the sample in order to provide us with a range of experiences. The six orders covered diesel and electric trains, each of the manufacturers and a geographical spread of TOCs. They also included some orders that were complete and others that are still in progress. We interviewed key personnel, and reviewed key documents, at the TOCs and also at the SRA.

The orders were made by the following TOCs:

c2c

A relatively small TOC running mainly commuter services between London and Essex. Electric trains powered by overhead line. Trains manufactured by Bombardier (previously Adtranz).

Connex South Eastern

A large commuter TOC running services between London and Kent. Electric trains powered by third rail. Trains manufactured by Bombardier (previously Adtranz). This is the same model of train as the c2c order, but with a different means of power supply. Part of the Mark 1 replacement programme, the order is still in progress.

First Great Western

Runs high speed services between London, the West of England and South Wales. Their new diesel trains, manufactured by Alstom, were the first domestic high speed trains to enter service since privatisation of the rail industry.

First North Western

A regional TOC operating trains in the North West of England. Diesel trains manufactured by Alstom, not yet fully in service.

South West Trains

A large TOC operating both commuter and high speed services between London and the South West. Electric trains powered by third rail, manufactured by Siemens. Part of the Mark 1 replacement programme, SWT made the largest train order ever placed. The trains began to enter service in late 2003.

Virgin CrossCountry

An inter-city TOC operating high speed trains around the country. Diesel-electric trains manufactured by Bombardier.

Consultation with stakeholders

We met or corresponded with 14 organisations and invited their comments on the following key issues:

- the targets set for introducing new rolling stock, including the deadlines set in the rail regulations for modification and removal of Mark 1 trains, and the dates set in franchise agreements;
- any factors that might have impeded the organisations' ability to carry out their role in helping to bring reliable new passenger trains into service in good time and within budget, in particular:
 - the financial incentives and disincentives associated with the introduction of new trains; and
 - the effect of the terms of newly announced franchises on the rail sector's ability to meet statutory and franchise targets for the introduction of new trains;
- what the SRA has done to help the organisations overcome these factors, and how successful the organisations consider the support of the SRA has been. This included the extent to which the SRA shared good practice and lessons learned between the various organisations involved in bringing new trains into service; and
- what work the organisations have done separately from the SRA to overcome these factors, and what the results have been.

We consulted with:

Train manufacturers

- Alstom Transport UK
- Bombardier Transportation
- Siemens Transportation Systems

Rolling stock leasing companies (ROSCOs)

- Angel Trains Ltd
- HSBC Rail (UK) Ltd
- Porterbrook Leasing Company Ltd

Other key stakeholders

- Association of Train Operating Companies
- Health and Safety Executive
- Network Rail
- Office of the Rail Regulator
- Rail Passengers Council
- Rail Safety and Standards Board (formerly Railway Safety)
- Railway Forum
- Railway Industry Association

Survey of Train Operating Companies

Between March and June 2003, we carried out a survey of all 25 train operating companies (TOCs). Sixteen of the TOCs have made orders for new trains, but we also wished to ascertain the views of those TOCs that have not made orders. The survey sought TOCs' views and experiences on a wide range of issues relating to the introduction of new trains, including the role of the SRA and the reliability, costs and passenger capacity of new trains.

We received responses from all 25 TOCs, and analysed their responses on:

- the SRA's performance against its rolling stock objectives;
- the SRA's role in sharing good practice and lessons learned between the TOCs;
- the reasons for their successes and difficulties in getting new trains into service;
- the costs of their new trains, compared with expected costs and with the costs of the old trains they replaced;
- the reliability of their new trains, compared with the old trains they replaced; and
- the benefits to passengers of the new trains.

Interviews with key organisations

Between August 2002 and September 2003, we interviewed senior staff at the key organisations responsible for getting new trains into service. We ascertained:

- the roles and responsibilities of each organisation; and
- how these roles and responsibilities contribute to getting new trains into service, and to improving their reliability once in service.

We met the following organisations:

- Association of Train Operating Companies
- Department for Transport
- Health and Safety Executive
- Network Rail
- Strategic Rail Authority

Data analysis

In addition to the data obtained through our survey of TOCs and our six case studies, we analysed:

- SRA data as at November 2003 on the progress of train orders against targets set in manufacturing contracts, franchise agreements and the statutory deadlines for the modification and replacement of Mark 1 rolling stock; and
- data from the Association of Train Operating Companies for the six months to September 2003, on the reliability of both new and old trains.

Visit to a manufacturer

We visited the British headquarters of Bombardier Transportation in Derby and received a tour of the factory, to enable us to see at first hand an example of the facilities for manufacturing new trains.

Appendix 2 Glossary of organisations

Association of Train Operating Companies (ATOC)	The Association of Train Operating Companies (ATOC) is an unincorporated association owned by its members, the Train Operating Companies (TOCs) that provide passenger rail services. ATOC is the official voice of the passenger rail industry and provides collective representation to the government and other bodies, such as the media, on behalf of the industry. It also provides its members with a range of services that enable them to comply with the conditions in their franchise agreements with the Strategic Rail Authority (SRA) and their track access agreements with Network Rail.
Department for Transport (DfT)	The Department for Transport's objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment. As part of this overall objective, the Department aims to improve rail punctuality and reliability and meet rising demand. The Department provides funding to the Strategic Rail Authority and is responsible for transposing the European rail interoperability Directives into UK law.
Health and Safety Commission (HSC)	The Health and Safety Commission ensures that risks from work activities are properly controlled. It advises Ministers on all matters relating to health and safety at work. It conducts and sponsors research, promotes training, provides an information and advisory service, and submits proposals for new or revised regulations and approved codes of practice. The Commission is a statutory Non-Departmental Public Body (NDPB) with Crown status set up under the 1974 Health and Safety at Work Act.
Health and Safety Executive (HSE)	The Health and Safety Executive (HSE) is a statutory Non-Departmental Public Body (NDPB) with Crown status set up under the 1974 Health and Safety at Work Act. It receives funding via the Health and Safety Commission (HSC) from the Department for Work and Pensions, and is effectively the operational arm of the Commission. The HSE advises the HSC on policy and general operational issues to ensure that risks to people's health and safety from work activities are properly controlled.
Her Majesty's Railway Inspectorate (HMRI)	HM Railway Inspectorate (HMRI) is part of the Health and Safety Executive. Its operational and technical inspectors focus on the railway industry and offer guidance, manage the railway permissioning regimes and ensure compliance with the law by inspecting and investigating accidents and complaints. HMRI has been involved in approvals work on the railways since 1840, as an independent authority aiming to ensure public confidence.
Network Rail	Network Rail is the owner and operator of the railway infrastructure. It maintains, renews and upgrades every aspect of the infrastructure including the track, signalling systems, bridges, viaducts, tunnels, level crossings and stations. Network Rail is a company limited by guarantee. It has no shareholders, but is accountable to members, who do not receive dividends or share capital. All of Network Rail's profits are reinvested into the rail infrastructure.
Office of the Rail Regulator (ORR)	The Office of the Rail Regulator is a small, non-ministerial government department staffed by civil servants, including a team of experienced railway operational and engineering staff, and headed by the Rail Regulator. The Rail Regulator is an independent statutory office holder appointed by government under the Railways Act 1993. The Regulator receives general guidance from the Secretary of State for Transport under the 1993 Act. The Regulator aims, through independent, fair and effective regulation, to achieve the continuous improvement of a safe, well-maintained and efficient railway which meets the needs of its users and to facilitate investment in capacity to satisfy the demands of growth in passenger and freight traffic at the time it is needed. The Regulator's principal function is to regulate Network Rail's stewardship of the national rail network infrastructure.
Rail Passengers Council (RPC)	The Rail Passengers Council and Committees are the voice of rail passengers and have been set up by Parliament to protect passengers' interests by ensuring that users' views are fully represented whenever decisions are taken that affect the rail network. Where concerns arise, the Council can ask the Strategic Rail Authority (SRA) to intervene and use its powers to resolve problems. The Council co-ordinates the work of Rail Passengers Committees representing each of six English Regions, Scotland and Wales.

Rail Safety and Standards Board (RSSB)	The Rail Safety and Standards Board (RSSB) was established on 1 April 2003, implementing one of the core sets of recommendations from the second part of Lord Cullen's public inquiry into the Ladbroke Grove train accident. Its prime objective is to lead and facilitate the railway industry's work to achieve continuous improvement in the health and safety performance of the railways in Great Britain, and thus to facilitate the reduction of risk to passengers, employees and the affected public. As part of its role the RSSB establishes and maintains Railway Group Standards. The RSSB is a not-for-profit company owned by major industry stakeholders. The company is limited by guarantee and is governed by its members, a board and an advisory committee. It is independent of any single railway company and of their commercial interests.
Railway Forum	The Railway Forum is an industry-wide body promoting the growth of a safe, efficient and affordable railway in the UK. It is the only UK railway group that represents the majority of the industry. This includes passenger and freight operating companies, rolling stock leasing companies (ROSCOs), infrastructure providers, equipment suppliers, Network Rail, the Railway Industry Association and Association of Train Operating Companies (ATOC). Membership is open to any organisation that is engaged in any capacity in the UK railway industry. The Railway Forum's roles are principally to act as a lobby group and think tank for the industry.
Railway Industry Association (RIA)	The Railway Industry Association (RIA) is the trade association for UK-based suppliers of equipment and services to the world-wide industry. It has more than 130 member companies from across the range of railway supply. RIA provides its members with technical, commercial and political information; represents the supply industry's interests to government, Network Rail and others; provides opportunities for dialogue and networking between members; and undertakes promotional activity through briefings, visits overseas, hosting inwards visits and organising UK presence at exhibitions overseas. In addition, RIA sponsors the Value Improvement Programme, working with other industry parties to drive out waste from the railway supply chain.
Railway Safety	Railway Safety was the predecessor body to the Rail Safety and Standards Board (RSSB). Prior to the establishment of the RSSB, Railway Safety had responsibility, amongst other things, for establishing and maintaining Railway Group Standards.
Rolling Stock Leasing Companies (ROSCOs)	Rolling stock leasing companies (ROSCOs) are the owners of passenger rolling stock, which they lease to Train Operating Companies (TOCs), and finance the purchase of new trains. There are three ROSCOs, all owned by banks - Angel Trains Ltd, HSBC Rail (UK) Ltd and Porterbrook Leasing Company Ltd.
Strategic Rail Authority (SRA)	The Strategic Rail Authority (SRA) was created under the Transport Act 2000 as a body corporate to provide a single organisation for strategic planning, co-ordinating and supervising the activities of the rail industry, and for the disbursement of public funds. It formally came into being on 1 February 2001. As well as providing overall strategic direction and leadership for Britain's railway, the SRA lets and manages passenger franchises, develops and sponsors major infrastructure projects, manages freight grants, publishes an annual Strategic Plan, and is responsible for some aspects of consumer protection. The SRA operates under Directions and Guidance (D&G) from the Secretary of State for Transport. In Scotland it is also subject to Directions and Guidance from the Scottish Minister for Transport, and is subject to Directions and Guidance from the Mayor of London in respect of services operating within London.

Train Manufacturers	Train manufacturers build new rolling stock to a specification agreed between the manufacturer, ROSCO and TOC. The contract for building a new train is between the train manufacturer and the ROSCO and, sometimes, the TOC. Three train manufacturers have produced rolling stock for the UK market following privatisation - Alstom Transport UK, Bombardier Transportation and Siemens Transportation Systems. Two of the manufacturers, Alstom and Bombardier, each have a factory in the UK.
Train Operating Companies (TOCs)	The 25 Train Operating Companies (TOCs) are responsible for providing passenger rail services in the UK. The TOCs operate under franchise agreements with the Strategic Rail Authority and lease trains from ROSCOs to enable them to operate services.
Vehicle Acceptance Bodies (VABs)	Vehicle Acceptance Bodies (VABs), or vehicle acceptance and conformance certification bodies as they are more properly termed, are accredited by the Rail Safety and Standards Board (RSSB) on behalf of Network Rail. VABs certify that new and modified rolling stock designs, construction and maintenance arrangements will comply with Railway Group Standards.

Reports by the Comptroller and Auditor General, Session 2003-2004

The Comptroller and Auditor General has to date, in Session 2003-2004, presented to the House of Commons the following reports under Section 9 of the National Audit Act, 1983:

		Publication date
Culture, Media & Sport		
Income generated by the Museums and Galleries	HC 235	30 January 2004
Cross-government		
Managing resources to deliver better public services - Report - Case studies	HC 61-I HC 61-II	12 December 2003 12 December 2003 28 January 2004
departments' preparations	HC 234	20 January 2004
Defence		
Operation TELIC - United Kingdom Military Operations in Iraq Major Projects Report 2003	HC 60 HC 195	11 December 2003 23 January 2004
Law, Order & Central Institutions		
Youth Offending: The delivery of community and custodial sentences	HC 190	21 January 2004
Public Private Partnership	0	
Refinancing the Public Private Partnership for National Air Traffic Services	HC 157	7 January 2004
Regulation		
Out of sight - not out of mind: Ofwat and the public sewer network in England and Wales	HC 161	16 January 2004
Transport		
Strategic Rail Authority: Improving passenger rail services through new trains	HC 263	4 February 2004

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