Office of Rail Regulation

PR08 Performance Regime Recalibration

Final Report

ARUP

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This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no

responsibility is undertaken to any third party

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1 Introduction

Arup was appointed by the Office of Rail Regulation (ORR), in conjunction with Network Rail (NR) and the Association of Train Operating Companies (ATOC), in May 2008 to recalibrate the Network Rail and Train Operating Company (TOC) Schedule 8 Performance Benchmarks and the Schedule 8 TOC Payment Rates, as part of the 2008 Periodic Review of Performance payments within the railway industry.

This report presents our findings. Following this introduction, the project brief is summarised. The underlying principles and general methodology of the recalibration process are then described, including sources of data, and issues relating to data remapping and cleansing. The Network Rail and TOC Benchmark recalibration process is then described in detail, including the data and methodologies employed, and calculation issues encountered. The Responsibility Matrix development methodology is then described, including the background to and origins of the approach, the data used, and the means adopted for dealing with TOC-on-TOC interactions not covered by the Responsibility Matrix. Finally, the TOC Payment Rate calculation process is described in detail, including the data used, the detailed methodology, and the calculation of Charter Liability.

We would like to record our thanks for the assistance provided by all those involved in the process, including ORR, ATOC, individual TOCs, and in particular Network Rail, whose staff spent a significant amount of time assisting with data provision and interpretation issues.

2 Recalibration Brief

2.1 Project Brief

The overall project brief was to conduct a review of certain parameters of the railway industry Schedule 8 passenger performance regime, and, on the basis of the review, to recommend appropriate changes to those parameters, and thus to assist with ORR's Periodic Review 2008 (PR08).

The specific objectives of the project were (i) to calculate and update the performance 'benchmarks' for Network Rail and the TOCs, based on the analysis of historic performance data, and (ii) to calculate and update the TOC Payment Rates, again based on analysis of historic data, but covering both performance and actual train running data.

The calculation of Network Rail's Payment Rates is a separate issue, and, although our original proposal for the project included the option of recalibrating the Network Rail Payment Rates, this option was not exercised, and this element was thus excluded from the final project brief.

2.2 Schedule 8 – Background to Project

The Schedule 8 Performance Regime is a key element of Britain's privatised railway industry, and the payments made and received under the regime are a significant element of the outgoings, revenues and profits of both the Train Operating Companies and Network Rail.

The aim of the Schedule 8 Performance Regime is to provide TOCs and Network Rail with suitable incentives to maintain and improve their operational performance. The effects of changes in individual organisational performance levels, and changes to timetables, infrastructure, passenger and freight demand and the resulting changes in organisational interactions, mean that the performance regime must be periodically reviewed and updated to accurately reflect these changes.

Performance includes both punctuality (measured in terms of lateness at specified Monitoring Points on the railway network) and cancellations. A single performance measure is facilitated by representing cancellations in terms of an equivalent number of minutes of lateness (referred to as 'Deemed Minutes Lateness', or DML), and combining these with the corresponding lateness values (referred to as 'Actual Minutes Lateness', or AML)¹.

The regime is based on the benchmarking of both TOCs and Network Rail against their historic performance: when either party underperforms relative to its benchmark, it is then required to pay compensation to the party affected. Equivalently, when either party outperforms its benchmark, it receives an incentive payment from the beneficiary of this 'over-performance'. The underlying idea is that if both parties perform to their respective benchmarks, the regime is then financially neutral. The structure of the payment levels reflects the effects on passenger revenue of train lateness, the principle being that where a TOC experiences delays attributable to another party (either Network Rail or another TOC), Schedule 8 compensates them for the resulting loss of revenue.

There are two separate payment mechanisms within Schedule 8. The first deals with the effects of delays and cancellations caused by Network Rail, and the second with the effects of delays and cancellations caused by TOCs to other TOCs or to Freight Operating Companies, or FOCs ('TOC-on-TOC, TOC-on-FOC delay').

¹ It is worth noting that the schedule 8 regime operates using lateness (i.e. the difference between the planned and actual times at which a train arrives at a specific point). This must be distinguished from delay, which relates to the specific effect of an incident. If a train is delayed this may or may not give rise to lateness, depending on whether the train is able to make up the time which has been lost. Thus a delay may not, in itself, affect passengers if they still arrive at their destination on time.

TOC-on-TOC delay is handled by means of the 'star model', under which Network Rail essentially acts as a central clearing house for compensation payments, rather than payments being made directly between individual TOCs.

Thus the two mechanisms are as follows:

- Network Rail makes payments to (or receives payments from) TOCs, based on the degree to which it has under- (or over-) performed relative to its benchmark for Network Rail-attributable delays, <u>including TOC-on-TOC and TOC-on-FOC delays</u>; and
- Network Rail receives payments from (or makes payments to) each TOC, based on the degree to which the TOC has under- (or over-) performed relative to its benchmark for TOC-on-Self delays. The payment rates for this element take into account the historic relationship between TOC-on-Self and TOC-on-TOC delays, which means that Network Rail recovers the payments it has made in respect of TOC-on-TOC delays, and its financial position in respect of these remains neutral.

To maximise the effectiveness of the regime, benchmarks should be realistic and the payment rates should be set at a level that appropriately rewards improved performance or penalises poor performance from either party. It is particularly important that the benchmarks are set at appropriate levels, and that the benchmark calculations are carried out on a consistent basis.

In respect of the TOC payment rates, a key issue is the distribution of the payments between the Service Groups of the 'perpetrating TOCs', i.e. the TOCs responsible for delays and cancellations experienced by other operators; while delays and cancellations are recorded at the Service Group level (and, indeed, at the CAPRI/ Contract Group and individual train level) for the 'victim TOC', they are only recorded at the TOC level for the perpetrating TOC, and a means is required of distributing the attributed delays and cancellations between the perpetrating TOCs' individual Service Groups. This issue is described in detail in the following sections of this report.

2.3 Key Assumptions and Issues

The calibration period used was 11 December 2005 – 8 December 2007 (Periods 0610 to 0809 inclusive), with the exceptions of CrossCountry and Virgin West Coast, as explained in Section 4.3.

The December 2007 timetable was used as the basis for the TOCs, Service Groups and service patterns employed in the recalibration.

No changes to services beyond December 2007 were incorporated in the recalibration, with the exception of the amalgamation of Gatwick Express with Southern.

Significant 're-mapping' of TOCs and Service Groups was required in the recalibration process to take account of franchise changes that occurred during the recalibration period, including the creation of the 'Greater Western' franchise and the realignment of TOCs in the Midlands. This is described in more detail in Section 3.2.2.

All monetary values (i.e. the TOC payment rates) derived in the course of the recalibration process are at 2008-9 price base.

3 Methodology

3.1 Underlying Principles

The two essential principles underlying the recalibration process are:

- Benchmarks represent recent historic levels of Performance; and
- TOC Payment Rates represent TOCs' liabilities to other TOCs resulting from Performance shortfalls.

Benchmarks are pre-determined levels of Performance Minutes which are set by the Regulator for both Network Rail and the TOCs. Their values reflect historic levels of performance, and, if a TOC or Network Rail performs 'better than benchmark', a payment from the other party is triggered; if, on the other hand, performance is below benchmark level, a payment to the other, affected party is triggered.

When trains operated by one TOC are delayed or cancelled as a consequence of problems caused by another TOC, the 'victim TOC' is compensated by Network Rail, which has in turn to recoup the compensation costs from the 'perpetrating TOC'. The TOC Payment Rates are calculated with the objective of ensuring that Network Rail's payments to victim TOCs are balanced by payments from the corresponding perpetrating TOCs.

These principles and objectives are reflected in the Benchmark calculation process and in the Responsibility Matrix and TOC Payment Rates calculation processes, described in detail in Sections 4, 5 and 6, respectively.

3.2 Data Sources

Three primary sources of data were used in the recalibration process: PEARS and PSS (Performance Systems Strategy) performance data, and ACTRAFF (Actual Traffic) train running data.

3.2.1 **PEARS**

The PEARS system is used to calculate payments to be made in relation to lateness, and contains the relevant lateness and delay data at a fairly aggregate level. It also has a number of intermediate datasets which can be used for the benchmark calculations for some TOCs: because the PEARS data are not updated to reflect changes in TOCs and Service Groups that result from the re-franchising process, they can only be used directly for those TOCs that have not been affected by re-franchising during the recalibration period. The PEARS system also contains essential reference data which were used in the recalibration process. These data were supplied by Network Rail.

3.2.2 PSS

As noted in Section 2.3, significant re-mapping of data was required for some TOCs and Service Groups as a result of franchise changes. While this was necessary simply to ensure that historic records were updated to reflect the situation at December 2007, it was also essential to ensure that TOC-on-Self and TOC-on-TOC delays and cancellations were correctly attributed. For example, in the case of the Greater Western franchise, formed by the amalgamation of the former Great Western, Thames Trains and Wessex franchises, TOC-on-TOC delays inflicted by one of the three former franchises on another are equivalent to TOC-on-Self delays in the amalgamated franchise, and such records within the recalibration period, but prior to the franchise change, had to be updated accordingly. Similarly, the splitting of Central Trains services between London Midland and other TOCs meant that some historic TOC-on-Self delays had to be re-mapped to the appropriate perpetrating and victim TOCs as TOC-on-TOC delays. Some 'intra-TOC' re-mapping was also required to reflect changes within TOCs at Service Group and individual train levels. The main franchise changes that occurred during the recalibration period are summarised in Table 3.1.

New Franchise	Old Franchise	Date of Change
First Greater Western	First Great Western	April 2006
First Greater Western	First Great Western Link (Thames Trains)	April 2006
First Greater Western	Wessex Trains	April 2006
First Capital Connect	Thameslink	April 2006
First Capital Connect	WAGN	April 2006
CrossCountry	Central Trains	November 2007
CrossCountry	Virgin CrossCountry	November 2007
East Midlands Trains	Central Trains	November 2007
East Midlands Trains	Midland Mainline	November 2007
London Midland	Central Trains	November 2007
London Midland	Silverlink	November 2007
London Overground	Silverlink	November 2007
Transpennine Express	Virgin CrossCountry	December 2007
Virgin West Coast	Virgin CrossCountry	November 2007
Southern	Gatwick Express	June 2008

Table 3.1: Franchise Changes During the Recalibration Period

In such cases where TOCs and/or their constituent Service Groups changed during the recalibration period as a result of the re-franchising process, PSS data were used, since the data in this system are updated to reflect these changes, in contrast to PEARS. PSS data include detailed historic delay and lateness records at incident and train level respectively, and were obtained from Network Rail. PSS is held in an Oracle database, which allows great flexibility in the way that data can be extracted and summarised. Where the PEARS data were unsuitable for the benchmark calculations, PSS data were used.

Two separate queries were conducted within PSS: initially, incident-level delay information was extracted, and an additional query was subsequently introduced to extract train-level timings information. The use of these datasets is described in detail in Section 4.

Several unforeseen issues were encountered during the extraction of the PSS data. The key issue was the time required to obtain the data due to download restrictions, although ongoing discussion with and assistance from Network Rail accelerated this process as the project continued.

Several issues were also encountered with specific data for those operators which had been subject to re-franchising, and whose records thus required re-mapping. It was found that, whilst some data fields had been re-mapped to correctly attribute delay in accordance with the franchise structure that applied at the agreed 'recalibration point' of December 2007, others remained in their originally-coded format to preserve the original dataset. This issue related to the mapping of 8-digit train service codes to Service Groups, and 'Responsible Manager' codes. In order to address these inconsistencies in the data, additional data, in

the form of appropriate lookup tables², were provided by Network Rail to ensure that all data fields could be re-mapped correctly.

3.2.3 ACTRAFF

ACTRAFF³ data for April 2007 – March 2008 inclusive were used to develop the Responsibility Matrix used for the calculation of the TOC Payment Rates (see Sections 5 and 6). ACTRAFF provides daily records of the numbers of trains using each track section of the national heavy rail network, disaggregated by TOC/FOC, Service Group, eight-digit Train Service Code, Peak type (i.e. Peak, Off-Peak or 'All Trains') and train Class. This dataset was supplied by DeltaRail.

Data for the year to March 2008 were used in order to provide an up-to-date and representative record of train service interactions during the latter part of the recalibration period. Data prior to April 2007 were not used because it was considered that any benefits arising from the additional records would be outweighed by the disadvantages of their comparative obsolescence.

3.3 Re-mapping of Data

As noted above, re-mapping of several fields in the PSS dataset was required to ensure that delay incidents were correctly attributed for both 'perpetrating' and 'victim' train operators.

3.3.1 Service Group Re-mapping

A Service Group re-mapping table was provided by Network Rail so that all eight-digit Train Service Codes could be used to obtain the correct TOCs and Service Group Codes in force at December 2007. This was also used to address situations where trains' Service Group Codes change en route, and delays are allocated to the Service Group in force at the train's ultimate destination.

Another issue to be addressed was the re-mapping of Gatwick Express services to their new Southern Service Group (HW07) to reflect their incorporation in the Southern franchise. Although this occurred after the December 2007 recalibration point at the Summer 2008 timetable change, it was agreed that this change should be incorporated, since it occurred prior to the completion of the recalibration process.

This re-mapping approach ensured that all of these issues were addressed, and that an updated and consistent delay dataset was used for the recalibration process.

3.3.2 Delay Re-attribution

In addition to the re-mapping of the Service Groups themselves, some re-attribution of delay minutes was required to ensure that TOC-on-TOC and TOC-on-Self delay minute records remained consistent after the Service Group re-mapping – this was a particular issue where TOCs were merged (e.g. First Greater Western) and/or split (e.g. the Midlands re-franchising process). This process was facilitated by two lookup tables provided by Network Rail, one re-mapping all Responsible Manager codes to reflect the December 2007 situation, and the second taking account of changes resulting from the Midlands re-franchising process. Some issues, such as Heathrow Connect being allocated to First Great Western and BAA at different locations along its route, had to be resolved separately.

² A lookup table is a table of data, each record of which contains a unique value, or 'key', which may be used as a reference to the other, corresponding data elements of the record. In the situation referred to here, the eight-digit Train Service Code is used as a key to identify (i.e. look up) the corresponding Responsible Manager Code or TOC and Service Group Code.

³ ACTRAFF (Actual Traffic) data comprise records of actual, as opposed to planned, train movements on the railway network. The data used for this project contains daily counts of the numbers of trains operating over each discrete track section, classified by Operator, Service Group and eight-digit Service Code. Train tonnage and other data are also available. The dataset is produced by DeltaRail.

3.3.3 Peak Type Re-mapping

Following the Service Group re-mapping, it became necessary to re-map some Peak types. Delay records are coded either to 'Peak' or 'Off-Peak', where a defined Peak type exists, or else to 'All Trains'. Some Service Group re-mapping, however, led to services transferring between these Peak types. The conversion of services from 'Peak' or 'Off-Peak' to 'All Trains' was straightforward. The reverse situation was more complex, however, and the uncertainty surrounding the process was resolved by running the Benchmarking calculations twice, once with the unknown Peak types set to 'Peak', and again with them set to 'Off-Peak', with the averages of the two sets of results (which were, in any case, very close) being used.

One issue concerning Peak type remains unresolved. It was found that Gatwick Express records in PSS use PPM Peak definitions (where all weekend services are designated off-peak) instead of those defined in Schedule 8 (where the peak includes some Saturday services). This issue is still outstanding. As a consequence, the TOC Payment Rate for those First Capital Connect service groups which interact with Gatwick Express Saturday services is lower than it would otherwise be, and payments to Southern will also be slightly reduced, although this latter effect is relatively insignificant.

3.4 Merged and Planned Delays

The extracted PSS data included records whose Dispute Status was listed as 'merged'. A lookup table was provided by Network Rail to identify whether these records were still in dispute or had been resolved, and the relevant delay records were updated accordingly.

All Planned Delay (Incident Category = 801) records were removed from the process.

3.5 Excluded Days

Records for Christmas Day and Boxing Day are excluded from all datasets and calculations, because of the unusually low levels of train movements on those days. Other 'exceptional days' were considered for exclusion, but were retained in the datasets in order to maintain a representative set of data.

4 Benchmarks

4.1 Reference Data

The benchmarking process was undertaken using the latest available reference data for the calibration period. This was the December 2007 PEARS dataset, from which all Monitoring Point Weightings and Deemed (i.e. cancellation-equivalent) Minutes Lateness were obtained.

4.2 Methodologies

Three different recalibration methodologies were used, depending on whether the TOC under consideration had been affected by the re-franchising process during the recalibration period, and, if so, the extent of those effects:

- Where an operator was unaffected by re-franchising, a standalone PEARS methodology was used.
- Where re-franchising changes had occurred, one of two methodologies using additional, PSS data was used. The first PSS methodology joins PSS delay data to PEARS lateness data, enabling the correct re-mapping of TOC-on-Self and TOCon-TOC delay following franchise changes, and the subsequent re-mapping of PEARS lateness data. This approach was used for most operators in which changes occurred at a Service Group or CAPRI/Contract Group Code level.
- Where sub-CAPRI code changes occurred (i.e. one or more, but not all, trains in a CAPRI group were affected), a second PSS methodology was adopted, using PSS delay and lateness data alone in order to recreate a pseudo-PEARS dataset, since PEARS lateness data could not be disaggregated to accurately represent these changes.

(Note: For the last approach, where pseudo-PEARS data was produced from the PSS timings data, it was necessary to add information on the directionality of each Monitoring Point, using the recorded STANOX locations and PEARS reference data, which proved to be quite time-consuming. Some multiple records were present within the dataset where manual adjustments had been made to the recorded lateness. Where these were found, the record with the highest 'timing sequence number' was retained, and all other records were dropped.)

4.3 Recalibration Periods

The performance data used for most of the recalibration process covered Periods 0610 to 0809 inclusive, i.e. 11 December 2005 – 8 December 2007, the two years prior to the recalibration point. The exceptions to this were the data used for CrossCountry and Virgin West Coast, which covered Periods 0609 to 0808, i.e. 13 November 2005 – 10 November 2007. The latter data range was used to avoid the need for the re-mapping of the complex interim arrangements that were in place during the transition of some services north of Birmingham and Manchester on the West Coast Main Line from Cross Country to Virgin West Coast and TransPennine Express.

4.4 Calculation Issues

The recalibration process was complicated and made more time-consuming than originally envisaged by the following issues:

 Re-franchising and re-mapping of a number of TOCs, and in particular the Midlands refranchising which saw the redistribution of services from four existing TOCs (Central, Silverlink, Cross Country and Midland Main Line) to four new TOCs (London Midland, East Midlands, Cross Country and London Overground);

- The need to assign directionality to Monitoring Point weightings in certain cases when dealing with the most complex remapping issues; and
- Peak Type re-mapping for certain service groups, when services were remapped from a peak or off-peak service group to an "all trains" service group, or vice versa.

One specific issue arising out of the Midlands refranchising relates to the transfer of Birmingham-Scotland services from the Cross Country TOC to Virgin West Coast. In some cases prior to the remapping these services formed part of Cross Country South West to Scotland services, the South West – Birmingham portion of which remains with Cross Country (albeit in a different form). However, the remapping within PSS has the effect of transferring liability for TOC on TOC delays caused by these services entirely to Virgin, which in turn gives rise to a liability to First Great Western which should rest with Cross Country. As this liability is clearly identifiable from the calculations, it has been agreed with the parties concerned that a manual adjustment should be made to transfer a proportion of this liability back from Virgin to Cross Country.

5 Responsibility Matrix

5.1 Principles

The Responsibility Matrix is a key element of the TOC Payment Rate calculation process. As noted in Section 2.2, above, delay and cancellations data are recorded at a detailed level for the 'victims', but are only recorded at the TOC level for the perpetrating TOC, i.e. no records are kept of the Service Group or individual train responsible for delays or cancellations.

Since the Payment Rates are to be disaggregated by causing Service Group, an alternative means of attributing delays and cancellations at the Service Group level is required, and this is provided by the Responsibility Matrix. This approach was first used by KPMG in the 2000 recalibration, and was refined by DeltaRail in the 2003 recalibration, which used ACTRAFF data to generate a matrix based on actual, rather than planned, train running data.

The fundamental assumption underlying the responsibility matrix approach is that the attribution of delays and cancellations should reflect the extent of 'shared running' between TOCs on the railway network, and the resulting interactions between the trains of different TOCs operating on shared sections of the network, as 'transmitted' through the signalling system.

These interactions take place at three levels, as recorded in the ACTRAFF data: (i) shared track sections, where different operators' trains run on the same track sections, thus passing delays more-or-less directly between preceding and following services; (ii) shared 'corridors', where trains do not necessarily share the same track sections, but may instead run on parallel tracks on a shared route (e.g. in the same direction on the Up Fast and Up Slow lines on a four-track route, or in opposite directions on a two-track route), with service interactions and delays being transmitted at crossovers, etc.; and (iii) shared locations, where trains do not run in parallel at any stage, but interact at locations where two tracks or routes cross each other at a point (a diamond crossing being the most literal example of this), or simply meet without crossing, e.g. where services on a branch line run to and from a junction with the main line at a station, without running onto the main line (examples include some branch line services to and from Maidenhead, Marks Tey and Oxenholme).

Once distinct sets of such interactions have been established (using a descending 'shared track, shared corridor, shared location' hierarchy), the proportions of the total TOC-on-TOC interactions experienced by each of the perpetrating TOCs' Service Groups are determined, with these splits/proportions being used to attribute Actual and Deemed Minutes Lateness between perpetrating TOC Service Groups. The results are disaggregated by 'Peak Type' and 'Day Type', thus effectively producing distinct matrices for Peak, Off-Peak and 'All Trains' services, and for weekday, Saturday and Sunday services.

Some TOC-on-TOC delays and cancellations occur where there is no shared running between the perpetrating and victim TOCs (e.g. South West Trains and ScotRail, between which delays may be transmitted directly via CrossCountry services, or indirectly, via two or more 'intermediate' operators), so that no apportionment between perpetrating Service Groups can be determined from the ACTRAFF data. In such situations, the Actual and Deemed Minutes Lateness are attributed between the perpetrating TOC's Service Groups in proportion to the Service Groups' respective shares of TOC-on-Self delay, which are available from the Performance data.

5.2 Methodology

Some pre-processing of the ACTRAFF data was required prior to the generation of the Responsibility Matrix, in order to adjust some anomalous train count data, to remove data for excluded dates, and to re-map Train Operator and Service Group Codes that had

subsequently changed as a result of the re-franchising process; some rationalisation of Peak Type records within the dataset was also required.

The amended ACTRAFF data were then used to generate the Responsibility Matrix, as outlined above. Cases of shared running by different TOCs are identified and recorded at the track, corridor and location levels. Where shared running at the track level was identified, any shared running at the corridor and location levels for that TOC and Service Group combination was ignored; where track-level shared running was not found, but corridor-level shared running was, any location-level shared running for that combination was in turn ignored; finally, if no track- or corridor-level shared running was found, any identified location-level shared running records that were used.

The shared running data were used to calculate 'Joint Running Coefficients' (JRCs) for perpetrating and victim Service Group pairs, and also for perpetrating TOC and victim Service Group pairs (i.e. aggregating the results at a perpetrating TOC level). The JRCs were calculated as the product of the perpetrating and victim train counts and the track section or corridor length (i.e. as train miles or train km) for shared track and shared corridor records, and simply as the product of the perpetrating and victim train counts for shared location running.

Dividing the Service Group-level JRCs by the TOC-level equivalents then produced the proportion of joint running for each Service Group in each perpetrating TOC, and thus the final Responsibility Matrix enabling the delays and cancellations experienced by each victim Service Group to be allocated between the Service Groups of the perpetrating TOC, thus enabling Service Group-level attribution of delays (Actual Minutes Lateness) and cancellations (Deemed Minutes Lateness), and the disaggregation of TOC Payment Rates.

As noted above, not all TOC-on-TOC interactions are covered by the ACTRAFF data; for these cases, an alternative approach was employed, using the calculated proportions of TOC-on-Self delay to attribute TOC-on-TOC delays and cancellations between the Service Groups of perpetrating TOCs.

6 TOC Payment Rates

As noted above, the TOC Payment Rates represent perpetrating TOCs' liabilities to victim TOCs resulting from TOC-on-TOC delays and cancellations, and are calculated to ensure that Network Rail's payments to the victim TOCs are balanced by the payments from the perpetrating TOCs to Network Rail. The Payment Rates are therefore calculated on the basis of historic TOC-on-TOC delays and cancellations, and Network Rail's Payment Rates to the victim TOCs.

6.1 Methodology

The same cleansed and re-mapped historic delay and cancellations data as used in the Benchmark calculations were used to calculate the TOC Payment Rates.

The TOC-on-TOC delay and cancellations for each perpetrating TOC Service Group were calculated as a proportion of the total Network Rail-attributable Actual Minutes Lateness (delays) and Deemed Minutes Lateness (cancellations), using the Responsibility Matrix to distribute the liabilities among the Service Groups.

This calculation had four distinct elements: TOC-on-TOC delays and cancellations covered by the Responsibility Matrix; TOC-on-TOC delays and cancellations not covered by the Responsibility Matrix, for which the division of TOC-on-Self delay between the perpetrating TOCs' Service Groups were used; TOC-on-TOC delays and cancellations where the rates of payment received by the victim TOCs' are covered by Schedule 8; and TOC-on-TOC delays and cancellations where the rates of payment received by the victim TOCs' are not covered by Schedule 8, but are 'bespoke', as in the case of the Freight Operating Companies and the non-franchised TOCs (i.e., Heathrow Express, Hull Trains, Grand Central, Wrexham and Shropshire, and Nexus).

These results were aggregated to establish each perpetrating Service Group's share of Network Rail's liability to each victim Service Group, and then multiplied by the corresponding Network Rail Payment Rates to determine each perpetrating Service Group's financial liability. Finally, this liability was divided by the perpetrating Service Group's recorded TOC-on-Self lateness minutes to determine the liability per TOC-on-Self minute, thus producing the TOC Payment Rates by Service Group.

6.2 Charter Liability

Seven TOCs still receive an Access Charge Supplement in respect of their liability under their passenger charter arrangements, and therefore their TOC payment rates need to be adjusted to in order to compensate Network Rail for the TOC-on-TOC element of this payment.

The methodology used to carry this out followed that from previous recalibrations. Based on historic charter performance figures provided by the TOCs, a simulation was carried out to estimate the probability of triggering charter payments for each service group. This probability was then used to estimate Network Rail's likely liability in respect of passenger charter payments, based on the relevant annual season ticket revenue for each service group. Delay data from PSS was used to estimate the proportion of this liability due to TOC-on-TOC delay, and this was then apportioned amongst causing service groups prorate to the liabilities calculated for the TOC payment rates.