

*A Report Prepared by International Risk Management Services  
On Behalf of the Department of Public Enterprise*



**A Review of Railway Safety in  
Ireland - Implications of the  
Delay in the Implementation of  
the Mini-CTC Project**

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## **1. INTRODUCTION**

As a result of queries raised by the Minister for Public Enterprise following review of Issue 03 of *A Review of Railway Safety in Ireland – Second Implementation Review*, [1] and in the light of the recent decision by Iarnród Éireann (IE) to terminate the existing mini-CTC contract, IRMS was asked by the Department of Public Enterprise (the Department) to review:

- the latest information available from IE for the status of those lines where accident frequency and/or risk levels are predicted to increase;
- a high-level strategy paper prepared by IE setting out a safety action plan pending the implementation of the mini-CTC project.

This report contains the results of the review.

## 2. RISK MODEL RESULTS

### 2.1 Introduction

IE prepared a fax [2] containing justification of the actions taken on the four routes where risk (either collective or individual) has been predicted in [1] to increase.

This information was reviewed by the IRMS team and a number of subsequent telephone discussions to clarify this information were held between IRMS, IE and the Department. Additional information was then provided by IE in an e-mail [3] regarding a further line section (Carrick on Shannon to Sligo) where the accident frequency is predicted by the risk model to increase but where both collective and individual risk has decreased, due to the imposition of a Temporary Speed Restriction (TSR).

Table 2.1 below summarises the changes proposed to the risk model results provided in [1] as a result of the above process.

Line Section	IE Comment	IRMS Response	Proposed Amendment to Risk Model
1. Athenry - Galway	Between the audits of 2000 and 2001 all of the points at Athenry were clipped and scotched so that no conflicting routes could be set, eliminating the possibility of collision. In addition, a 10mph TSR was introduced. This ensured that there was no increase in individual risk. The poor condition of the infrastructure in Athenry is recognised and is currently being addressed.	The 10mph TSR had not been incorporated into the model as this information had not previously been supplied by IE. It should also be noted that clipping and scotching should only be seen as a short term solution (6 months at most) – a more long term safety solution must be found beyond this timescale.	Incorporate the 10mph TSR into the model.
2. Athlone – Claremorris	The basic condition of equipment on this route has been improved. At Claremorris over 50% of the points are clipped and scotched out of use, additionally all points remaining in use have been overhauled, vulnerable cables have been protected and a safety management system put in place restricting access to the underside of the signal cabin.	This line was not directly subject to audit in the 2001 programme. The conditions were thus assumed to be similar to adjacent line sections in the absence of further information from IE (requested by IRMS at the commencement of the study for the population of the line sections not subject to audit). However IRMS did view improved conditions at Claremorris, Knockcrockery and Roscommon in 2001 which tend to substantiate IE's comments for this line.	Input improved condition of the mechanical points into the model for this line section.

Line Section	IE Comment	IRMS Response	Proposed Amendment to Risk Model
3. Connolly – Mullingar	The basic condition of the equipment on this route has improved through the installation of new signalling equipment and trackwork from Clonsilla to Maynooth. The signalling interlocking at Mullingar signal cabin has been renewed and improvements have been carried out to points and signals. There has, therefore, been no increase in risk.	The new signalling equipment does not impact the model as it calculates the risk at the worst section of the line, not the average condition. However it is agreed that the remaining points have not deteriorated from the condition observed in 2000.	Amend train frequencies and passenger numbers to 1998 levels (as the increased train frequency only occurs over the newly resignalled part of the line). Also, revise the condition of the mechanical points to the values assessed in 2000 into the model for this line section.
4. Mullingar - Carrick on Shannon	In addition to signalling improvements at Mullingar, all points on this route had improvement work carried out. Where interlocking testing indicated a potential failure equipment was taken out of use to eliminate the risks threatened by those failures.	Discussions with the IRMS auditor confirmed that the condition of the S&T equipment on this line was more or less the same as for the 2000 audit, on balance marginally worse but not by a significant margin. It is still better than it was in 98, which is what the existing model is predicting.	On balance IRMS feel there is no compelling reason to change the risk model inputs for this line.
5. Carrick on Shannon - Sligo	With regard to Carrick-on-Shannon/Sligo, there was the normal maintenance on the points - they all passed the points test at the (IRMS) audit	Discussions with the IRMS auditor noted that the state of the S&T on this line was poor, which is why IE had introduced a TSR to control the risk. This control is already built into the risk model.	IRMS consider that there is no reason to change the results of the existing model.

**Table 2.1: Summary of Changes Proposed to the Risk Model**

## 2.2 Revised Risk Results

Table 2.2 provides the revised results calculated as a result of the changes made to the risk model described in Table 2.1 above.

Line	Frequency (per annum)		Collective Risk (per annum)		Individual Risk (per annum)	
	Original	Revised	Original	Revised	Original	Revised
Athenry - Galway	0.64	0.64	0.60	0.05	1 in 14,100	1 in 166,000
Athlone – Claremorris	0.82	0.48	0.52	0.31	1 in 7,500	1 in 12,700
Connolly – Mullingar	0.85	0.58	0.38	0.31	1 in 6,000	1 in 7,900

**Table 2.2: Revised Risk Model Results**

It can be seen that the inclusion of a TSR for the Athenry-Galway line, whilst not affecting the frequency of a train accident, has had a dramatic effect on both the collective and individual risk estimates, lowering them by a factor of over ten. The changes made for the Athlone-Claremorris and Connolly-Mullingar lines have lowered frequency, collective risk and individual risk estimates below those predicted for these lines in 1998 and 2000.

### 2.3 Limitations of the Risk Model

It should be noted when considering the above results that the risk model developed for the audit programme was designed to assess large scale changes in risk across the network. It was not intended as a tool to investigate specific issues of concern in depth (such as the impact of the delay in implementing the mini-CTC project). Such an analysis requires a much more detailed modelling tool, the development of which has been strongly recommended to IE in each IRMS audit report to date.

### 3. IE'S STRATEGY FOR MANAGING SAFETY ON THE MINI-CTC LINES

#### 3.1 IE's High-Level Strategy

Following IE's decision to terminate the mini-CTC contract, IE prepared a high-level paper to set out its strategy for managing risks on the affected lines [4].

IRMS' comments on this paper were as follows:

1. The basic strategy as outlined in the paper is sound and is supported by IRMS. However, this high level strategy requires fleshing out to provide the necessary detail as to how this is to be implemented in practice.
2. The strategy needs to be supplemented by a risk mitigation plan to set out how safety on the affected lines will be ensured in the short term (ie over the next year) until the condition assessment exercise is completed and remedial works begin to be implemented.
3. It is considered that a total of 9 months to complete the condition assessment exercise seems optimistic – it is IRMS' opinion that the duration will probably be more in the region of one year.
4. A detailed programme is required to substantiate the 5 year timescale quoted, to ensure this is achievable given all of the other competing network refurbishment resource requirements.

#### 3.2 IE's Short-Term Strategy

Following IRMS' comment 2 above, IE prepared a paper to set out their short-term strategy for managing safety on the affected lines [5].

IRMS' comments on this paper were as follows:

1. Overall, the paper presents an acceptable strategy, but is extremely light on detail. The note does not thus add greatly to IRMS' knowledge of exactly what is now being done to ensure that these lines are safe. For example, the paper states that *"a number of points and crossings were either taken out of use ...or speed restrictions applied"*. What IRMS would also have expected to see would be:
  - an objective, measurable basis as to how it was determined at each location whether immediate remedial action was required;
  - a list of locations where such remedial work has been applied. The stations where points have been put out of use are not identified, nor are the number of such instances quoted;
  - what systems have been put in place to ensure safety given these remedial measures (for example, how often will the scotching and clamping be inspected to ensure such measures remain effective, how has it been ensured

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that drivers are aware of TSRs, monitoring of train speeds though these restrictions, etc).

2. There is no explanation as to the basis upon which the work programme will be prioritised.
3. The increase in maintenance quoted is welcome but is not quantified sufficiently within the paper to give full confidence that safety will be adequately enhanced.
4. There is reference within the paper to improved resources being used. This is welcome, but more information is required in order to comment on adequacy, competence and other safety related factors.
5. The “*refurbishment of points*” quoted requires amplification. It should include points being restored to gauge, any defective sleepers or switches replaced, stretchers and sole plates renewed as necessary, all signal fittings renewed and points being brought back into full safe working order.
6. It is agreed that good work is being done on repairs to locking frames.
7. The initiative to remove redundant assets should be given maximum impetus, especially where points can be improved.
8. The long term plan must take into account safety requirements associated with modernisation, but must not be used as an excuse for additional delays in replacing worn-out assets.

#### **4. CONCLUSIONS AND RECOMMENDATIONS**

In conclusion, whilst IE's overall principles established in [4] and [5] appear sound, it is not possible to provide full reassurance from the brief notes supplied by IE that the correct actions are underway without further detailed information. IE should thus produce a comprehensive plan which states:

- who is going to do what work;
- when;
- with what resources;
- what objectives and criteria are to be applied;
- a full description of the methodologies to be employed.

Once such a plan in place, it is strongly recommended that a sample audit exercise is undertaken on behalf of the Department to ensure that it is being implemented in a satisfactory fashion.

## **5. REFERENCES**

1. *A Review of Railway Safety in Ireland – Second Implementation Review*, IRMS Report 7335.01, Issue 03, April 2001.
2. Fax from IE to the Department of Public Enterprise, Fax Ref 1539 23<sup>rd</sup> May 2001 (copy of correspondence contained in Appendix I of this report).
3. E-mail from IE's Chief Engineer Infrastructure to the Managing Director of IRMS, 28<sup>th</sup> May 2001 (copy of correspondence contained in Appendix I of this report).
4. Fax from IE's Chief Engineer Infrastructure to the Department of Public Enterprise, 7<sup>th</sup> June 2001 (copy of correspondence contained in Appendix I of this report).
5. E-mail from IE's Chief Engineer Infrastructure to the Department of Public Enterprise, 2<sup>nd</sup> July 2001 (copy of correspondence contained in Appendix I of this report).

## *Appendix I*

### *Copies of Relevant Correspondence*

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## 1. Fax from IE to the Department of Public Enterprise, Ref 1539, 23<sup>rd</sup> May 2001

### 1.0 Introduction

There are four routes where the report shows that the individual passenger risks have increased. These routes are:

1. Athenry - Galway (Route 24)
2. Connolly - Mullingar (Route 29)
3. Mullingar - Carrick-on-Shannon (Route 30)
4. Athlone - Claremorris (Route 25)

Without direct access to the prediction model it is not possible to quantifiably check the findings (either increase or decrease). By their very nature all prediction models are susceptible to swings relevant to the input data. This is a high level model.

### 2.0 Comments on specific sections

**Athenry – Galway:** Between the audits of 2000 and 2001 all of the points at Athenry were clipped and scotched so that no conflicting routes could be set, eliminating the possibility of collision. In addition a 10mph speed restriction was introduced. This ensured that there was no increase in individual risk. The speed restriction was not taken into account in the risk model. The poor condition of the infrastructure at Athenry is recognised and is currently being addressed.

In Galway points that were found to be in poor condition were clipped and scotched. All train movements in this yard are very low speed because it is a terminal station. This, again, ensures that individual passenger risk has not increased.

A safety management system is in place for all stations from Ballinasloe to Galway.

**Connolly – Mullingar:** The basic condition of the equipment on this route has improved through the installation of new signaling equipment and trackwork from Clonsilla to Maynooth. The signaling interlocking at Mullingar signal cabin has been renewed and improvements have been carried out to points and signals. There has, therefore, been no increase in risk.

**Mullingar – Carrick-on-Shannon:** In addition to signaling improvements at Mullingar, all points on this route had improved work carried out. Where interlocking testing indicated a potential failure equipment was taken out of use to eliminate the risks threatened by those failures.

**Athlone – Claremorris:** The basic condition of equipment on this route has been improved. At Claremorris over 50% of the points are clipped and

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scotched out of use, additionally all points remaining in use have been overhauled, vulnerable outdoor cables have been protected and a safety management system put in place restricting access to the underside of the signal cabin.

### **3.0 Summary**

In our professional opinion there has been no increase in risk on any of the lines and this has been confirmed by Bert Hope, the IRMS auditor, in a telephone conversation on 22<sup>nd</sup> May 2001. We both also agree on the poor condition of the infrastructure at some locations on these routes and the need to progress the remedial works.

## **2. E-mail from IE's Chief Engineer Infrastructure to the Managing Director of IRMS, 28<sup>th</sup> May 2001**

Andrew

No there was not a long term speed restriction at Mostrim. However part of the signalling equipment at Mostrim was clipped out last year awaiting repairs that were complete at the time of the audit. With regard to Carrick-on-Shannon/Sligo, there were the normal maintenance on the points – they all passed the points test at the audit.

Brian

## **3. Fax from IE's Chief Engineer Infrastructure to the Department of Public Enterprise, 7<sup>th</sup> June 2001**

Mini CTC was originally scheduled to be commissioned in December 1999. The latest review of the project, as carried out by Project Consultants, MACE in March 2001, envisaged this would not now be complete for at least another three years, ie five years behind the original schedule.

The board's decision of 29<sup>th</sup> May 2001 was to reject the MACE report and to issue termination notice for the existing Mini-CTC contract, because of non-compliance on the part of the contractors. The Board, however did give a clear indication to immediately pursue re-signalling of the Mini-CTC lines by alternative means. A time scale of five years was indicated to Board to put this in place.

Because the Mini-CTC is already so far behind schedule it is necessary to undertake certain works to ensure that the safety of the existing infrastructure is maintained at an acceptable level and this is in progress on a prioritised basis. The minimum level of acceptable standard of safety has been the subject of the IRMS reports, and it is to this level that the infrastructure must be maintained. We have already put into place a high level risk assessment, however a more in-depth study of condition assessment will be required.

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## **Condition Assessment**

This study would involve an in depth survey of the 26 stations that were integral to the Mini-CTC project, and would provide detailed numerate analysis of the life expectancy of each station. There are various tried and tested systems available to choose from, each producing quantifiable and measurable results based upon accepted standards of risk analysis.

- a) The output from this study will be an invaluable tool to provide a detailed prioritization of the ongoing interim refurbishment/renewal schemes that are necessary to maintain the infrastructure to an acceptable level of safety for forthcoming 5/7 years until such time as a comprehensive programme of upgrading is put into place. This quantification would provide the Iarnród Éireann management and Board with the necessary information to ensure that the interim expenditure is being directed towards the management of risks to safety.
- b) A further output from this study would be as a quantifiable input towards the production of the strategy plan and project specification for any proposed comprehensive system upgrade. It will also act as a means to integrate any interim works with the comprehensive system upgrade thereby reducing cost and operational disruptions.
- c) Finally it will provide evidence that the infrastructure is being upgraded and managed in a quantifiable manner with respect to the management of safety.

Once the condition assessment study has been completed for the 26 stations and the benefits have been evaluated the study will be extended network wide.

## **Refurbishment and Renewals**

The ongoing programme of infrastructure maintenance, presently in place, will be extended to take into account the need to extend the working life of the Mini-CTC stations for a further period, more than 5 years, given that any new project will in itself be some 3 to 5 years in duration. The programme will also be subject to the findings of any Condition Assessment project that may be forthcoming.

## **5/10 Year Programme**

Whilst a 5/10 year programme of refurbishment/renewals is being produced this can only be governed by the known issues. It is recommended that during the moratorium created by the recent decision to delay the introduction of the Mini-CTC, advantage be taken to produce and put into place a high level strategy plan. This strategy plan will guide the type, level and order of any refurbishment undertakings in an endeavour to ensure that any Capital is expended in such a manner as to minimise any duplicated costs.

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**4. E-mail from IE's Chief Engineer Infrastructure to the Department of Public Enterprise, 2<sup>nd</sup> July**

**1. Introduction**

The ongoing maintenance of the signalling on the Mini CTC lines is based on detailed inspections and increased maintenance on these lines. In addition on the non CTC and non Mini CTC lines detailed inspections are also being carried out and urgent priority work dealt with.

In order to manage any possible problems and to further reduce risks on the infrastructure, the actions outlined below have been implemented.

**2. Short Term Plan**

Following our increased level of inspection, a number of points and crossings at stations were either taken out of use (by scotching [wedging] and clamping) and/or speed restrictions applied. At a number of Stations, Safety Management Notices have been put in place. The requirements to take these measures were either due to the physical condition of the actual points and crossings or the determined potential faults at the mechanical locking frames in the local signal boxes. In both instances safety and risk reduction were the underlining factors influencing these strategies. Refurbishment of existing pointwork is also taking place. These short-term measures are now all in place.

**3. Medium Term Plan (Forthcoming 10/12 months)**

Considerable progress has been made with respect to the refurbishment and relocking of many of the signal boxes and other locking frames, and in many instances has resulted in the lifting of restrictions and re-instatement back to operational service. This work is ongoing and expected to be complete within the Medium Level projected timescale. Work is already in place to prioritise and refurbish the points and crossings. At this immediate time the work is being concentrated on the Mullingar to Sligo and Galway Lines. The work involves the process of refurbishment of various compartments (locks, detectors, cranks and pins) by external engineering manufacturing companies. This process will ensure a ready ongoing supply of refurbished materials.

Whilst this process is being progressed, the infrastructure site work of power cleaning, reballasting, resleepering and general refettling of the points and crossings trackworks is continuing. Both Claremorris and Mullingar are actively being worked on.

Work to replace the arrival points at Sligo is well in hand. On completion of these stations the refurbishment work will be extended as determined by prioritisation.

A further initiative of removing certain points and crossings and replacing them with plain track is being investigated. This will require ongoing

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discussions and negotiations with the local Operations Managers, and will result in the long-term reduction of maintenance efforts and costs.

#### **4. Long Term Plan**

Generally both the Short and Medium Terms should be considered only as interim expedients. In the longer term much of the P & C will be replaced with new equipment, however in almost all instances the Long Term Operational and Modernisation Strategy that is presently being progressed will govern the actual location of these replacements.

The design, timescale and prioritisation of the modernisation are likely to influence later stages of the Medium Term Plan.

#### **5. Conclusions**

The plan of action described above is already in place and will be expanded to encompass the entire network within the forth-coming weeks. The refurbishments will progress throughout the next 10/12 months, and will be prioritised to ensure that those areas evaluated as to being most at risk will take precedence. As the refurbishment work progresses, the speed and other operational restrictions will be lifted thus returning the network to its previous potential with an enhanced level of safety. The matter is also on the agenda of the Iarnród Éireann Board with regular reports both in relation to progress and resource support.