Investigation Guidance
PART 3 Practical support for accident investigators

Guidance and examples of good practices in accident investigation in Britain’s railway industry

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Glossary
Foreword
from the Director of Rail Safety, Office of Rail Regulation

Accident investigation is at the heart of the industry’s learning from operational experience and the commitment to continuous improvement in its safety performance.

This three-part guide on accident investigation gives valuable guidance on the investigation process from start to finish and beyond, into the important area of learning and applying the lessons learned.

By following this guidance transport operators should improve the quality and consistency of investigations and the resulting reports. Improved accident investigation by transport operators, followed by the implementation of the associated recommendations, will assist in improving safety management across the industry.

The industry consultation in the production of this RSSB facilitated guidance is a welcome example of cross industry cooperation.

We support this guidance and encourage the industry to apply its content through its procedures, the management of investigations and the training of staff who conduct these investigations.

Ian Prosser
ORR
Introduction

Good accident investigation consistently and accurately identifies immediate and underlying causes after thorough analysis and produces objective and appropriate recommendations.

This three part guidance covers the key aspects of investigation, but also other important related issues of accident management, including the provision of necessary systems and resources, response management, reporting, recommendation management and the learning of lessons, leading to continuous improvement. The key elements of an investigation are described in detail: remit, evidence gathering, interviewing techniques, analysis of immediate and underlying causes and recommendations.

The process for managing accidents is illustrated below, including cross-reference to the relevant module number in the digital training programme and the section (S) of the guidance.

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This update of the guidance expands on the principle of proportionality when deciding on the scale of the investigation. Section 4.2 in Part 2 describes this new approach in detail. This update is also supported by a new digital training programme as described below:

**Signposts - Digital training programme**

This free training programme is available via the RSSB website or by contacting the Safety Management Systems team at sms.programmes@rssb.co.uk. It can be used in a classroom environment with a tutor or individually on a computer. It is split into 10 modules lasting a total of 4 hours. This programme is closely based on the guidance and widespread use of it should raise the quality of accident investigations and so reduce future loss as a result of accidents.

The guidance is built on an understanding of risk management and the integration of both human factors principles and a positive safety culture, with the aim of continuous improvement in the application and performance of safety management. It emphasises the need for cooperation in the achievement of good accident investigation and improved safety management.

Good accident investigation consistently and accurately identifies immediate and underlying causes after thorough analysis and produces objective and appropriate recommendations. These should then be effectively implemented and the necessary lessons learned, leading to fewer accidents and continuous improvement, both within each transport operator’s activities and across the industry.

# 1 Principles and use of guidance

This, Part 3 of the guidance, aims to provide user friendly guidance to help investigators conduct good investigations.

## 1.1 Background

The benefits of good accident investigation and the commitment to continuous improvement in safety are understood by the railway industry. This suite of documents has been produced in response to the industry’s request for practical support to assist in the achievement of better accident investigation.

## 1.2 Purpose, audience and status of guidance

This part of the guidance, aims to provide user friendly guidance to help investigators conduct good investigations. It is aimed at those with the following responsibilities but should be of interest to others whose roles include safety responsibilities:

- Experienced investigators
- Line managers who are responsible for conducting accident investigations
- Those who directly support the investigators in conducting the investigation
- Examples of processes used by transport operators that are examples of good practice (these are not subject to extensive comparison with others but nonetheless should be useful to most readers)
- Useful lists of points extracted from more than one source
- References to statements in other documents that should be of use to readers
Parts 1 and 2 are aimed at senior managers and safety/accident managers respectively, as follows:

- **Part 1 The role of the senior manager** provides senior managers with a high level overview of the need for good accident investigation and the important role they play in ensuring effective processes are in place.
- **Part 2 Development of policy and management arrangements** provides user friendly guidance to help managers develop and apply effective policies on conducting good investigations and learn lessons from these investigations.

The contents of this guidance are not mandatory though some references are made to legal and Railway Group Standard (RGS) requirements. This suite of documents provides guidance beyond the scope of Railway Group Standards but it is not intended to supersede or conflict with any of the contents of these standards.

### 1.3 Scope and use

This guidance is intended to apply to a wide range of undesired events and extends beyond the requirements of Railway Group Standard (RGS) GO/RT3119 *Accident and Incident Investigation* and its associated Guidance Note GO/GN3519, which are largely focused on train operations. The following undesired events are not mandated for investigation in GO/RT3119 but this guidance could be applied to these events:

- Non-train related accidents
- Accidents involving only minor injuries
- Accidents off the main line
- Construction related accidents possibly in possessions
- Accidents only involving one duty holder
- Incidents* involving equipment
- Near misses* (sometimes known as close calls or near hits – possibly reported via CIRAS)
- Other undesired events, eg train delayed in a tunnel but with no injuries
- Health exposures (eg asbestos)
- Accidents during travel while on duty
- Accidental release of substances causing harm and/or environmental impact

* The scale of the required investigation should be based on the potential consequences, and therefore risk, should circumstances have been slightly different. This could apply to incidents where the result is no injury or damage. (see section 4.2 for more detail)

There are many references to good practices of three types, as described below:

### Good Practice - Three types

- Examples of processes used by transport operators that are examples of good practice (these are not subject to extensive comparison with others but nonetheless should be useful to most readers)
- Useful lists of points extracted from more than one source
- References to statements in other documents that should be of use to readers

Those who conduct investigations, from the experienced regular investigators to those with less experience who conduct occasional investigations, to the line managers who undertake investigations on their patch when undesired events occur, should all find this guidance of use. The checklists should be particularly useful as they stand but may be better with company specific details added.

*In order to assist with the low level accident investigation a fictional example is worked through in Appendix B. This example gives an indication of the scale of the resource which may be required*
The risk based approach taken by this guidance can also be applied to accidents related to trespass and suicide, which are outside the remit of the above mentioned RGSs. This could range from a report to SMIS up to a high level of investigation where a trend is identified that may relate to significant costs in terms of life, minutes lost, risks or lessons that could be learned.

This guidance document is available on the RSSB website and it is intended that good practice examples will be added and updated regularly. Transport operators are therefore encouraged to send examples that they consider to be good practice, so that these can be shared. Email, sms.programmes@rssb.co.uk.

Organisations may choose to use this document for practical guidance or to adapt it to fit with their own procedures. Some of the checklists may be useful on site as durable cards or similar.

This guidance does not cover the more specialist techniques used for major accidents such as metallurgy tests. Transport operators will require competent experts in such cases.

1.4 Guiding principles integrated into this document

This guidance is built on a good understanding of the principles of risk management, human factors and safety culture.

1.4.1 Risk management

Good safety management is dependent on an understanding of safety risks and then controlling these risks in an active and systematic way. When done effectively, risk management should result in fewer accidents. However, when an undesired event does occur, the underlying causes should be thoroughly investigated to ensure that appropriate recommendations and actions are taken. High level reviews of investigation findings should then ensure that lessons are learned, and acted upon, so as to make a similar event less likely and of lower consequence if it were to be repeated.

HSE publication HSG245 Investigating Accidents and Incidents contains the following text which matches the approach taken within this guidance document: ‘Carrying out your own health and safety investigations will provide you with a deeper understanding of the risks associated with your work activities. Blaming individuals is ultimately fruitless and sustains the myth that accidents and cases of ill health are unavoidable when the opposite is true. Well thought-out risk control measures, combined with adequate supervision, monitoring and effective management (ie your risk management system) will ensure that your work activities are safe. Health and safety investigations are an important tool in developing and refining your risk management system.’

1.4.2 Human factors

Integration of human factors principles is essential to successful safety management and good investigation practices (including investigation techniques, interviewing, making recommendations and learning lessons from past accidents). This guidance therefore incorporates a well developed understanding of human factors, rather than referring to these as ‘add ons’, and so there is little specific reference to the term ‘human factors’, other than in training and competence sub-sections.

Human factors assist us in understanding why things go wrong, from the unsafe actions at the time of the undesired event back to the earlier underlying causes. The Swiss Cheese model, which is based on James Reason’s theory of accident causation, is a clear illustration of this and it is the root of many modern applications of human factors to accident investigation processes. This model illustrates the fact that accidents are usually the result of a complex chain of contributory events some of which are present in normal working conditions. The layers of defences against hazards may each have failures and it is when these line up that the accident occurs, as illustrated in the following diagram 1.
The following example further illustrates the lining up of failures in safety barriers:

**Clapham Junction collision 1988 - Barriers and failures in signal installation**

**Standards** - Failure to brief standards to supervisors

**Installation procedures** - New works installation and testing procedures are not properly followed

**Event** - Train collides into the back of a stopped train

**Project management** - Inadequate monitoring by management leaves poor practices to continue

**Resourcing** - Excessive supervisor workload prevents checking work of subordinates

**Signalling** - Fault in signal wiring keeps the signal at green

Diagram 1 Swiss Cheese model
(from the website of the Disaster Management Institute, Bhopal)

Diagram 2 Swiss Cheese model - example
The term ‘human factors’ should not be misunderstood to suggest that the sole focus is on finding fault with an individual whose actions may be immediately perceived to be the direct cause of an accident. It should, on the contrary, lead to a wider analysis of underlying causes, giving consideration to unsafe conditions and identification of system breaches.

1.4.3 Safety culture

Commitment to the development of a strong or ‘positive’ safety culture is fundamental to good accident investigation and continuous improvement. This is reflected in employee (frontline and management) attitudes towards safety, the frequency of key day-to-day safety behaviours and the quality and effectiveness of the underlying safety management system (SMS).

Organisations with strong safety cultures use a variety of sources, such as employee feedback and management reviews, to actively manage risk. When accidents and incidents do occur, these are seen as opportunities to improve and learn lessons. Based on an understanding of human factors and accident causation, appropriate remedial action is then able to be taken to remove barriers to safe working practices and to reduce the risk of a recurrence.

1.5 Terminology for accidents, incidents and near misses

Rail industry literature relating to investigations is inconsistent in its use of the terms used, namely those associated with accident and incident, including near miss and close call.

These words may have different uses ranging from formal use in standards, to regular written and verbal use in technical and management meetings, to the daily front line use by rail managers and staff. The meanings also have different origins, from long term rail industry understanding, through to the more recent common usage by safety professionals, and to different terminology influenced by the construction world, which has now been integrated into Network Rail documentation.

This guidance does not mandate definitions but uses the terminology in a way that should suggest common understandings while allowing flexibility.

Transport operators may wish to continue to use their own terminology and, as it is unlikely to be used in safety critical situations, any ongoing confusion over interpretation should not be critical.

2 Before the event

In order to achieve good accident investigation the policy, resources, training and other issues related to investigation should be in place, as specified within the company’s Safety Management System and its own procedures and processes.

2.1 Why investigate?

Good investigation should lead to thorough analysis, identification of the underlying causes, then the proposal of appropriate recommendations which, if implemented and monitored effectively, should result in fewer accidents. This will produce an economic benefit with less damage and fewer injuries to employees, passengers and the public.

There are also legal requirements relating to accident investigation and the most obvious for the railway industry are listed here, but this list is not exhaustive:

- The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) [ROGS], in particular Schedule 1 which requires of an SMS: ‘procedures to ensure that accidents, incidents, near misses and other dangerous occurrences are reported, investigated and analysed and that necessary preventative measures are taken’
• The Railways (Accident Investigation and Reporting) Regulations 2005
• Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)
• The Safety Representatives and Safety Committees Regulations 1977
• Health and Safety at Work etc Act 1974

Transport operators must also comply with the requirements of RGSs, the most relevant ones being:

• GE/RT8047 Reporting of Safety Related Information
• GO/RT3119 Accident and Incident Investigation
• GO/RT3118 Incident Response Planning & Management

In addition Guidance Note GO/GN3519 Guidance on Accident and Incident Investigation, gives specific guidance related to GO/RT3119.

2.2 Cost of accidents

Much has been written about the cost of accidents, particularly by the HSE, both in the rail industry and the wider UK economy. When it comes to drafting recommendations it is useful that investigators have an appreciation of the full costs of accidents. Accidents are expensive with many factors contributing to this. In addition to the more obvious ones are the loss of reputation and morale, distraction from main tasks, legal fees, time taken and resources involved in investigating through to review and the application of the lessons learned. For major accidents these costs can be extreme, to the level of business collapse.

2.3 The roles of the various investigation bodies

Various bodies, the main ones being RAIB, BTP and ORR, have legally specified roles relating to railway investigations and these are described in a Memorandum of Understanding (MoU). The MoU content is only likely to be of interest to investigators in relation to higher level investigations and company procedures and arrangements for investigations should recognise the role of these other bodies.

2.4 Safety Management System

Policy, resources, training and other issues related to investigation will be specified within a company’s SMS and its own procedures and processes (Part 2 contains details). These should meet the legal and RGS requirements and, where appropriate, complement the Network Rail National Emergency Plan and its supporting documents. They will also provide direction and guidance to investigators and should cover the following related areas:

• Incident response management (see section 3)
• Accident investigation, including competence and training and other resources
• Cooperation
• Safety representatives

2.4.1 Competence

*Investigators should be competent to conduct the investigations they are asked to undertake*

Training should be adequate and up to date, recognising that refresher training may be required. Where other knowledge and skills are necessary to complement those of the lead investigator they should be made available.

Competence can be maintained through the application of a competence management system and could contain the following:

• Logging of the review of all reports and feedback to writer
• Keeping records of all related training
• Maintaining of competence in human factors as part of thorough accident investigation
• Basic training to suit level and type of investigations
• Refresher training as appropriate in recognition of the impact of non-use of skills (possibly as a result of fewer accidents due to improved learning)
• Useful qualifications may include the NEBOSH certificate
• Knowledge of the relevant command structures

Organisations should ensure that investigators maintain their initial competence, given that the opportunity
to practice competence can be infrequent. In fact, the result of improved investigation should lead to fewer accidents, and so fewer investigations. Competence management systems should be able to facilitate the maintenance of the required competence via refresher training, exercises and regular reviews.

In addition to issues of competence investigators should have good interpersonal skills and they should be able to resist pressures to accept the ‘obvious’ causes without consideration of all the evidence (and have management support for this). Investigators who lead teams should have good leadership skills.

2.4.2 Physical resources and equipment

In addition to trained and competent personnel, with time to undertake the investigation, physical resources should be available and, in addition to the necessary mobile phone, these might include the following (this is not an exhaustive list):

- Local/route maps
- Cameras
- Voice recorder
- Measuring equipment (including non-metallic)
- Personal protective equipment
- Facilities to manage all data
- Torch
- Laptop computer
- Secure containers/locations for perishable evidence

2.4.3 Cooperation

Good accident investigation is reliant on cooperation between those involved: transport operators, contractors, emergency services, public bodies and other relevant agencies. Responsibilities for such liaison should be allocated and understood before accidents occur.

The following is a non-exhaustive list of the stages of investigation where cooperation is essential:

- Coordination at the scene of the accident including making the site safe
- Sharing of data, eg on personnel and vehicles
- Coordination of witness interviews
- Discussion on proposed recommendations
- Ensuring accurate reporting of data to, eg SMIS

Part 2 section 2.7 contains more details on cooperation.

2.4.4 Safety representatives

The Safety Representatives and Safety Committees Regulations 1977 give safety representatives the right of access to safety records and to carry out inspections and examinations of reportable accidents. The HSE suggests that it is good practice to involve the representative as ‘an investigation involving the health and safety representative can give employees more confidence to cooperate.’

The HSE also advises that there should be an agreed system for informing the relevant safety representative if an accident occurs and that they should then be involved as soon as possible.

Good Practice - Joint inspections

Network Rail’s Health & Safety Handbook points to the importance of a joint approach to the investigation, an element of which could be a site inspection, with the line manager arranging that the safety representative be accompanied by somebody from the management team. Part 7 of the ‘Investigators’ Handbook’ also lists the types of accidents and incidents that should be reported to the safety representative.
3 Initial response to event

On being alerted to an accident the responsible organisation’s response should be quick and of an appropriate scale – from the major undesired event to the minor injury. Included in this early response should be elements of the investigation.

3.1 Initial response management on site and the start of the investigation

The first actions in the event of an accident are to establish individual safety and then to arrange protection of the site. However, key aspects in the management of the early response to undesired events can have an impact on the investigation, for example the gathering of perishable evidence.

If the investigator is at the scene soon after the event, then the investigation process can be started. But if not, the actions of anyone else who is at the scene early may be of great assistance to the investigation and may affect its conclusions, for example, by capturing perishable evidence which could otherwise be lost.

The following checklist should be of use to those who are earliest at the scene of the accident:

Good Practice - Initial Response

Checklist for use of those who are earliest at the scene of an accident.

- **Ensure own safety and safety of others**
- **Arrange protection** of site (eg via signaller)
- **Call for assistance**, giving necessary details (eg numbers of injured to emergency services, and to the railway control state the support required from rail organisations)
- **Attend to injured** (eg first aid if appropriate)
- Where safe attempt to **stop/limit further danger or environmental impact** (eg stop leakage)
- **Record what has happened** (possibly involving a walk through the area of the undesired event
- **Start to gather perishable evidence**, ie which may be altered by weather, time or movement, eg:
  - photographs of the site and equipment and any pollution
  - names, addresses and statements from witnesses
  - hot brakes or wheels
  - instrument and gauge readings
- **A log** of actions and who is on site after the event, with timings
3.2 Early reporting

It is important that the early reports of accidents contain information that is as accurate as possible. Investigators, who may have access to such early information, should liaise closely with those who do the required reporting to the various bodies and systems to ensure that the industry benefits from good data. Investigators of occupational health exposures such as asbestos should ensure that good records are kept of exposed personnel and the exposure levels.

3.3 Urgent safety reports

If the investigator becomes aware of an urgent safety problem or failure that may have implications elsewhere on the rail network the relevant person in the company should be made aware of the issue and supplied with accurate information. This is necessary in order that correct data is reported, eg via www.railnotices.net (registration is required for this site).

4 Investigation

The principal investigation of any undesired event is conducted by the organisation immediately responsible for the activity. An early review of the event is necessary to capture the circumstances while still recent and to decide the remit and the resources required for the investigation. The gathering of evidence is crucial to a good investigation and early action and planning will be required to ensure perishable and other physical and witness evidence can be obtained.

4.1 Who investigates?

For the more significant accidents investigators should establish whether it is RAIB’s intention to investigate and, if so, they should liaise over RAIB’s requirements and timescales, the remits and the arrangements to ensure cooperation, effectiveness of investigations and to optimise resources, eg the sharing of non-confidential evidence such as photographs.

For other events

*the responsible organisation should select the appropriate investigator and support team, if necessary. In the case of lower level accidents the initial response manager may be the investigator and could even set the remit.*
4.2 Early review and proportionate level of investigation

An early review of the event is necessary in order to assess the level of the investigation and to complete the details of the remit. A good investigation report requires the remit to make clear what is required.

The scale of the review should be related to the scale of the actual loss, or potential loss had circumstances been slightly different, and this should be guided by company standards and/or RGSs. Part 2, section 4.2, contains a three stage filtering process aimed at achieving proportionate, consistent and systematic decision making on the scale of investigations. This new material offers the industry a simple tool that is aimed at significantly improving the accident investigation process.

If the lead investigator is known before the early review it can be of benefit if that person is able to visit the accident scene and liaise with the manager in charge of the site. Visiting the site at the same time of day as the accident, when light and other environmental factors are likely to be similar, may also be of benefit. The lead investigator should take an active role in deciding the supporting investigation team and any technical experts.

4.3 Remit

Investigator involvement in the development of the remit can bring benefits and the investigator should be encouraged to suggest improvements to the remit if new evidence makes this appropriate. For investigators who are involved at this stage the following outline list of minimum remit requirements should be useful:

**Good Practice - Remit requirements**

- Determination of events leading up to accident
- Immediate and underlying causes and any contributory factors
- Recommended system improvements to address likelihood of recurrence and the consequences and any local actions
- Report urgent safety problems requiring early remedial action
- Completion timescale
- A well structured report covering the above

If the investigator is involved in the early review consideration should be given to, for example, perishable evidence such as, dangerous goods labels, statements from those directly involved in the event and photographs of evidence that could change or be moved.

4.4 Gathering of information and evidence

Piecing together what happened can be difficult and it is necessary to be persistent and accurate. A detailed description of the work activity immediately before the event, especially noting anything different from the usual, should be very useful. This can be followed up to ascertain whether changes to the norm, and awareness of these by those involved, was contributory. In addition, where the gathered evidence gives conflicting information, an explanation should be sought, possibly requiring further scrutiny of the sources.
The principles of good evidence gathering and preservation apply to all levels of investigation and can be applied using a checklist such as the following:

**Good Practice - Gathering of evidence**

A checklist for evidence gathering (which is a combination and expansion on the lists in GO/GN3519 and HSG245) could contain:

- **Photographs** especially things that may perish or be moved (some sensitivity may be required and, where a digital camera is used, a statement confirming no editing may be necessary and the date and time should be set)
  - Views or video of the site to show full layout and from different perspectives
  - Equipment damage and details such as model numbers
  - Pictures related to possible causes
  - Spillages
  - Include scales and measurements where appropriate
  - CCTV footage (note activity before, during and after the accident)

- **Diagrams and sketches**

- **Environment** - conditions at the time
  - Indoor, eg layout of workplace, lighting and general housekeeping
  - Outdoor, eg weather

- **Witness statements [see next sub-section]**
  - Voice recordings at the scene with witness agreement

- **Personal injury details**
  - Description of injury
  - Agent that made contact
  - How the injury came about
  - First aid and internal accident reports
  - Occupational health and other personal records

- **Description of work activities**
  - Materials
  - Actions
  - Safety equipment and processes
  - Note anything unusual that day

Continued...
Continued...

- **Communications and work arrangement records**
  - Safe Systems of Work
  - Permits to Work
  - Minutes of appropriate planning/safety meetings
  - Signal box registers
  - Telephone and radio recordings
  - Total Operations Process System train lists and consists
  - Training records for those whose training needs to be considered
  - Also competence records (are they appropriate for tasks?)
  - Content of training and timing
  - Refresher training/tool box talks’
  - Briefing on specific risks on the day
  - Rosters, rotas, work schedules, hours worked, related to fatigue
  - The right people in the right job’s

- **Maintenance histories**
  - Vehicle and component maintenance records
  - Equipment details and maintenance records
  - Infrastructure maintenance records
  - Technical test results

- **Data on precursor events**
  - Train data recorder downloads
  - Records of faults, eg rail breaks or oil spillage on floor
  - Records of similar events or involving similar elements (from SMIS), eg same people, same rolling stock or same location
  - Incident Factor Classification System (see section 6.2)
  - Related risk assessments (suitable and sufficient and was risk controlled?)
  - Alcohol and drug test results

- **Assurance records** such as audit reports, monitoring of systems that should have detected faults and relevant risk assessments

- **Work incentives**
  - Targets and piecework
  - Bonus priorities
  - Performance vs safety

- Relevant **procedures and instructions** from SMSs down to local instructions

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### 4.5 Witness evidence

Witness statements are very important to the investigation of what happened and those to be considered should be identified as soon as possible. First hand accounts are especially useful but others with a more remote involvement can add vital information for the identification of underlying causes. Witnesses may be asked for statements (which should be signed and dated) and/or they may be interviewed. A list of those for interviewing could include:

- Those directly involved
- Eyewitnesses
- Those who made relevant communication before, during and after the event
- Supervisors and managers and others employed in the system of work that was employed at the time of the accident
- Those who designed and operated the safety systems that were intended to regulate the work associated with the event

Interviews should be conducted as soon as possible after the event, while accommodating shift working and medical requirements. Accurate records of interviews should be kept. This will help to avoid the influence of memory loss and contamination through conversations with others. Consideration should also be given to the number on the interview panel, so as not to inhibit the process, and to the presence of an employee representative.
An investigation strategy will assist in the management of interviews. It could cover the explanation of what happened and why, and note the gaps in information to be filled; the strategy should therefore be reviewed after each interview.

Interviews can be used to gain new information, confirm existing evidence and to test hypotheses. Plenty of time should be taken to plan each interview so that they are adequately resourced, well structured and targeted for the individual, while remaining flexible to respond to the situation. Preparation should include anticipation of difficult situations and interviewees who may be unwilling to talk, or may be upset or may intimidate the investigator.

Employees and others may face significant pressures after an undesired event. Interviewers should be aware of reasons that interviewees may provide information that is not completely true, and that varied or additional questioning may be appropriate to gain accurate evidence. Such reasons could include:

- Feeling under pressure to give an answer even though they do not remember the details
- Feeling under pressure to give the 'right' answer
- Worry about being blamed, threats to their employment or prosecution
- Worry about ‘telling on’ others
- Fear of senior managers
- They may be traumatised or shocked
- They may face several interviews some of which may have been challenging

The following are some examples of good practice that could be employed in setting the right tone for interviews:

### Good Practice - Setting the right tone for the interview

- Rather than a remote, and possibly intimidating, head office consider using
  - A local office
  - Non-work related location
  - Witness’s home
- The dress style of the interviewer should be considered
- Prepare for interviewees who may need specific considerations: eg those with disabilities or language difficulties, children and the bereaved
- Make the purpose of the interview clear, eg ‘to establish the facts to prevent a recurrence and not to allocate blame’ and explain how the interview will run
- Aim for an informal atmosphere and build a rapport, rather than like a courtroom or disciplinary hearing
- Explain the level of confidentiality and use of evidence and any legal issues or requirements
- Introduce those present and their roles
- Use body language that supports the purpose of the interview, eg:
  - Relaxed state
  - Square on, with open posture and lean forward to encourage
  - Good eye contact

Where there is more than one interviewer the roles of each should be well planned.

Interviews may be assisted by the use of diagrams, pictures and maps and the playing of recordings so having the right equipment available is important.

Where a witness is a trade union member they would normally be entitled to an observer from the trade union, and where they work for another employer consideration should be given to one of their managers being present during the interview, where this may be beneficial.
Interviewing those involved as a group can be a useful option for some types of undesired events but there are pros and cons that should be considered. A benefit may be the chance to draw out, in the context of a just culture, a fuller picture, where one person’s comment may trigger the thoughts of another and this may be particularly helpful where those involved are in shock. A dis-benefit may be where blame is wrongly pointed in a certain direction and some may be intimidated into supporting this. Individual interviews may be appropriate in addition to group interviews.

Good Practice - Types of questions

Interviewers should be aware of the use of different techniques and types of questions to get different results:

- **Closed questions**, eg starting with ‘is’, ‘are’ and ‘do’ may gain a factual answer and be used to test accuracy but are also liable to close down discussion
- **Open questions**, starting with ‘what’, ‘why’, ‘could’, ‘how’, and ‘would’ can be used to open discussion and perhaps set a more relaxed environment
- **Leading questions** such as; ‘I assume that…?’ are likely to be of little value in an investigation
- Questioning that takes the interviewee back into the accident situation, even exploring the senses – sounds, smells, light and dark, can help build the picture

Good Practice - Style of questioning

- Encouraging phrases can be used to expand on discussion, eg ‘Tell me more…’
- Talking more slowly can help take the interviewee back to the scene
- Allow adequate time to respond to questions
- Silence can also be an interview tool as it can provide an incentive to speak more

Good Practice - Conversation management and cognitive interviewing

- Conversation management – encourages a spontaneous disclosure of information. It...
  - Builds a rapport
  - Asks mainly open questions
  - Avoids confrontation
  - Appears to only seek an understanding
- Cognitive interviewing, taking the interviewee back to the accident situation using:
  - Report everything and giving time to do this
  - Context reinstatement, taking the witness to the scene in the present tense and appealing to the senses eg sounds, colours and people
  - Temporal order of recall, ie changing the order of events to work backwards
  - Change of perspectives to see the event through the eyes of another
To ascertain underlying causes of accidents it can be helpful to keep asking ‘why?’ to lead back through the chain of events and causes, eg:

### Good Practice - Ask Why?.... Because

- Why did the train pass the red signal?
- Why was the driver speeding?
- Why did the driver not know about the emergency speed restriction?
- Why were the ‘Late Notices’ not updated?

‘Why’ questions can continue until appropriate underlying causes are identified

Note that these questions may also lead to other contributory factors

If there are any doubts about the evidence or gaps in the events leading to the accident it is useful to ask the interviewee to explain again from a different perspective and order, eg going backwards through the events. Confirming the recollection of the interviewee by summarising the interview and then asking the interviewee to comment may also assist.

### 4.6 Timelines

The use of a timeline can assist in developing the summary of events, especially when there are a complex set of factors in the period before the event and there is a need to follow the different aspects. An example could be a diagram showing driver actions, communications and movements separately, but also so they can be compared with each other. These factors may, or may not, all be considered to be causal at the stage of developing the timeline but they should assist in building the picture. Sub-sections 4.8 to 4.11 Appendix A deals, in some detail, with causal analysis techniques and human factors.

A simple example of the inputs to the timeline might be, for example:

**Table 1 Simple timeline**

<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0600</td>
<td>Driver discussion with signaller</td>
<td>After stopped at red signal</td>
</tr>
<tr>
<td>0610</td>
<td>Isolation confirmed</td>
<td>From Electrical Control Room</td>
</tr>
<tr>
<td>0612</td>
<td>Instruction to crane operator to unload</td>
<td>From Engineering Supervisor</td>
</tr>
<tr>
<td>0620</td>
<td>Instruction to driver to continue</td>
<td>From signaller</td>
</tr>
<tr>
<td>0625</td>
<td>Accident</td>
<td>Train hits crane</td>
</tr>
</tbody>
</table>

The timeline can also be extended back to underlying causes, eg to cover when staff were briefed and policies were amended.

Reconstruction of the events on paper, in diagrams or using models can also be useful in filling gaps in evidence.

Investigations may well require iterative processes as new information raises the need to go back to check or challenge earlier evidence and repeat some earlier work. Investigators should keep an open mind to the benefits of such iteration.

It is important to be open, honest and objective throughout the investigation and to avoid snap judgements and pre-conceived ideas. The focus should be on accident prevention rather than placing blame; the latter is likely to lead to defensive responses.
4.7 Causes – immediate and underlying

As it is necessary to consider all the causes leading up to an undesired event it is useful to work backwards from the moment of the accident through the history of the potential causes that eventually led to the final event.

This guidance document uses terms for two types of cause: immediate and underlying

The immediate cause is the error/unsafe act or condition just before the accident and usually there would be only one such immediate cause, which in the case below is the ‘slip’.

A member of staff wearing inadequate footwear, running on a platform, slips on a patch of oil and damages knee.

For the purposes of this guidance underlying refers to what are also known elsewhere as root causes and all the causes that may have preceded the immediate cause and the associated unsafe act and/or conditions. The underlying causes of the event above may be:

- Lack of supervisory resource
- No policy for responding to spillages
- No system to warn of arrival of disabled passenger (if this was the reason for running)
- No system to supply adequate safety footwear

References to root causes and root cause analysis can still be found in railway documentation and these are largely derived from the Ladbroke Grove inquiry report which recommended root cause analysis training for driver standards managers. This training was aimed at identifying weaknesses in management systems.

One of the reasons for this guidance is the industry’s past weakness in the identification within reports of the underlying causes leading up to the immediate cause and it is hoped that this section and the further sections on human factors will lead to improvements in identifying underlying causes.

RAIB also uses Causal Factors in its reports and these are defined in footnotes as: ‘Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening’. RAIB also refers to Contributory Factors.

Table 2 Two examples of immediate and underlying causes

<table>
<thead>
<tr>
<th>Cause</th>
<th>SPAD</th>
<th>Train nearly hits person on pedestrian crossing at station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Cause</td>
<td>Driver speeding</td>
<td>Pedestrian walked behind stationary train into path of another</td>
</tr>
<tr>
<td>[RAIB’s Causal Factor]</td>
<td>Driver did not read ‘Late Notices’</td>
<td>Misunderstanding that warning sound applied to stationary train</td>
</tr>
<tr>
<td>Underlying Cause</td>
<td>Process for notifying drivers of Late Notices is not adequate</td>
<td>Inadequate response to level crossing risk assessment output actions</td>
</tr>
</tbody>
</table>

The underlying causes that are further back in the organisation’s processes, such as appropriate training, when addressed, are likely to have the biggest impact on preventing future accidents. On the other hand, immediate causes that may not seem significant may also have lateral applications in other operations, so wider benefits can be gained in addressing them, eg early cleaning of spillages.

During investigations others factors that were not causal to the accident, but which should be addressed, may be identified and these may also lead to recommendations.
It is not uncommon to see in investigation reports into lower level accidents ‘no fault found’ or similar but, to prevent recurrence, it is necessary to look further. An understanding of human factors should lead to consideration of the necessary underlying causes such as distraction, fatigue, fitness, motivation and competence.

Sections 4.8 to 4.11 include further detailed explanations relating to accident causes and factors. The analysis on the causes and factors should be summarised in the ‘conclusions’ which then lead to the development of the recommendations.

4.8 Investigation techniques to determine causes

The structure and method of investigation and the central component, the causal analysis, will vary for different types and scales of events but certain principles apply to all. There are some underlying principles that are useful to understand and follow when investigating an incident.

Determine what happened. This involves determining the key events that happened in the sequence leading up to the accident (and sometimes events directly following the accident too). It involves identifying who was involved, what happened and where it happened. It involves determining the key failures, whether they are people’s actions or equipment or system failures.

Determine why it happened. For each of the key events, determine why they occurred. It is often useful to keep asking ‘why’ in order to identify underlying causes. Consider causes from the perspective of the individual, job and organisation.

Care should be taken before claiming that something is a ‘fact’. The gathering of good evidence is essential to optimise the ability to ascertain these facts as much as possible.

<table>
<thead>
<tr>
<th>What</th>
<th>Why</th>
<th>Remember</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sequence of events</td>
<td>• Ask ‘why’ for each of the events</td>
<td>• Identifying the cause of errors and violations will help you to tackle and resolve the real issues</td>
</tr>
<tr>
<td>• Who, where, what</td>
<td>• Keep asking ‘why’!</td>
<td></td>
</tr>
<tr>
<td>• Determine the error/</td>
<td>• Consider individual, job and organisational causes</td>
<td></td>
</tr>
<tr>
<td>violation(s) and other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>failures (eg equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>failures)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diagram 3: What, Why and Remember

There are a number of different approaches to structuring underlying causes, each with its own training requirements. There are commonalities between these methods and it maybe useful for investigators to combine these in order to give a flexible approach to suit different types and complexities of investigations.

This guidance does not aim to promote any particular method of analysis, but some of the more commonly accepted approaches are listed below and readers may wish to try them.

• STEP (Sequentially Timed Events Plotting)
• AcciMap
• Fish-bone diagrams
• Fault tree analysis
• SCAT (Systematic Cause Analysis Technique)
• MTO Analysis Accident investigation

The ORR’s RM3 process may also be useful in some investigations. When considering the organisational factors relating to an accident, some of the most obvious of the 26 sections of the SMS can be reviewed. This process should assist in identifying weaknesses in the application of the SMS, ie, some of the underlying causes.
4.9 Why do human errors happen?

It is important that investigators have an understanding of why people make errors in order to consider why accidents happen. Everyone, regardless of knowledge, experience or training can commit errors. However, human errors can result from understandable, predictable aspects of the environment in which we work.

Developing an understanding of human error will help investigators understand the range of underlying causes that can contribute to unsafe acts and unsafe conditions. This will enable investigators to develop more robust recommendations for managing and mitigating the likelihood of accidents occurring in the future.

Further information on human errors, with detailed explanations of errors and violations, is expanded in Appendix A.

4.10 Underlying causes: factors which can contribute to accidents

In attempting to understand why an accident happened and to determine the underlying causes, many factors may need to be considered. It is recognised that accidents are often the result of a complex chain of contributory events or factors. The Swiss Cheese model, introduced earlier in the document, gives a simple illustration of unsafe conditions. There may be contributory factors relating to the individual, job and the organisation which may create unsafe working conditions. A few examples are shown in Diagram 4:

![Diagram 4: Contributory factors that may influence safe performance](image)

**Individual factors**, such as fatigue, stress, shift work, and competence can affect safe performance at work. For example, fatigue can lead to slower reaction time, loss of concentration, reduced ability to judge speed and distances and result in variations in performance. Knowledge, skills and experience can also affect performance at work. Someone new to a job may lack knowledge which may lead to slower decision making and difficulty in coping with complex tasks. However, having many years of experience does not mean that a person will perform more reliably. Experienced operators may become complacent or over-confident which might contribute to an inability to perceive risks. As well as technical ability and knowledge, non-technical skills (such as situational awareness, co-operation and working with others and workload management), are also important and can make the difference between safe and unsafe performance.

**Job and workplace** factors can impact the worker. Factors such as poor usability of equipment (eg driver controls or signaller workstations), environmental factors (eg heat, noise, and vibration), and high and low levels of workload may all have a detrimental affect on performance at work. The complexities of communication, planning and teamwork in the railway may also lead to misunderstandings that could lead to accidents occurring.

**Organisation factors** can also influence human performance and behaviour at work. Organisational culture, leadership and supervision may impact people’s decisions and actions. The safety culture within an organisation may undermine desired performance for a number of reasons, such as management prioritising performance over safety.

The investigator should be aware of these contributory factors, both to assist in building the full picture of underlying causes and in making appropriate recommendations. Considering these factors during an investigation will help to ensure that all potentially relevant factors are addressed. Some of these contributory factors can be observed, others need further questioning or data collection (eg reviewing competence management materials or work procedures), to gain a complete understanding of how the person behaved during the event and why.
4.11 Human factors training for accident investigators

Part 2, section 2 of this guidance contains details of RSSB’s human factors training course for accident investigators and makes reference to Network Rail’s Human Factors Investigation e-learning programme, which is also outlined below:

10 Incident Factors

As part of the development of Network Rail’s human factors investigation e-learning programme, it was recognised that a checklist of prompts would encourage investigators to consider the range of different underlying causes. This resulted in the 10 incident factors which is a framework for structuring information about underlying causes and contributory factors. CIRAS and the Incident Factor Classification System (IFCS) module within SMIS recognise these 10 factors, which are as follows:

1. Communications
2. Practices and processes
3. Information
4. Equipment
5. Knowledge, skills and experience
6. Supervision and management
7. Work environment
8. Teamwork
9. Personal
10. Workload

These were developed following a review of existing investigation checklists and involving expert judgement from other human factors specialists involved in accident investigation. The factors were then validated by reviewing existing investigations to confirm that the prompts covered the sort of factors typically found in railway investigations and could be applied to the railway domain.

4.12 SPAD investigations

Principles of investigation contained within this guidance apply equally to SPADs as they do to other undesired events. SPAD reports should benefit from the use of this document especially the later sub-section on Human Factors. Railway Group Standard GO/RT3119, Issue 3, came into force in March 2013 and it is supported by GN/RT3519 Issue 3.
5 Investigation report

The objective of an investigation report should not only be to report accurately on the accident mechanism and its causes and, to formulate recommendations to improve safety, but also to demonstrate that the investigation has been conducted with a high level of professionalism.

5.1 Writing the report

The report should be clear, easy to read and factual and, must address the requirements of the remit, which is referred to in detail in the previous section. For example, ‘factors for consideration’ should be based on the ‘summary of events’ which in turn is based on the evidence described before it. The ‘conclusions’, including the immediate and underlying causes, should be based on the issues discussed in the ‘factors for consideration’. Then the ‘recommendations’ should be linked back to the above items and specifically to the conclusions and, the relevant immediate and underlying causes.

Good Practice - Report structure - key sections

- Evidence, eg photographs, downloads and interviews
- Leads to - Summary of events, eg timeline
- Leads to - Factors for consideration, eg human factors
- Leads to - Conclusions including causes, eg explanation of underlying causes
- Leads to - Recommendations

Further general guidance on report content is available from many sources, but specifically for the rail industry in GO/GN3519 Guidance on accident and incident investigation in 2.2.5 and 2.3.3, including the mandated requirements for Formal and Local investigation reports.

In addition to the headings immediately above, and those items listed in section 4 as remit content, it is useful to include:

- Date, time and location of the event
- Brief description of the nature of the event
- A statement on the purpose of the investigation (relating to the remit)
- A description of the environment and geographic features, eg track configuration and weather (Diagrams, plans, maps and photographs are useful methods)
- A summary of the evidence
- Names of the investigator/s

The investigation is likely to have more impact if it is completed quickly and thoroughly and the report is published within the timescale set in the remit.

5.2 Data protection issues

The Data Protection Act (DPA) is primarily aimed at protecting individuals from misuse of their personal details. It becomes relevant to those involved in accidents and their investigation when details could be passed on to a third party that may use the information for other than matters directly relating to the accident investigation. Most of the potential problems in relation to the DPA can be avoided by not including names of individuals in an accident report or other documentation that may be made available to third party organisations Part 2 of this guidance contains further detail on this issue.
5.3 Recommendations

Recommendations are advisory rather than mandatory but they will be issued within a framework that will expect the recommended, or similar, action to be taken. The investigation will be productive to the extent that the real causes of unsafe acts and conditions are accurately identified, evaluated and corrected. The number of recommendations is not important. Their quality, relevance and practicability in addressing the causes of the event and the unsafe acts and conditions that preceded it are. One systematic model for achieving this is the use of ‘SMART’ recommendations. There is some variation about what these letters stand for but the following is generally accepted:

Table 3 SMART

<table>
<thead>
<tr>
<th>Letter</th>
<th>Meaning:</th>
<th>Brief explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Specific</td>
<td>A clear description of what is required and who is responsible is necessary for any action to take place. Each recommendation should only address one issue.</td>
</tr>
<tr>
<td>M</td>
<td>Measurable</td>
<td>If it can be measured then its level of implementation can be reviewed</td>
</tr>
<tr>
<td>A</td>
<td>Attainable</td>
<td>If it is not attainable it should not be recommended</td>
</tr>
<tr>
<td>R</td>
<td>Relevant</td>
<td>It should relate to the circumstances of the accident and how to prevent recurrence.</td>
</tr>
<tr>
<td>T</td>
<td>Time-bound</td>
<td>Timescales for stages and completion will allow monitoring of progress</td>
</tr>
</tbody>
</table>

The analysis will have identified risk controls that failed or were not present or had an impact on the undesired event. Recommendations should be considered that address these and meet the SMART criteria above and the following further considerations:

Good Practice - Good recommendations

Any recommendation should aim at making demonstrable improvement.

Further consideration should be given to:

- Will it be effective in reducing or eliminating the identified risk?
- Is it objective and balanced and free of judgmental and emotive language?
- Is it reasonably practicable?
- Are potential improvements roughly proportional to the impact of the change required?
- Will it be acceptable to those who will be affected by implementation?
- Will it be sustainable over time?
- Does it introduce new risks in another area, eg increased maintenance in a high risk environment?
- Is it based on firm evidence and therefore not counter factual?
- Prioritising of recommendations may be appropriate, eg via the timescale or the monitoring process?
- Have there been similar events? This may suggest urgent action?
- Where there are multiple implementers is the lead body made clear?
- Where reviews or research are recommended is it clear how the outputs should be used to improve safety?
5.3.1 Hierarchy of recommendations

Recommendations can be considered to apply at three levels, effectively a hierarchy of the control of hazards, and the likely effectiveness of these should be considered, along with the potential costs:

1. Eliminate the deficiency to prevent an accident from the same cause, eg a change of component
2. Accept that there is a risk of failure but adjust the system to reduce the likelihood of recurrence eg more restrictive operating conditions
3. Accept the difficulty in eliminating and controlling the risk of failure and reduce the consequences, eg use of protective equipment

These are, in effect, filling some of the holes in the Swiss Cheese model. The recommendation should make clear which of the above is intended eg:

‘In order to prevent future similar accidents component X should be redesigned ….’

5.3.2 Proportionality of recommendations

The potential costs for implementing the proposed recommendation should generally be proportional to the expected benefit

and the investigator should have an awareness of these costs and benefits. Immediate costs, however, are not the only factor to be considered. Public confidence, staff morale, risk of prosecution and other factors may need to be considered.

5.3.3 Targeting of recommendations

Recommendations should be addressed to the appropriate organisations or post holders with prior dialogue with involved personnel so that there are no surprises. This dialogue should include relevant experts to assist in getting the recommendation right.

Some companies use ‘local actions’ or ‘corrective actions’ in addition to recommendations and it is important that these are clearly differentiated and defined. A local action, as defined by Network Rail, is a response directed at line management due to the application of an existing control measure not being followed (eg not following a rule, regulation or process) and it is not referred to a high level review panel, as recommendations are.

However, where it is identified that there is a systemic failure to apply a certain control across an organisation, eg a short cut that is against rule but management tolerates, the action should be a suitable recommendation.

5.3.4 Wide application of recommendations

Investigation may reveal unsafe conditions that are not directly related to the accident but nevertheless should be addressed, possibly via recommendations, in the interests of improving safety.

HSG245 Investigating Accidents and Incidents refers to the need to review related risk assessments and where the investigation reveals weaknesses in these and competence assessments then recommendations relating to altering and improving these may be appropriate, eg re-assessment of risk of slipping on a platform after several similar accidents.

When considering recommendations public behaviour should be considered, eg in designing a new walking route consideration should be given to risks such as alcohol related crime (lighting/supervision) or unsuitable footwear (adequate surfaces)?

5.4 Review of the draft report

The draft report should be reviewed against the remit. Investigators can benefit from constructive feedback on draft reports and records of these can be a useful element of the competence system.

5.5 Management of recommendations

Good, well targeted and well communicated recommendations will be more easily managed through acceptance, implementation and tracking.
5.6 Final SMIS report

Transport operators, where they are the event owner, are required to finalise, possibly amend, and close the SMIS entry, including details of causes, within 20 working days of the event. In addition, the event owner shall finalise the record in SMIS of causation details, completed summary report and recommendations arising from an investigation within twenty working days of publication of the investigation report. The investigator should supply the SMIS inputter with correct information to assist RSSB in the compilation of accurate industry wide data, to be used to better manage safety and prioritise actions. Part 2 contains details on final SMIS reports.

6 Learning from investigations

To systematically learn lessons organisations will need high level review processes. Once lessons have been learned the benefits will be gained through, for example, updated procedures and SMSs, training and briefing of staff and changes to monitoring and review processes.

6.1 Learning from operational experience

Good accident investigations, recommendations and reports are essential for companies and the industry, as a whole, to learn from operational experience. Companies will benefit from better knowledge of accidents if they, in turn, achieve good investigation, recommendations and reports. The consequence should be lessons being learned, improvements made, fewer accidents and so reduction in losses.

6.2 Incident Factor Classification System (IFCS)

The IFCS contains classifications of incidents based on information from investigation reports. The classifications range from engineering to human factors issues. Reviews of the classifications will be undertaken by human factors and safety specialists working within the rail industry. Some of the classifications are already in use by investigating organisations, including the RAIB and Network Rail.

The longer-term aspiration is that the IFCS is used to classify a wider range of incidents from across the rail industry (including those in other countries), and also other industries. This will increase the analysis that can be done and the potential learning that can be obtained from the investigations.

The key outcomes for IFCS are planned to be:

- Promotion of cross-Industry learning. Causal trends will be identified for all in the industry using a consistent classification for key incidents.
- Use by incident investigators. Use by incident investigators to identify incidents with similar causes which have happened in the past.

Good Practice - ICCS information

The ICCS can assist in providing answers to important questions such as:

- What sort of incidents have had errors in, for example, maintenance planning?
- What are the trends in, for example, SPADs where signalling issues have been identified as a cause?
6.3 Sources of lessons from accidents

There are many sources of accident information which transport operators, investigators and others in the industry can contribute to and learn from. A number are listed here but the list is not exhaustive and is subject to change:

(this list is expanded upon in Part 2, section 6.8)

- RAIB Bulletins - via [www.raib.gov.uk](http://www.raib.gov.uk)
- Right Track - log on to Opsweb ([www.opsweb.co.uk](http://www.opsweb.co.uk)) or email righttrack@rssb.co.uk
- RED - DVDs Copies can be obtained by contacting RSSB’s Programme Manager (Operational Safety) via enquirydesk@rssb.co.uk
- RSSB Operational Feedback Updates - via RSSB website and [www.opsweb.co.uk](http://www.opsweb.co.uk)
- Worldwide Accident Investigation Summary - via RSSB website and [www.opsweb.co.uk](http://www.opsweb.co.uk)

6.4 Measuring improvement in loss due to accidents

Investigators have an important role in reducing loss due to accidents and companies should be aware of such improvement. Safety performance indicators relating to this could include, for example:

- Were reports completed to meet the timescale in the remit?
- Was feedback given to the investigators/report writers?
- Were the recommendations implemented on time?
- Were the interface arrangements with others satisfactory (from the accident to recommendation implementation)?
- Was the effectiveness of the implemented recommendations reviewed at a high level?
- What is the overall accident trend and how is it linked to the above?
Appendix A - Human failure, errors and violations

To systematically learn lessons organisations will need high level review processes. Once lessons have been learned the benefits will be gained through, for example, updated procedures and SMSs, training and briefing of staff and changes to monitoring and review processes.

In order to understand why people make mistakes, it is useful to know how human error can be defined and classified. Human errors are defined as *unintended actions or outcomes* and are a fundamental part of everyday life. Errors result in poor performance which is indicated by a failure to reach set goals. Error is very wide ranging and there are a number of approaches to categorising different human errors.

The most common categorisation within a human factors framework is the Generic Error Modelling System (GEMS), which has been developed into the categories presented in Diagram 5 based on industry experiences of practical application of the GEMs model and input from human factors specialists. The categories form part of the cross-industry Incident Factor Classification System (IFCS) and are consistent with categories used by Network Rail and RSSB for developing incident investigator competence.

HSE’s HSG48 *Reducing error and influencing behaviour* provides further useful information on human error and violation classification.

It is important to make a distinction between *errors* and *violations*. Whilst errors are unintended actions, violations are deliberate deviations from rules, procedures, instructions or regulations. The key point is that to be a violation, the act must be deliberate, such as where a person knowingly takes shortcuts, circumvents or just doesn’t apply safety rules.
While violations are deliberate rather than unintentional deviations from safe practice, most violations are motivated by a desire to carry on with the job and/or complete a task in less time. People rarely break rules maliciously, but because of poorly designed systems or procedures, lack of time, conflicting objectives and poor safety culture. It is important that such circumstances are exposed and understood.

Violations can be classified into the following categories:

Table 5 Violations

<table>
<thead>
<tr>
<th>Violation</th>
<th>Routine</th>
<th>Situational/ exceptional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error types</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception slip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action slip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory lapse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision error</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Routine</strong></td>
<td>This is when breaking the rule or not following the procedure has become the normal way of working. It is almost invisible until there is an accident (or sometimes as the result of an audit). Routine violations are promoted by a relatively indifferent environment, ie one that rarely punishes violations or rewards compliance: “We do it like this all the time and nobody even notices.”</td>
<td>Short-circuiting straps are always laid out prior to isolation being granted, as the team likes to save time where possible.</td>
</tr>
<tr>
<td><strong>Situational/ exceptional</strong></td>
<td>This is when people break the rules because of particular pressures or circumstances arising from a specific job. An example of a situational violation concerns railway shunters; the Rule Book prohibits shunters from remaining between wagons when wagons are being connected. Only when the wagons are stopped can the shunter get down between them to make the necessary coupling. On some occasions, however, the shackle for connecting the wagons is too short to be coupled when the buffers are fully extended. The job can only therefore be done when the buffers are momentarily compressed as the wagons first come into contact with each other. Thus, the only way to join these particular wagons is by remaining between them during the connection and watching your head. The result is obvious.</td>
<td>A train is inadvertently routed into a possession. The signaller had not switched ARS “off” and was using reminders to make sure the trains were not routed towards the possession.</td>
</tr>
</tbody>
</table>
Appendix B - Example of a minor accident investigation on a station

This example is included in order to illustrate the use of the guidance and what might be a reasonable level of resource in response to a minor accident. (It is a variation on the accident used in Part 2 section 4.2)

Take the example of a young adult passenger tripping when alighting from a train which has stopped at a Network Rail managed station where the platform staff belong to another train operator. The train guard initially attends to the passenger who sustains a twisted ankle. The accident is the first of its kind for a few years at this station. This should be of particular interest to operators and users of stations.

Table 6 Minor accident investigation

<table>
<thead>
<tr>
<th>Investigation and related actions</th>
<th>Section in Part 2 Company</th>
<th>Section in Part 3 Investigator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Principles and use of this guidance</td>
<td></td>
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<tr>
<td>RGSs do not mandate an investigation but a line manager level investigation is suggested.</td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td>2 Before the event</td>
<td></td>
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<tr>
<td>There should be an understanding that this sort of accident should be investigated to avoid repeat</td>
<td></td>
<td>2.1, 2.2</td>
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<tr>
<td>accidents to passengers and reduce claims due to this accident or others.</td>
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<tr>
<td>The company should have policies in place and adequate resources, including competent investigators</td>
<td></td>
<td>2.4</td>
</tr>
<tr>
<td>and reporting arrangements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff at the scene of the accident should cooperate with other parties as appropriate (Network Rail</td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td>and train operators).</td>
<td></td>
<td></td>
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<tr>
<td>3 Initial response to event</td>
<td></td>
<td></td>
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<tr>
<td>Staff involved should ensure safety of themselves and the injured passenger; this will probably</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>require communication with the driver station staff and signaller. A record should be made of the</td>
<td></td>
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<tr>
<td>event and this could include: recording names and addresses of the injured person and witnesses,</td>
<td></td>
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<td>noting stepping distances, etc (see checklists in Part 3, 3.1)</td>
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<tr>
<td>Staff involved should pass on accurate information to those who report the accident and complete</td>
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<td>3.2</td>
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<td>appropriate accident report.</td>
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</table>
4 Investigation

(On the assumption that the information available at the time of the accident suggests that the passenger tripped whilst on the train – rather than when stepping onto the platform - and that the train operator therefore takes the lead)

The train operator should decide on who should investigate and ensure that a remit is set. This could be automatic in the sense that the company policy may state that line managers investigate accidents up to a certain level within their area of responsibility. The remit may also be covered by reference to a checklist in the policy.

The investigator should gather evidence eg CCTV footage, photographs of the train floor and doorway, records of similar events and maintenance history. (see checklists in 4.4)

Interviews or statements from witnesses and others involved should be arranged, eg train and station staff, train maintainer and other passengers. (see checklists in 4.5)

The searching for causes should be done with an open mind and it is essential that underlying causes are identified. Wider issues should be explored such as: overcrowding and use of alcohol and if these were possible factors was such an accident foreseeable? Previous similar events on the same train or others in the fleet should be checked and if found to be the case then questions should be asked about what actions were proposed at that time and then taken.

In exploring underlying causes an awareness of human factors is necessary and there is considerable guidance on this, some relating to employees, but also to others such as passengers who may require to be dealt with differently.

5 Investigation report

The report should meet the remit requirements and should be clear and well structured. For such an accident the report may be the accident report form which would require the passenger’s name so later use of this should address data protection issues.

In order to avoid data protection issues it is best to omit names of people.
### Investigation and related actions

<table>
<thead>
<tr>
<th>Recommendations should be SMART and be aimed at making demonstrable improvement. (see checklist in 5.3) They should be developed after liaison with the parties involved and should not come as a surprise. For example, if poor communication and action on problems relating to maintenance of doors is an underlying cause, then a recommendation could be. Improve the system for reporting train faults to include feedback and a sign off process for the user.</th>
<th>Section in Part 2 Company</th>
<th>Section in Part 3 Investigator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once issued recommendations should be managed (probably locally), including tracking through to implementation.</td>
<td>5.5</td>
<td></td>
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<tr>
<td>Final accurate reporting via SMIS should be completed.</td>
<td>5.6</td>
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</tbody>
</table>

### 6 Learning from investigations

This accident should be included amongst the statistics that form part of senior management review. However, if it were the case that the communication problem suggested above was part of a general malaise in the contract relationship with the maintainer, then this underlying cause should be reviewed at a high level. A more serious injury may prompt a similar response.

### Resources

The resources for such an investigation should probably be around the following scale:

- Line manager time to visit site, gather evidence, interview, analyse and write report
- Management time in overseeing through from remit to following recommendations
- Senior management review
- Staff who report
- Rail employees being interviewed

- Less than 2 days (spread over 2 weeks)
- Less than 2 hours
- Less than ½ hour/group
- Less than an hour
- Less than an hour each
## Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BTP</td>
<td>British Transport Police</td>
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<tr>
<td>CIRAS</td>
<td>Confidential Incident Reporting and Analysis System</td>
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<tr>
<td>DCP</td>
<td>Designated competent person</td>
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<tr>
<td>DPA</td>
<td>Data Protection Act</td>
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<tr>
<td>FOC</td>
<td>Freight Operating Company</td>
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<tr>
<td>HSE</td>
<td>Health and Safety Executive</td>
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<tr>
<td>HSG</td>
<td>Health and Safety Guidance (published by the HSE)</td>
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<tr>
<td>GEMR</td>
<td>Generic Error Modelling for Rail</td>
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<tr>
<td>IFCS</td>
<td>Incident Factor Classification System</td>
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<tr>
<td>LOE</td>
<td>Learning from Operational Experience</td>
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<tr>
<td>ORR</td>
<td>Office of Rail Regulation</td>
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<tr>
<td>RAIB</td>
<td>Rail Accident Investigation Branch</td>
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<tr>
<td>RGS</td>
<td>Railway Group Standard</td>
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<tr>
<td>SMART</td>
<td>Specific Measurable Attainable Relevant Time-bound</td>
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<tr>
<td>SMIS</td>
<td>Safety Management Information System</td>
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<tr>
<td>SMS</td>
<td>Safety Management System</td>
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<tr>
<td>SPG</td>
<td>Safety Policy Group</td>
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<tr>
<td>TOC</td>
<td>Train Operating Company</td>
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