Human Factors Performance in the Overall System and Use of the Ten Incident Factors

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Overview

• Human Performance and the 10 incident factors in industry

• Alstom use of the 10 incident factors to set strategy

• EMR SPAD investigation
Human Performance and the 10 Incident Factors

Human Performance

1. Slip/lapse
2. Intentional rule breaking
3. Decision error
4. Asleep or unable to respond

10 Incident Factors

- Verbal Communication
- Fatigue, health and wellbeing
- Processes and procedure documents
- Written information on the day
- Competence management
- Infrastructure, vehicles, equipment and clothing
- The person’s environment
- Workload (real or perceived) and resourcing
- Teamworking and leadership
- Risk management
Aims

• A consistent, usable agreement on types of human performance and types of underlying cause

• Rail Industry Standard for Accident and Incident Investigation RIS-3119-TOM (issue 2)

• Review and analysis across incidents
TOCs – Fatigue, health and wellbeing

FOCs – Competence management and verbal communication

10 Incident Factor Profiles for TOCs and FOCs
SPAD underlying causes related to fatigue

TOCs SPAD underlying causes related to fatigue
- Factors outside of work
- Mental or emotional health affecting performance
- Physical health affecting performance
- Worked a poor shift/roster approved by organisation
- Fatigue (physical or mental) - higher level category

FOCs SPAD underlying causes related to fatigue
- Mental or emotional health affecting performance
- Worked a poor shift/roster approved by organisation
- Factors outside of work
- Other wellbeing issues
- Fatigue (physical or mental) - higher level category
Key Activities

• Provision of accident investigation training to support implementation of the RIS

• Some companies using the 10 incident factors including: Freightliner, DB Cargo, Alstom, EMR, Network Rail

• Application to investigate the Period 3 peak in SPAD incidents

• Developing accident investigation process functionality in SMIS and develop industry capability in accident investigation aligned to SMIS system

• Application for driver, signaller and trackside staff task research
Alstom Railway Safety – Use of 10 Incident Factors

Mark Kenwright, Head of Railway Safety UK&I
13th November 2019
Agenda

Alstom UK&I “Railway Safety” Performance.

- Root Causes Analysis

10 Incident Factors Indicator

- Conclusions
01

Alstom UK&I “Railway Safety” Performance.
Alstom UK&I Long Term Trend – Product Safety Issues / Incidents Raised

UK&I Railway Safety Issues Raised (PST)

Number of Safety Issues Raised

Year

Forecast/Trend over 9yr period

Fasteners & Lubricants initiatives

Communication Timeline initiatives

10 Incident Human Factors initiatives

Collaboration initiatives

Precursor & NTS initiatives

Practices & Processes and Communication initiatives

Precursor & NTS initiatives  

Alstom UK&I Long Term Trend – Product Safety Issues / Incidents Raised

- Fasteners & Lubricants initiatives
- Communication Timeline initiatives
- 10 Incident Human Factors initiatives
- Collaboration initiatives
- Precursor & NTS initiatives
- Practices & Processes and Communication initiatives

UK&I Railway Safety Issues Raised (PST)

Number of Safety Issues Raised

Year

Forecast/Trend over 9yr period
02 Root Causes Analysis
Railway Safety Root Causes Analysis

UK&I Root Cause Analysis since 2012 (%)

- % Supplier Quality
- % Design Related
- % Maintenance Human Error
Approximately Half of all Railway Safety Issues raised could be linked to the Design and or Supplier Quality.
A significant number of Railway Safety Issues raised involved fixings incorrectly supplied, stored or fitted.

Maintenance Human Error (Examples)

Kitchen Ceiling light Panel

Final Drive Gearbox Drain plug
10 Incident Factors Indicator

### Percentage % of Incident Factor Causes

<table>
<thead>
<tr>
<th>Incident Factors</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>14%</td>
</tr>
<tr>
<td>Practices and Processes</td>
<td>16%</td>
</tr>
<tr>
<td>Information</td>
<td>12%</td>
</tr>
<tr>
<td>Workload</td>
<td>12%</td>
</tr>
<tr>
<td>Equipment</td>
<td>12%</td>
</tr>
<tr>
<td>Knowledge, Skills and Experience</td>
<td>4%</td>
</tr>
<tr>
<td>Supervision and Management</td>
<td>4%</td>
</tr>
<tr>
<td>Work Environment</td>
<td>4%</td>
</tr>
<tr>
<td>Personal</td>
<td>12%</td>
</tr>
<tr>
<td>Teamwork</td>
<td>12%</td>
</tr>
</tbody>
</table>

- **Product Safety - Incident Factors**
- **Operational Safety - Incident Factors**
## 10 Incident Factors

<table>
<thead>
<tr>
<th><strong>Communications</strong></th>
<th><strong>Workload</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>How we relay <strong>verbal</strong> information to each other in context of safety critical information.</td>
<td></td>
</tr>
<tr>
<td><strong>Practices &amp; processes</strong></td>
<td><strong>Work environment</strong></td>
</tr>
<tr>
<td>Written rules, standards, processes and methods of working which guide and structure activities undertaken.</td>
<td></td>
</tr>
<tr>
<td><strong>Information</strong></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td>Additional new or ad hoc information used to support an activity or task.</td>
<td></td>
</tr>
<tr>
<td><strong>Knowledge, skills &amp; experience</strong></td>
<td><strong>Supervision &amp; management</strong></td>
</tr>
<tr>
<td>A factor if the individual(s) involved did not have the appropriate knowledge to perform the activity safely.</td>
<td></td>
</tr>
<tr>
<td><strong>Personal</strong></td>
<td><strong>Teamwork</strong></td>
</tr>
<tr>
<td>The collection of influences which can affect attention, fatigue and focus of an individual at work.</td>
<td></td>
</tr>
</tbody>
</table>

Visit: Railway Safety UK & Ireland Intranet Page for further information
03 Conclusions
Conclusions

• Around 75 Product Safety incidents have been raised per year for the last 9 years.
• Supplier related incidents have been steadily decreasing.
• Design related incidents have been steadily increasing.
• Approximately 50% of the incidents raised relate to Human Error during Maintenance:
  • Communications and Practices & Processes are the dominant contributory factors.
• Initiatives Identified:
  • Raise awareness of the “dominant” Contributary factors of incidents raised.
  • Deliver & support the introduction of NTS within the business.
Our approach to Incident Investigation – Human Factors
• Formed in 2007 from former Midland Mainline franchise, part of Central trains franchise and part of Maintrain organisation, then East Midlands Trains.
• Operated by Abellio Group since October 2019.
• Operate approx 470 trains per day, the SFO for 90 stations,
• Mainline services from Leeds, Sheffield, Nottingham to St Pancras
• Long distance local services from Liverpool to Norwich
• Local services in East Midlands and Lincolnshire.
Incident investigations

- East Midlands Railways has four levels of investigation:
  - Level One – minor investigations
  - Level Two – investigations to a standard remit
  - Level Three – investigations to a remit set by the Designated Competent Person following an event review
  - Level Four – Formal inquiries, externally led investigations
Who carries out Level 3 investigations?

- Investigator identified at the Event Review
- Inexperienced investigators normally assigned a mentor
- Investigators have a range of skills, experience and competencies.
- EMR provide investigator training (from external providers) together with additional support regarding use of non-technical skills / human factors
- Includes support on building competency development plans with individuals involved
- Use of 10 incident factors build into latest version of our procedure
As Investigators we look at;
• Competence,
• Rules and Procedures
• Infrastructure
• Equipment
• AND Human Factors / NTS
NTS and Human Factors
Within the Investigation

The Basics;

• The Driver booked on at approximately 08.30.
• Then walked over to Platform 1 to locate his train which was to form the 08.55 service.
• The service was indicated to be departing from platform 1A but the only train platformed was in 1B which the Driver ascertained was his train after speaking to the guard.
• The platform starting signal cleared to a signal yellow which was displaying an X route indication.
• As the service departed the station the Driver sounded the warning horn for track workers and then for a Look-out a short distance after.
• The Driver had observed a green signal on Y line to which he focused his attention, only realising his mistake when he again looked for his signal and observed X line’s signal to be displaying a red/danger aspect.
• The service came to a stand after passing XXXX signal at danger without authority by approximately one coach length.
10 Incident Factors

Identification of Causal and Underlying Factors:

Human Performance
- Slippage
- Intentional rule breaking
- Decision error
- The person was asleep or unable to respond to the situation

10 Incident Factors
- Vision communication
- Fatigue, health and well-being
- Inattention, positioning and sitting
- Competency management
- Infrastructure, vehicles, equipment and clothing
- Written information on the day
- Written/recorded evidence
- Risk management

Team working & Leadership
- The Operations supervisor is responsible to complete the Station set up risk sheet. This sheet was incorrect as it therefore allowed access to the process. Should the Platform Assistant not observe the error then the potential is that customers board the wrong train or miss the service completely. This allows additional access to the Drivers and Train crew.

The new Manager Assessor of the Driver failed to observe feedback from previous assessments and therefore could not have developed the Drivers risk areas.

Fatigue, Health & Well-being
- Not a factor in this investigation. Not worth noting that the had worked eight consecutive days prior to the incident.

Verbal Communication
- The investigation has shown that the reporting of this incident was not completed in full by not informing the EMR Duty Route Control Manager (Local). The Driver wanted to leave the (GDR) equipment the to enable the Signaller to continue.

CSMR voice recordings were problematic in reviewing because of the new ODR requirements and EMR's computer software.

The Driver did not reconsider the Signaller's instructions when he changed ends to return into the Station.

Process & Procedure Documents
- The Station set up sheet was seen to be completed with an obvious error, this needs to be corrected and a search check completing prior to issue.

Manager Assessor or handwritten sheet (Recommendation) should be completed to avoid development feedback and Driver history being missed.

The Driver failed to inform the EMR Duty Route Control Manager (Local) of the incident.

The ten incident factors:

- Compliance Management
- Task Management
- The new Manager Assessor had no awareness of previous assessment feedback due to not being aware of previous assessments.
- Driver obtained the Job card the day prior to the train on the day of incident arrived. This shows evidence of the incident not being followed.
- The station set up sheet was incorrect allowing the Driver an amount of distraction when passing the signal/s.
- The Driver displayed a lack of RTS skills and was seen to be distracted by surrounding events and lose concentration.
- Failure to use the RTS skills and the Driver states that they do not normally do it.
- Written information on the day
  - All written reports and evidence were collected and reviewed on the day of the incident.
Workload & Resourcing
Not a factor within this investigation.

Although it was noted that ___ was the Driver's very first part of his diagram.

The Person's Working Environment
Not a factor within this investigation.

Human Performance

Slip/loose
There was a lapse of concentration on approach to signal ___ where the Driver failed to identify the caution aspect.

Intentional rule breaking
Not a factor within this investigation.

Decision error
The Driver approached signal ___ incorrectly, thinking he was approaching a proceed aspect.
The Driver incorrectly targeted signal ___ which is located on the same gantry.

The person was asleep or unable to respond to the situation
Not a factor within this investigation.
Conclusions

Summary of Conclusions

The Immediate Cause

The Driver of _____ failed to apply the train brake in sufficient time on the approach to signal _____ which was displaying a stop (danger) aspect and bring the train to a stand prior to the signal.

Underlying Causal Factors

Failure to comply with the EMT Train Driving Policy when approaching a signal at danger.

- Operate Trains in Service section 6.6.2 Route Risk, 6.6 Common Causes of SAPD, 6.7 Automatic Warning System (AWS), 6.8 Approaching Signs at Danger, 6.9 Approaching and Stopping Signs at Danger.

The Driver had numerous Non-Technical Skills failings (Appendix J).

- Situational awareness
- Workload Management
- Anticipation of risk
- Overall awareness
- Global awareness
- Effective, timely decisions
- Checking
- Maintain concentration
- Systematic and thorough approach
- Multi-tasking and selective attention
- Prioritising
- Confirmation bias
- Strong but wrong

Confirmation bias and strong but wrong

The Driver made an assumption that signal _____ was displaying a green proceed aspect when he had incorrectly targeted fixed signal _____.

Target Fixing

The Driver failed to identify signal _____ and subsequently targeted the incorrect signal. His priority changed to sounding the warning horn and observing track workers once he had seen the incorrect green signal displayed at _____ and failed to check the approaching signal on further approach to _____.

No positive action taken on approach to _____ signal.

Confirmation bias led the Driver to incorrectly approach _____ signal, as the Driver believed he was approaching a proceed aspect. The Driver took power whilst observing and sounding the train warning horn for track workers, understanding his error when he received the AWS warning for signal _____, which leads the investigator to believe that the Driver believed he had a clear signal aspect at signal _____ because he had missed the green aspect displayed at signal _____.

Read across.

The Driver incorrectly identified _____ signal as his own instead of _____ signal which was displaying a danger (stop) aspect. These signals are located on a gantry with two other signals but all four signals are identifiable due to being fitted with the identification boards and labelled _____ (right to left).

Distraction/concentration issues.

The Driver failed to maintain concentration through various distractions, observing and sounding the warning horn for track workers. Look-out and a distraction caused by leaving customers on the platform at _____ Station.

Risk Triggered Commentary Driving

The Driver failed to use RTCD (Risk Triggered Commentary Driving) on the approach to signal _____ when departing Nottingham Station or when observing track workers and the look-out.
Recommendations

1. Change of Competence Assessment Manager Handover Form.
   Reasons: To create a handover form to document and provide feedback to the new Competence Assessment Manager to afford visibility to concerns development with the Driver concerned, allowing the new Assessor/Manager to target those areas and provide a consistent standardised assessment approach to the Driver.
   Timescale: Within 3 Months of this investigation.

2. Voice Communication Review.
   Reasons: To ascertain during ongoing review meetings if all voice recording equipment is operative and working correctly. This will also include if the communications are obtainable and be able to be reviewed when requested by the Investigation post incident (including GDPR, retention and software issues). Updates can then be addressed and actions can be taken away by Network Rail and reported on prior to subsequent review group meetings. Included within the meetings, Network Rail are to sample voice recordings to ascertain if the GSMR recording equipment is functioning correctly and report back to the group.
   Owner: Chairperson Voice Communication Review Group – for East Midlands Railway.
   Timescale: Ongoing.

3. Running Brake Test Reminder.
   Reasons: Drivers are to be reminded of the EMR Running Brake Test rules and the potential for previous mental models and distractions at certain locations where combing this with the driver's skill and skill identification could be an issue.
   Owner: Driver Safety Engagement Manager – for East Midlands Railway.
   Timescale: Within 3 Months of this investigation.

4. The Driver is to be placed on a suitable Competence Development Plan.
   Reasons: The Driver is to be placed on a Competency Development Plan (CDP) to address the factors identified within this report and attend a Non Technical Skills awareness course/training to help support the CDP.
   Owner: [Name] – East Midlands Railway.
   Timescale: Prior to the Driver returning to his substantive duties.

5. Station setup sheet censor check form.
   Reasons: To enable the Station setup sheet to be completed correctly, minimising mistakes for Customers, Drivers/Senior Conductors and platform staff, enabling visibility to allow with no confusion.
   Owner: Lead Operations Manager - for East Midlands Railway.
   Timescale: Within 3 months of this investigation.

6. Reporting Procedure Reminder.
   Reasons: The reporting of incidents and significant events is to be placed on an EMR Notice for display in the Notice case of all EMR booking on points, to remind the requirements of reporting such events.
   Owner: Driver Safety Engagement Manager – for East Midlands Railway.
   Timescale: Within 3 months of this investigation.
Attention to interview to highlight Human Factor / NTS failings.

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*Do you use RTCD*
- Occasionally yes

*Did you on this occasion*
- No

*Why*
- I believe I didn't because I was fresh, use it when I'm tired, to remain focused, don't know why I didn't, I'll be because I was just leaving

*What stopped you on this occasion*
- Possibly all the distractions

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*You stated previously about singing single ladies, why didn't you do this*
- M. Believed there was too many distractions, and didn't focus on what I should have

*What were the distractions*
- M. Wrong platformed, people on the platform, Pway workers and reading across.

*Where is the crossover*
- M. I knew I was on... didn't focus on the... just on the green.

*Where did you see the signal from and can you see them both together*
- M. didn't focus on the signals just the Pway workers, after this when I went past them, looked and saw the green on...
BESPOKE NTS Coaching

Professional Discussion NTS (Non Technical Skills)

Master Template

Date

Prepared by

The S.T.A.R. - DUDA and GROW Model

May learning stages - There are 4
Unconscious incompetence, Conscious incompetence, Conscious competence and Unconscious competence
What do these mean

Stage | Definition | Description
Unconscious incompetence | Unaware of existing incompetence or limitation in knowledge or capability.
Conscious incompetence | Aware of incompetence or limitation in knowledge or capability.
Conscious competence | Aware of incompetence or limitation in knowledge or capability and able to take actions.
Unconscious competence | Exempt from incompetence or limitation in knowledge or capability.
Mitigate Future Risk and become more resilient to error.

Summary of the day:

You completed the NTS skill sorting exercise well and some groupings required a little reorganising, but the main point was that you interacted well and have read and understood the skills and how they can link into groups.

We had a good discussion about the incident and the surrounding circumstances and how this was related to NTS skills. I feel you now have an appreciation for NTS skills and how to apply them in understanding the task in hand and the risks of your actions or no actions.

This will help mitigate future risks for yourself whilst driving trains.

I think you enjoyed watching the observation videos and realised that blinkering your focus can allow you to miss the obvious staring you at. This has raised your awareness into global awareness and anticipation of risk.

You openly discussed and participated today well and I feel very positively, hopefully you have opened your mind to NTS and understand the task at hand.

You have various processes in place to keep you safe, but I would state that RTCPD is an excellent tool, which we discussed in detail and always associate this with an action.

Management notes:

Complete CDP as this is the last action was positive throughout today and gave good levels of input where needed.

Signed:

Signed:

Date:

Continue Doing?

MARKING OFF STATION STOPS
HIGHLIGHTING UNUSUAL STOPS
CHECKING STOPPING PATTERN,
WITH CONDUCTOR.
READ P.I.S. SCREENS.
KEEP CHECKING JOB CARD
THROUGHOUT TURN.

Start doing?

MORE RISK TRIGGERED COMMENTARY
DRIVING AND ALWAYS ENSURE AN
ACTION IS TAKEN.
Thank you

Any questions?