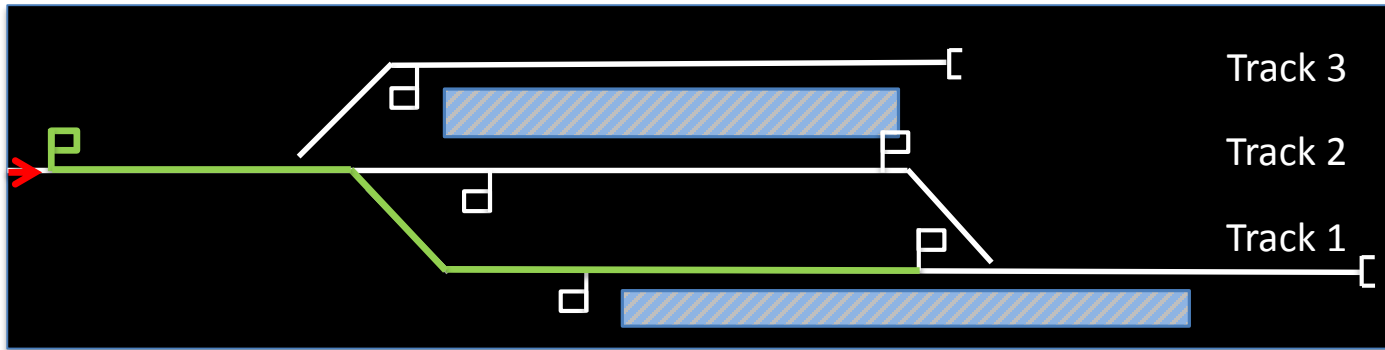


In-depth incident analysis - workshop

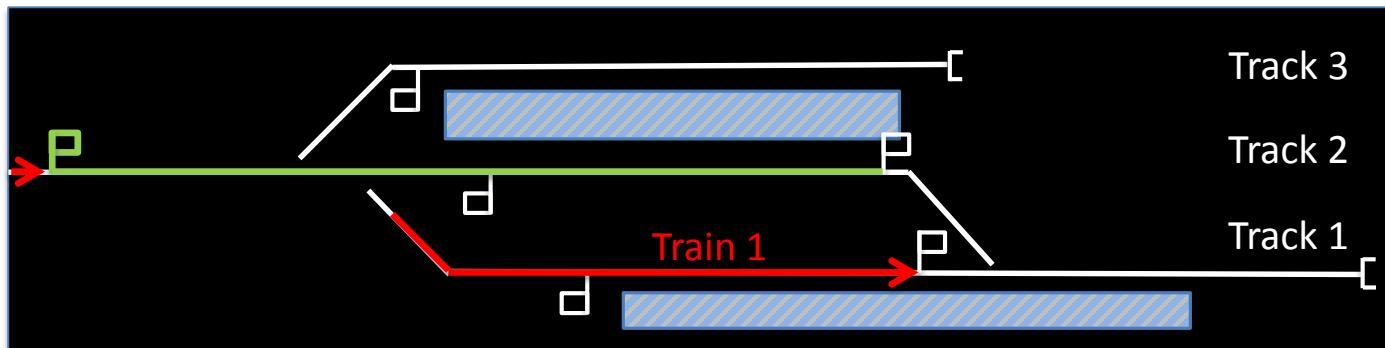
European Rail Safety Summit, Dubrovnik, 12 April 2018



- We investigate to prevent reoccurrence ...
- ... BUT, too often, occurrences are investigated with the number of events remaining unchanged
- Investigate differently, more in-depth
- Aim at reinforcing the capability of detecting and managing performance variability



The route path is set for Train 1 to enter the station on Track 1.
The signal on Track 1 is not opened yet.



Train 1 has entered the station at Track 1.
The rear end of Train 1 has passed the freeing point of the track section.
The route path is set for Train 2 to enter the station on Track 2.



Train 2 is entering the station towards Track 2, and hits the rear end of Train 1. At the same moment, the signal on Track 1 is opened to enable Train 1 to use the entire platform

Findings

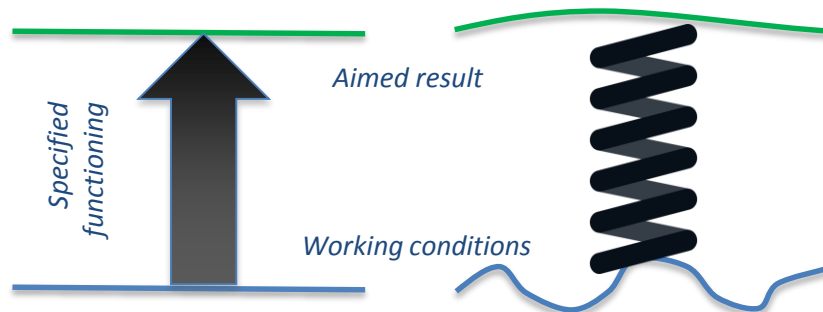
- Both trains respected the signaling and applicable regulations
- Checking of the safety conditions to authorise a train movement is technically not correctly supported: the insulated joint that is used as freeing point is situated within the track gauge of Track 2.
- The retrieved passenger train on Track 1 is longer than the useable length of this track. To enable passengers to exit safely, the permanent instruction is given to the signaller, via a written form, to open the signal on Track 1 whenever a train is entering the station, in order to artificially extend the useable length of Track 1.

- The interlocking system had recently been changed from an analogue into an electronic command technology, allowing for automatic route setting.
- There is an incompatibility between the drawing that is used as input for the design of the new interlocking system and the situation on site.
- Little instructions exist on how to perform such a design; this activity therefore being mainly performed based on personal experience of the designers.
- The tests that were run before the placing in service of the renewed interlocking system did not detect the design error.
- No risk assessment has been performed when designing the local roll out of the new interlocking system.

- Based on the findings, what recommendations would you issue?
- Anything else you want to know?

Sustainable Management of Safety

Activities are carefully planned and adverse situations (that can be expected) are anticipated



Human flexibility and creativity is needed to counter unexpected situations and to keep functioning

Sustainable safety management is managing the variability that might put successful process performance at risk:

- Continuously measure and understand the « tensions » between the prescribed safety process and the real behaviour and decisions
- Create and maintain those conditions that allow work to succeed

Structured analysis of the incident

- STEP 1 – critical performance
 - starting close to the event sequence, identify the function or activity that showed critical variability in its performance
- STEP 2 – expected performance
 - for the selected function, identify the expected performance as prescribed and/or specified
- STEP 3 – source(s) of performance variability
 - identify the factor(s) that can explain the critical variability in performance
- STEP 4 – monitoring capability
 - identify whether the responsible organisation is capable of identifying, monitoring and reporting the critical variability
- STEP 5 – further iterations
 - repeat steps 1 to 4 with functions that either manage the identified source(s) of performance variability or deliver monitoring and/or learning capability

- Apply the identified steps systematically to all activities that could help to understand the context in which this incident happened

A. Authorisation of train movements

- *Critical performance*: automatic opening of a signal while the previous train is still partly situated within the track gauge.
- *Expected performance*: all safety conditions are checked before authorising a train movement
- *Sources of performance variability*:
 - Checking of safety conditions technically not correctly supported => see **B. design**
 - Retrieved train is longer than the useable length of the track => see **F. track allocation**
- *Monitoring capability*: this type of situation is difficultly or not detectable during traffic operation

B. Design of local roll out for new interlocking system

- *Critical performance B.1:* choice of isolated joint as freeing point.
- *Expected performance B.1:* little instructions exist on how to perform such a design
- *Sources of performance variability B.1:* Incompatibility between drawings and reality on site
=> see **C. verification of design**

- *Critical performance B.2:* no risk assessment has been performed.
- *Expected performance B.2:* a generic procedure on the application of the CSM RA exists
- *Sources of performance variability:* poor knowledge of designers on applicable legislation
=> see **E. manage designers' competence**

- *Monitoring capability:* variability in the design (i.e. design choices) could be verified at both the design stage (see **C. verification of design**) and at the stage of placing in service (see **D. testing**)

C. Verification of the design

- *Critical performance*: the design error was not detected – it is not traceable whether a verification of the design was performed.
- *Expected performance*: the existing procedure requires a review of the design by an independent person, who did not take part in the design
- *Sources of performance variability*: no source of performance variability can be identified
- *Monitoring capability*: no measures exist to assure that this type of verification is performed

D. Testing before the placing into service

- *Critical performance*: although testing of the renewed interlocking system took place, the design error was not detected.
- *Expected performance*: the type of tests to be performed when placing a new interlocking system into service are prescribed in a generic way in a specific instruction
- *Sources of performance variability*: there is no trace of how the tests to be performed are identified, so no source of performance variability can be identified
- *Monitoring capability*: no measures exist to identify variability in the application of the mentioned instruction

E. Manage designers' competence

- *Critical performance*: no specific training was organised on the application of the CSM on Risk Assessment.
- *Expected performance*: although a generic procedure on how to apply the CSM on RA exists, the responsibility to organise training on the topic is not allocated within the organisation
- *Sources of performance variability*: the existing SMS documentation does not address responsibilities and/or instructions for activities that are only indirectly impacting safety
- *Monitoring capability*: the scope of the NSA assessment of SMS documentation only concerns activities that directly impact safety

F. Track allocation for trains

- *Critical performance*: the decision to receive a passenger train that is longer than the useable length on Track 1, with as risk control measure the instruction for the operator to open the signal when the train is entering the track.
- *Expected performance*: no clear instructions exist on track allocation; local performance is based on experience
- *Sources of performance variability*: passengers arriving at the platform on Track 2, cross the tracks to join the platform at Track 1, where the station exit and the parking are situated
- *Monitoring capability*: no measures exist to identify variability in the compatibility between rolling stock and infrastructure when allocating train paths

G. Authorisation of train movements

- *Critical performance*: the signal on Track 1 was not directly opened when Train 1 was entering the station.
- *Expected performance*: via a written form, the instruction is given to the open the signal on Track 1, when a train is entering the station, in order to artificially extend the useable length of the platform
- *Sources of performance variability*:
 - the reason for opening the signal was not known by the signaller, who also did not question the incompatibility of the arriving train with the available platform length
 - the reason for opening the signal was not clearly mentioned in the written instruction
- *Monitoring capability*: the correct and timely opening of the signal is not monitored

- Based on these further findings, what recommendations would you issue?

- What you look for is what you find ... and what will be improved
 - compare actual performance with expected performance (scope, responsibilities, risks) ... throughout the system
 - understand reason(s) for performance variability
 - context: how is performance shaped by the interaction between technical, human and organisational factors?
 - culture: why do certain types of behaviour and decisions stand out as ‘the right thing to do’?
 - analyse capability to:
 - identify (and adapt to) performance variability
 - manage sources of performance variability



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