



The Role of Human Factors in Inspection Errors/Failures in the Railway Industry

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Vancouver, BC

ATTICUS
CONSULTING GROUP LLC



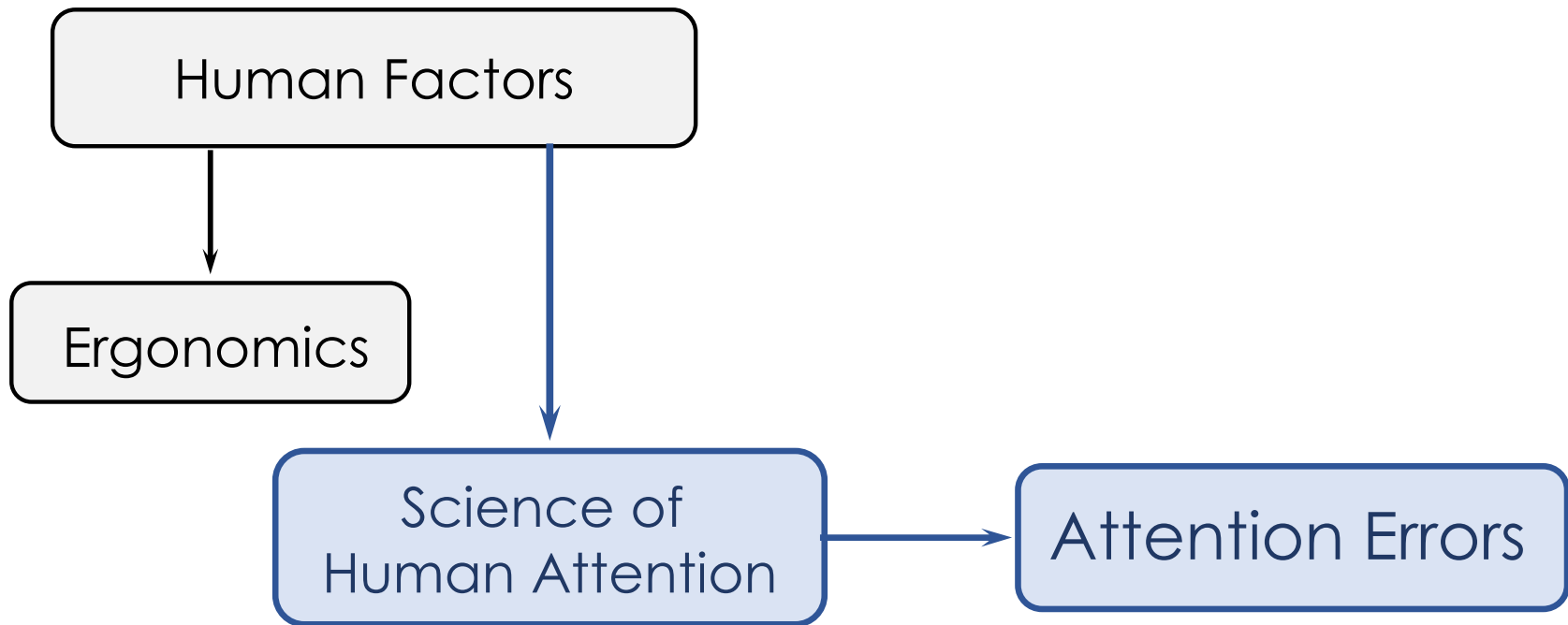
Human
Attention

Railway
Operations

Dr. Daniel Smilek

Randall Jamieson

Our Focus on Human Factors



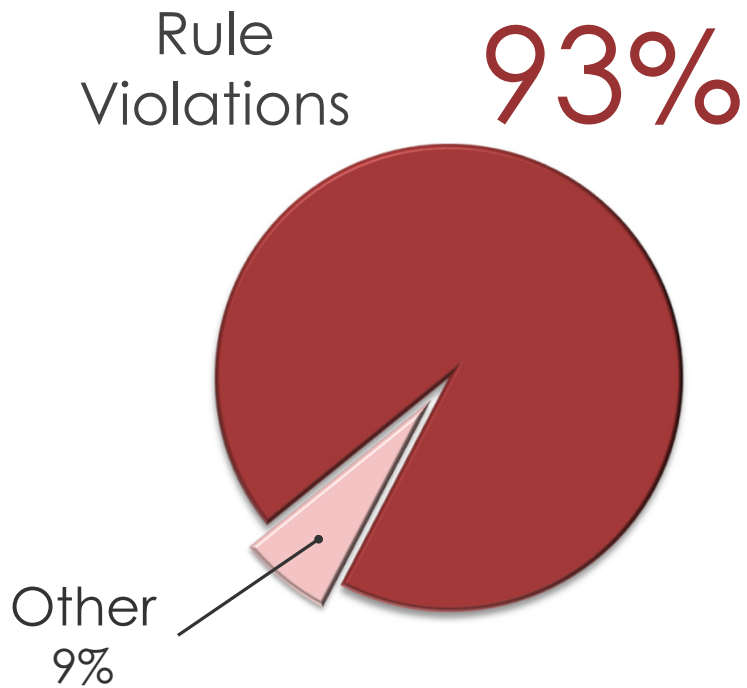


Errors are very common.

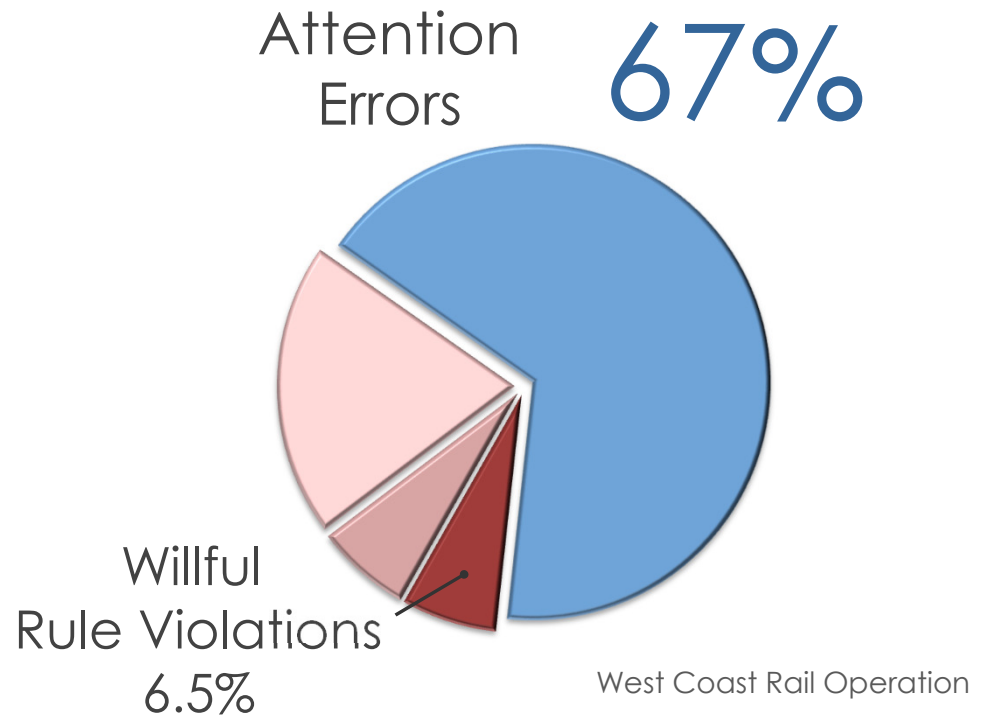
Errors happen to all of us.

We often don't even notice or
think about our errors.

Officer Investigations

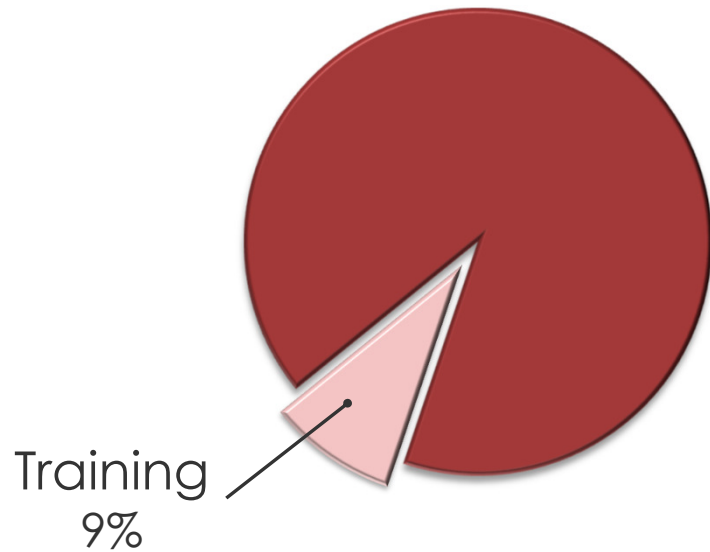


Atticus Analysis



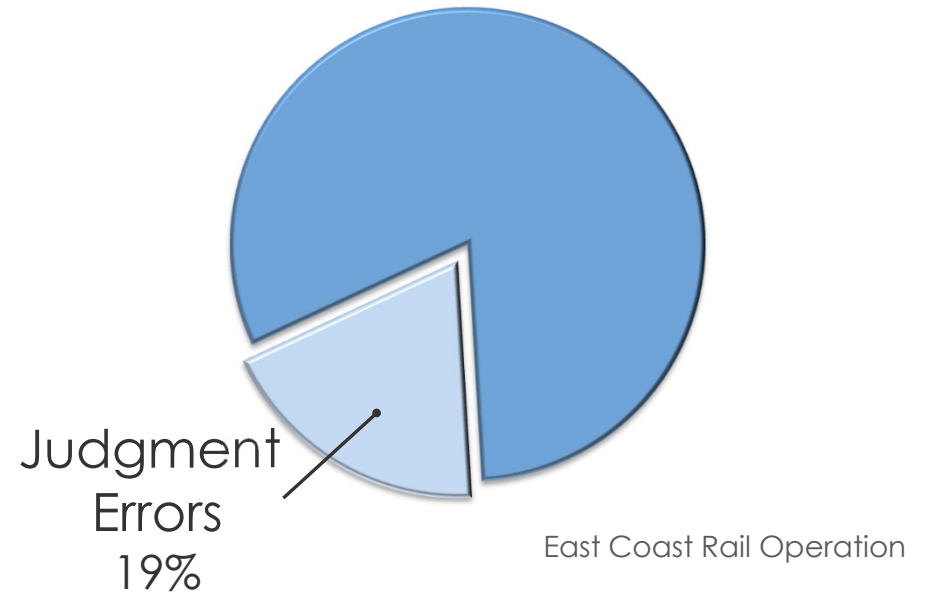
Officer Investigations

Rule Violations 91%



Atticus Analysis

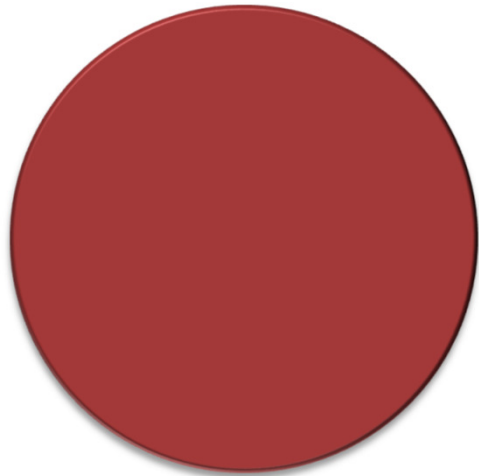
Attention Errors 81%



East Coast Rail Operation

FRA Safety Data

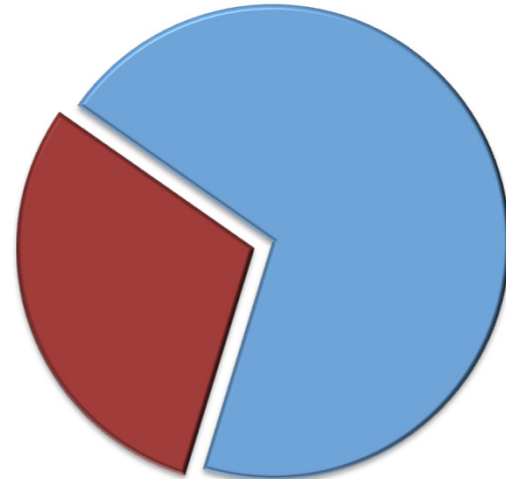
Defects 100%



Atticus Review

Attention Errors ~70%

Defects ~30%



A Common Root Cause of Inspection Errors:



Failure of human attention!



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Five Attention-Related Factors Involved in Inspection Errors



Five Attention-Related Factors Involved in Inspection Errors





Consider the nature of your conscious visual experience...

Put up your hand when you find the change.



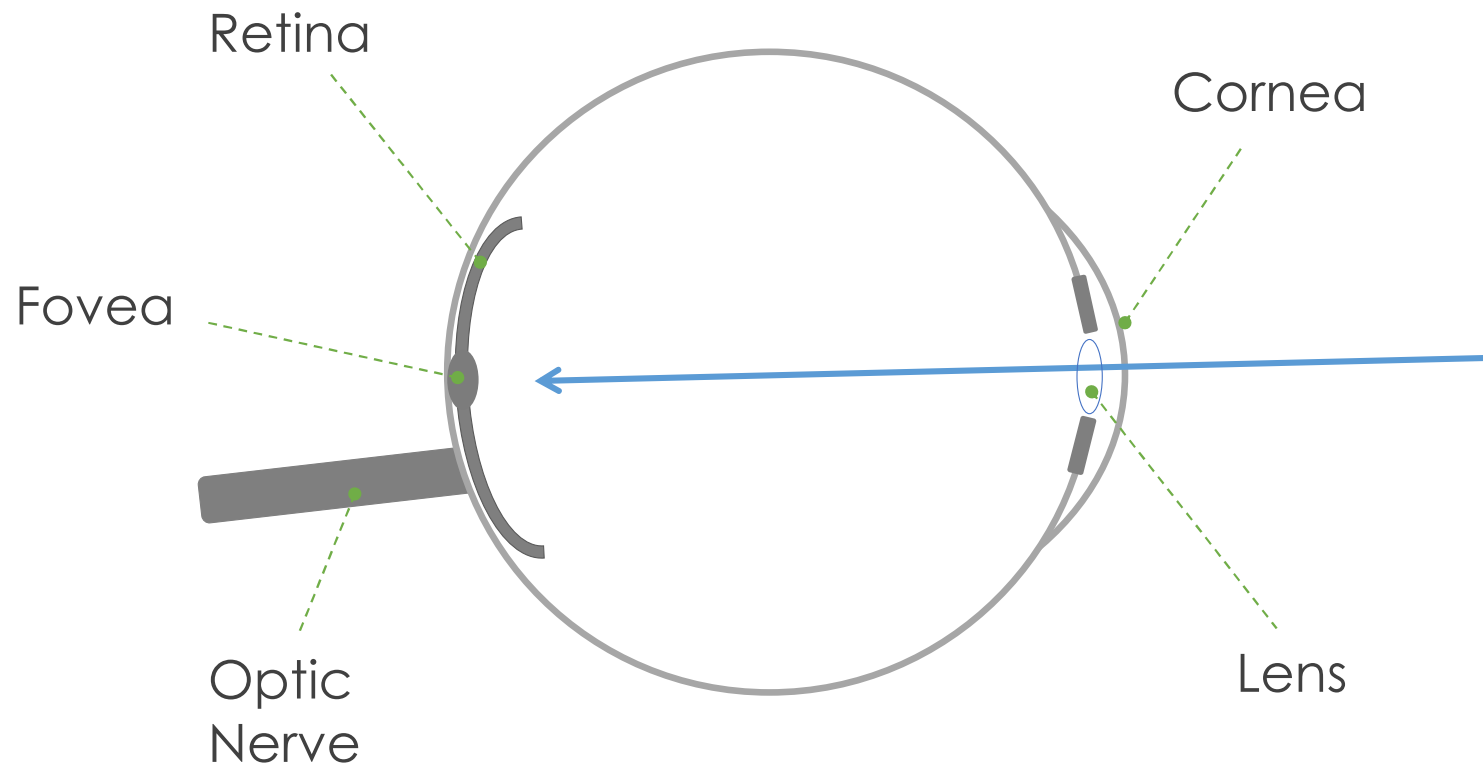
Here is another one!



Change Blindness

The Grand Illusion of Perception

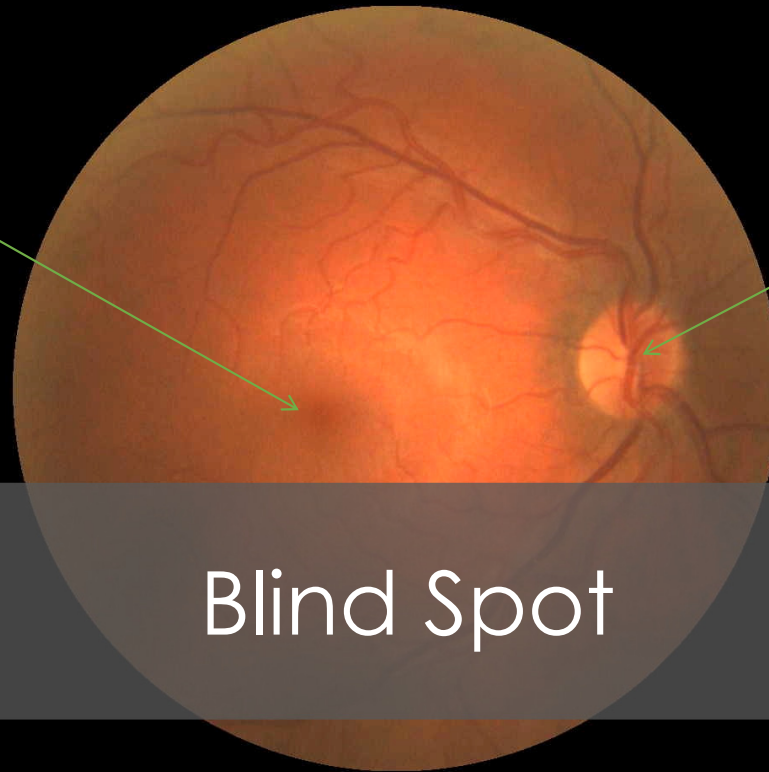
The Eye



The Retina

Fovea

Optic
Disc



Blind Spot

This is a very interesting presentation.
I am enjoying this presentation very much.
I hope it never ends. I could listen all day.
There are many good ideas here.
I will share them with my coworkers.
I will think about these ideas all day.
This is a good day to be here. It is fun.

Fixations



Saccades





















0:16:05.88 (00049740)



So, why do we miss the change in the
change-blindness demonstration?

The 'Grand Illusion of Perception'
might lead us to be overconfident
in our perception.

Five Attention-Related Factors Involved in Inspection Errors



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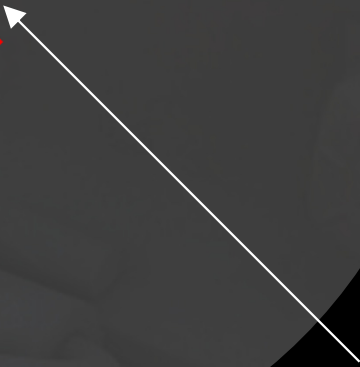


Looking \neq Seeing



Covert Attention

Covert
Attention



Missing Bolt

Fixation

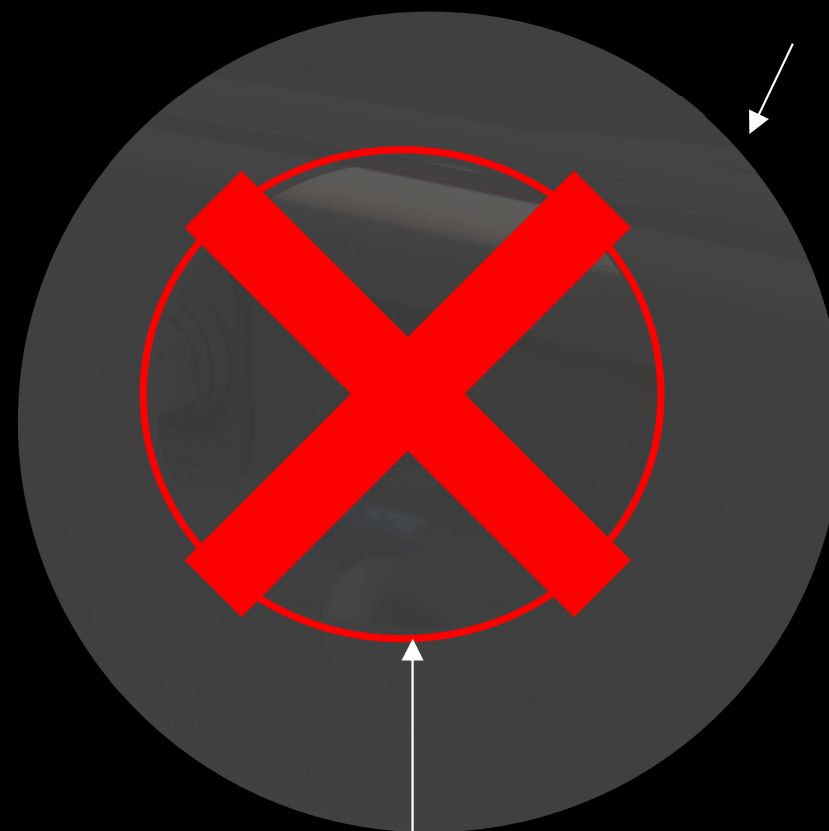


Inattention blindness
occurs when an item is fixated, but **not**
attended.



<http://www.nbcdw.com/traffic/stories/DART-Driver-Fired-After-Crash-on-Tollway-161947975.html>

Fixation



Attention



Internal Thoughts



When your attention is turned **inwards**
to your thoughts, you can become
functionally blind.

Five Attention-Related Factors Involved in Inspection Errors



Five Attention-Related Factors Involved in Inspection Errors





Describe the **people** in the scene



● Eye Fixation

Describe the **people** in the scene

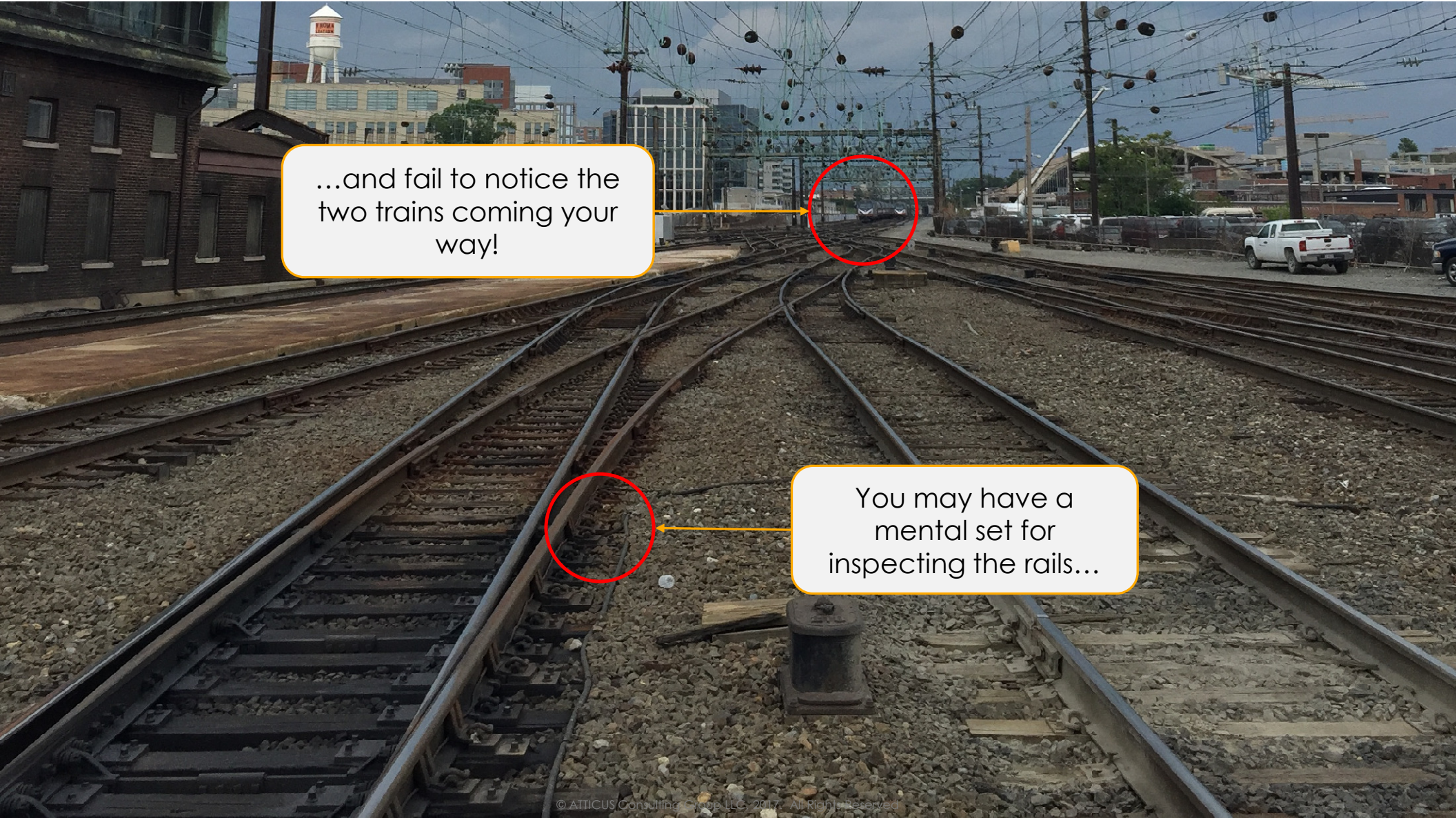


Describe the **location** of the scene



● Eye Fixation

Visual inspection is influenced by your
mental set, expectations, and prior
knowledge.



...and fail to notice the two trains coming your way!

You may have a mental set for inspecting the rails...

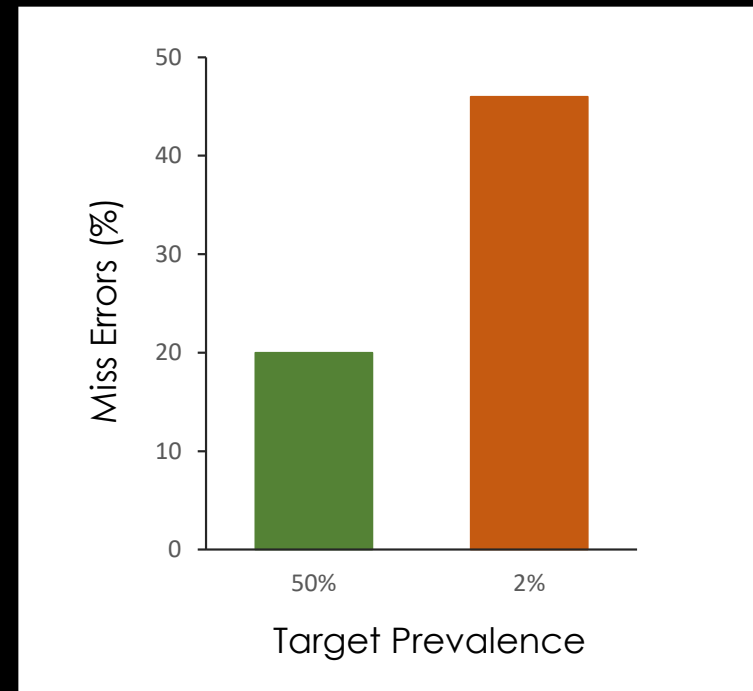
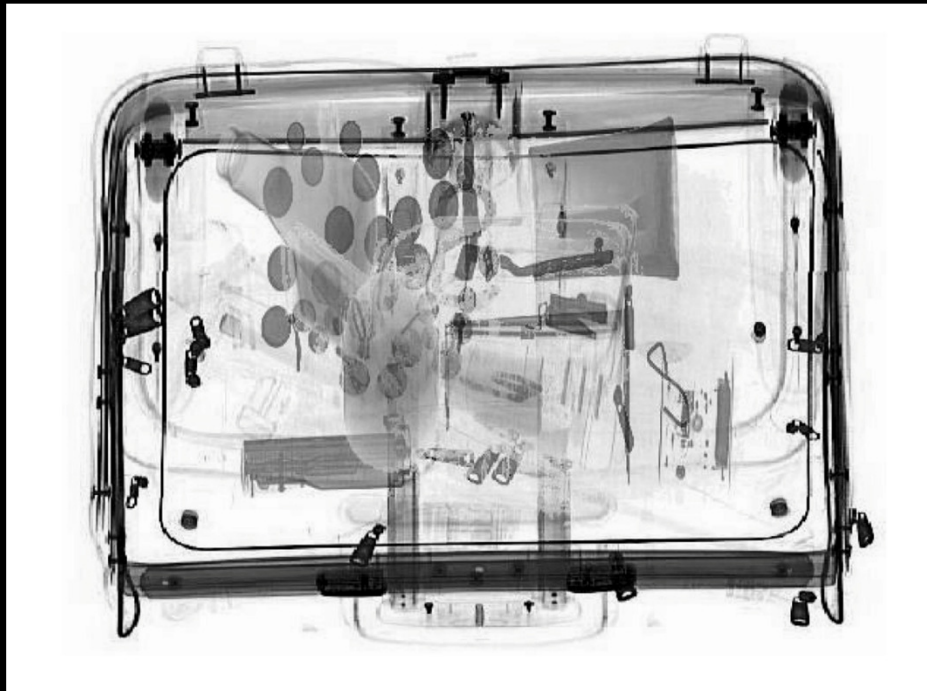
Five Factors That May Lead to Attention Errors During Track and Equipment Inspection



Five Factors That May Lead to Attention Errors During Track and Equipment Inspection



Target Prevalence



Wolfe, J. M., Horowitz, T. S., Van Wert, M. J., Kenner, N. M., Place, S. S., & Kibbi, N. (2007). Low target prevalence is a stubborn source of errors in visual search tasks. *Journal of Experimental Psychology: General*, 136(4), 623. (Fig 1).

Uncommon defects are *more*
likely to be *missed*.

Five Factors That May Lead to Attention Errors During Track and Equipment Inspection



Five Factors That May Lead to Attention Errors During Track and Equipment Inspection



Find the symmetrical “T”s of any color in any orientation.

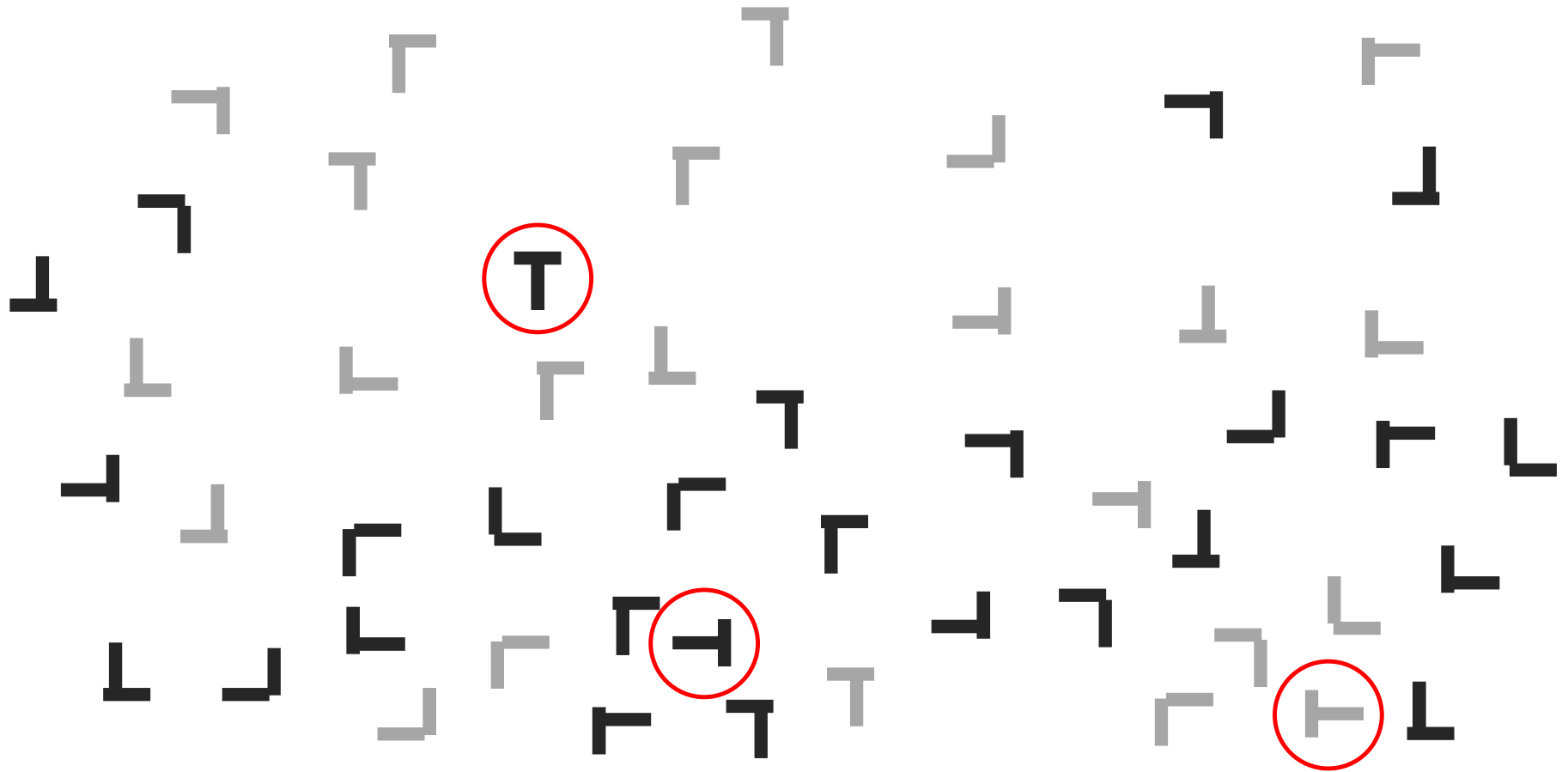
Target → **T** **T** ← Not a Target





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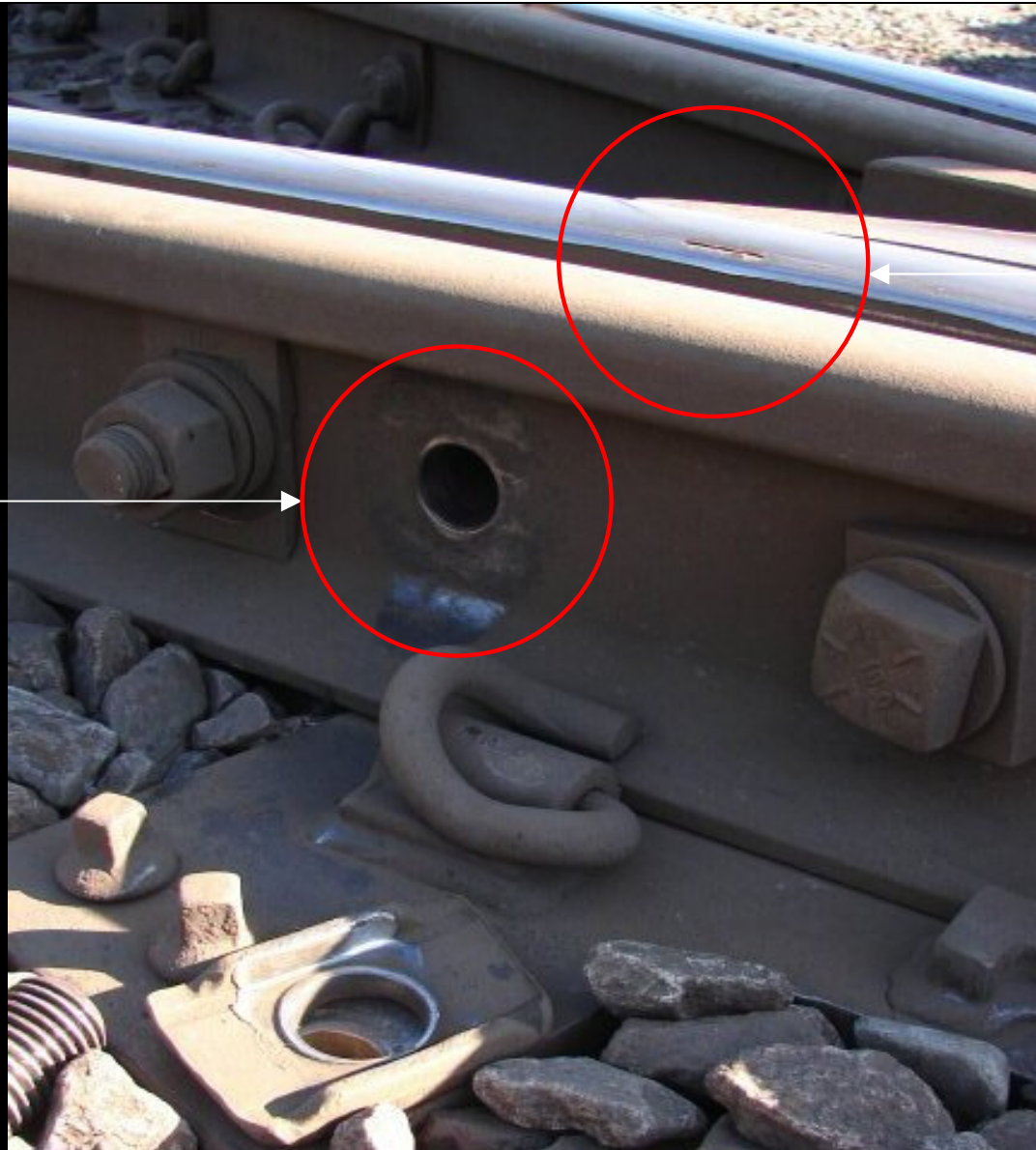


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Satisfaction of Search (SOS):
Inspection becomes **less effective** after
a salient defect has been found.

You may be satisfied after finding this defect...



...and completely miss this less salient defect.

Five Attention-Related Factors Involved in Inspection Errors



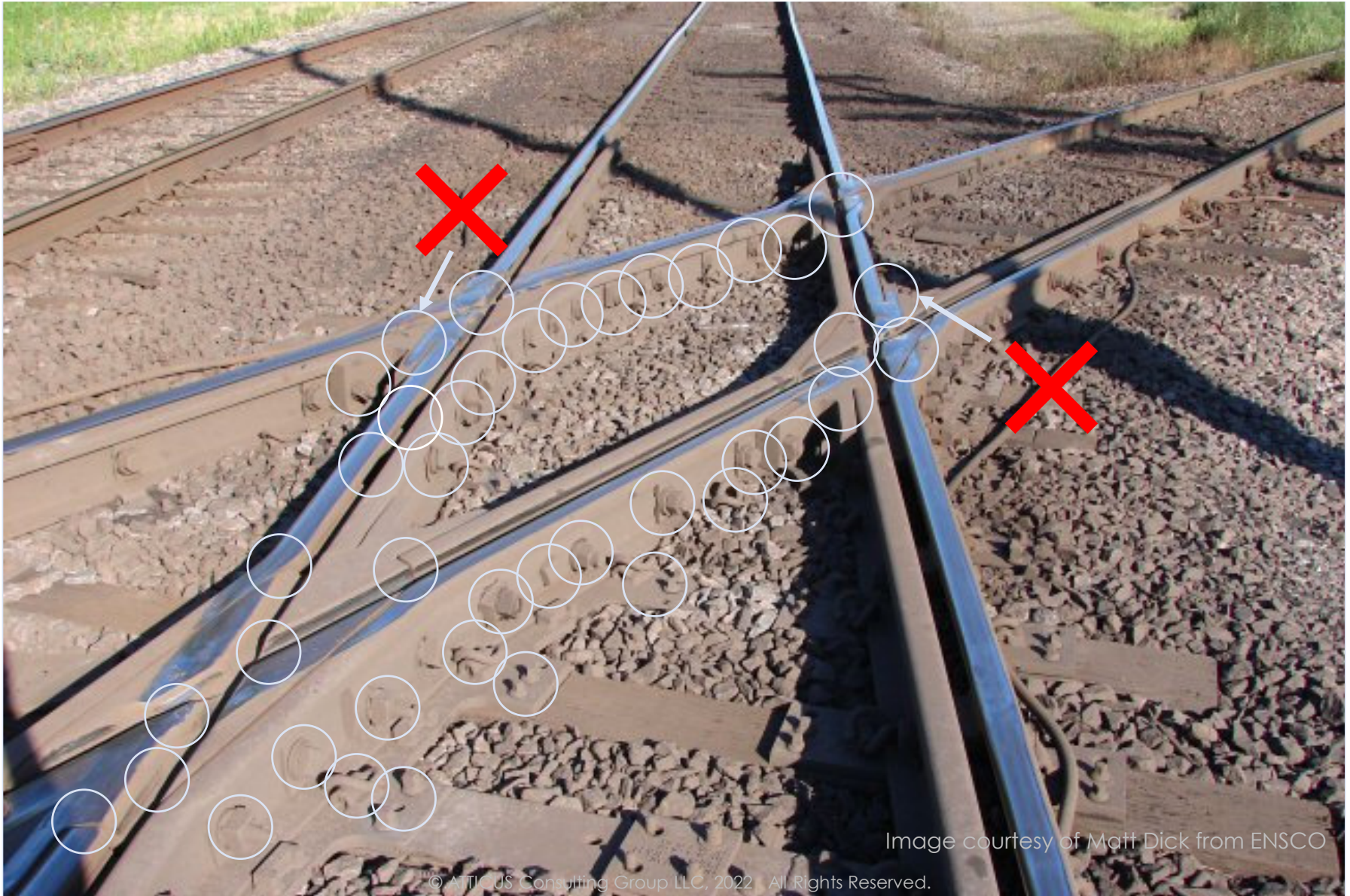


Image courtesy of Matt Dick from ENSCO



Attention Strategy

Employ a systematic active looking and scanning strategy.

Attention Performance Trinity™



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