



Transportation
Safety Board
of Canada

Bureau de la sécurité
des transports
du Canada



Human factors train accidents: From design to end user

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06 November 2019 Edmonton, AB

Canada

Outline

- About the TSB
- The relevance of microwave ovens
- Train accidents by cause
- Design and training ... together
- Human-machine interface
- Watchlist: Following signal indications
- Conclusions



TSB 101: Who we are, what we do

Mandate: To advance transportation safety in the air, marine, pipeline, and rail modes by:

- conducting independent investigations
- identifying safety deficiencies, causes, and contributing factors
- making recommendations to address systemic issues

TSB is not a regulator

It is not the function of the Board to assign fault or determine civil or criminal liability

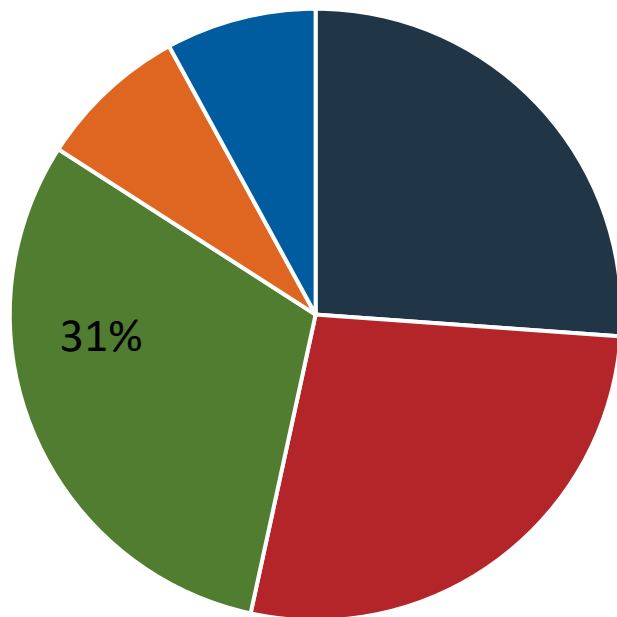


One of these ... is not like the others

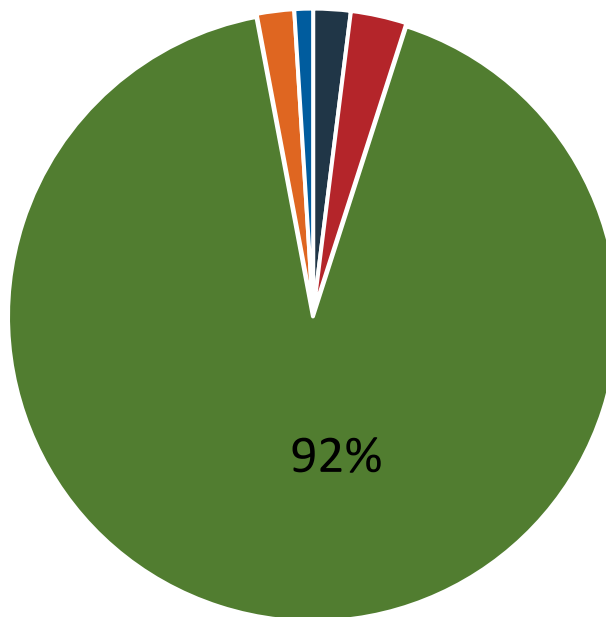


2018 Train accidents in Canada by cause

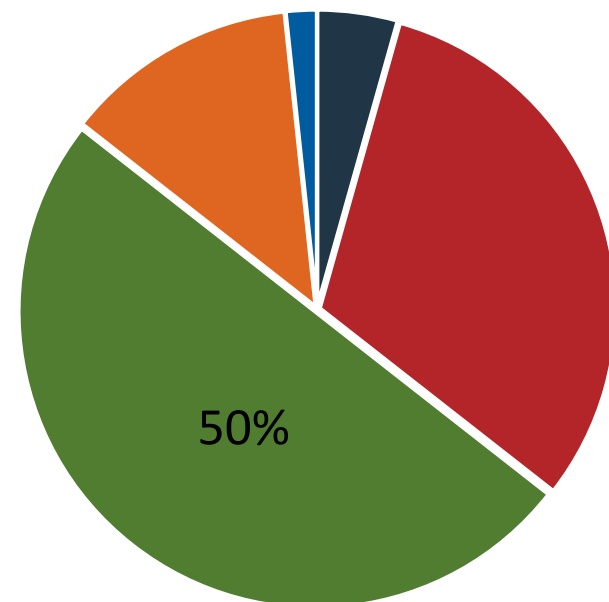
**Main Track Accidents
(collisions *and* derailments)
N=88**



**Non-Main Track Train
Collisions N=101**



**Non-Main Track Train
Derailments N=596**



Equipment **Track** **Human actions** **Environment** **Other**



Design and training ... and why they go together



TSB investigation R97C0147 (Field Hill)



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Design and training (continued)

Common practice:

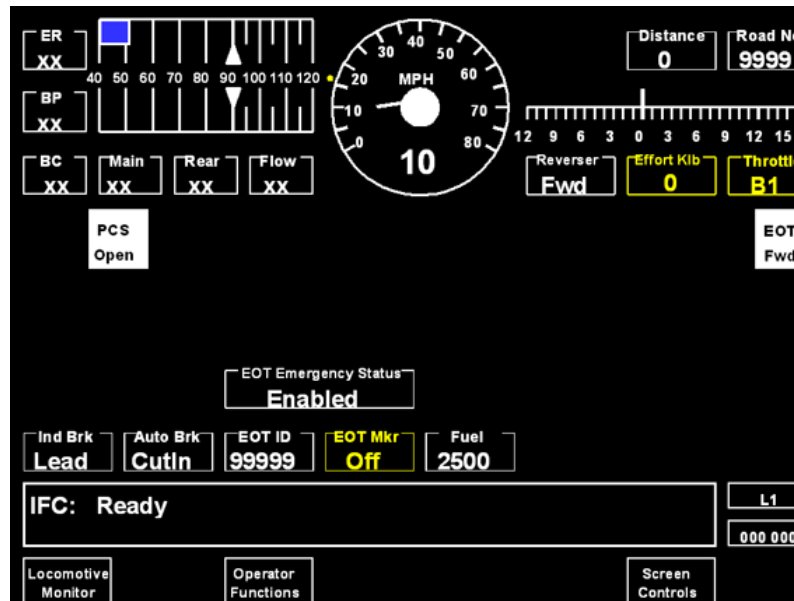
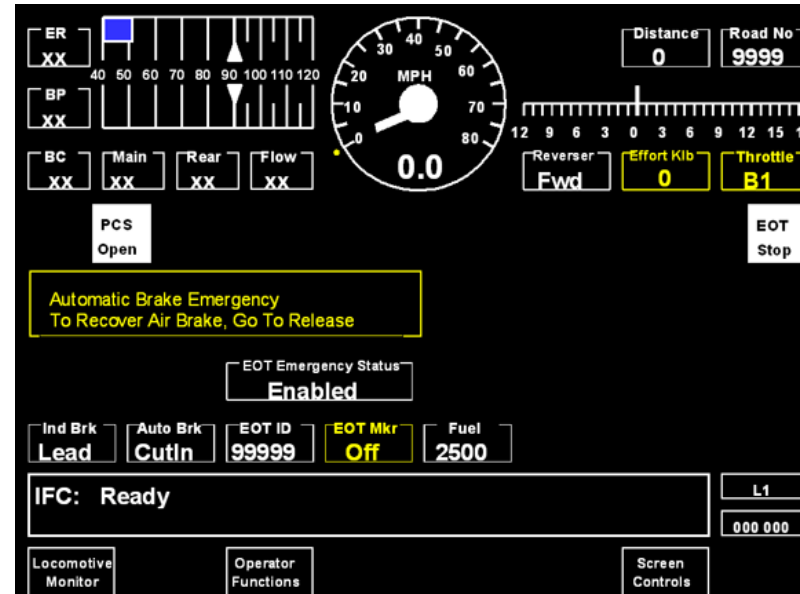
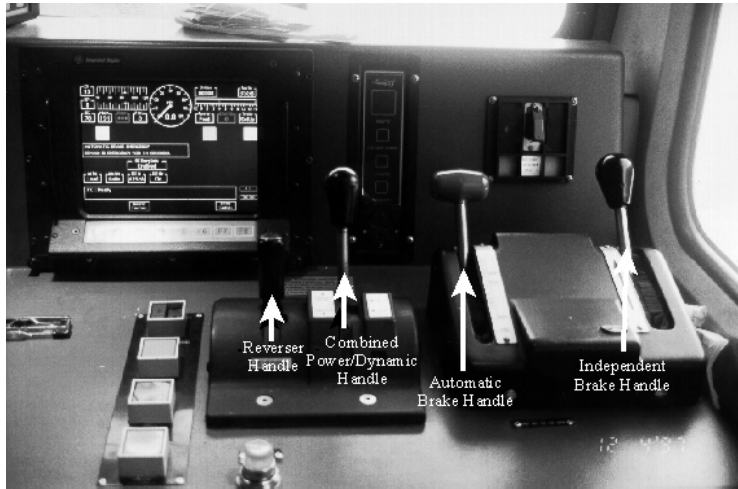
- Moved the combined controller (throttle/DB handle) from idle to “DB applied”
- Waited 60 seconds
- Moved the train automatic brake handle from “emergency” to “release”

Company instructions:

- Ensure combined controller is in idle and automatic brake valve handle in “emergency”
- Wait 60 seconds
- Turn automatic brake valve handle to “release”, pausing briefly in the “handle off” position



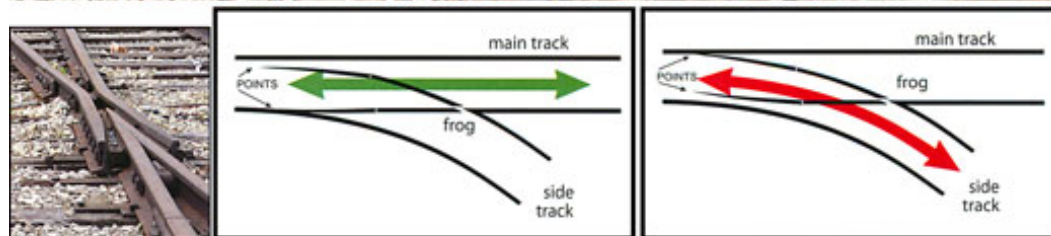
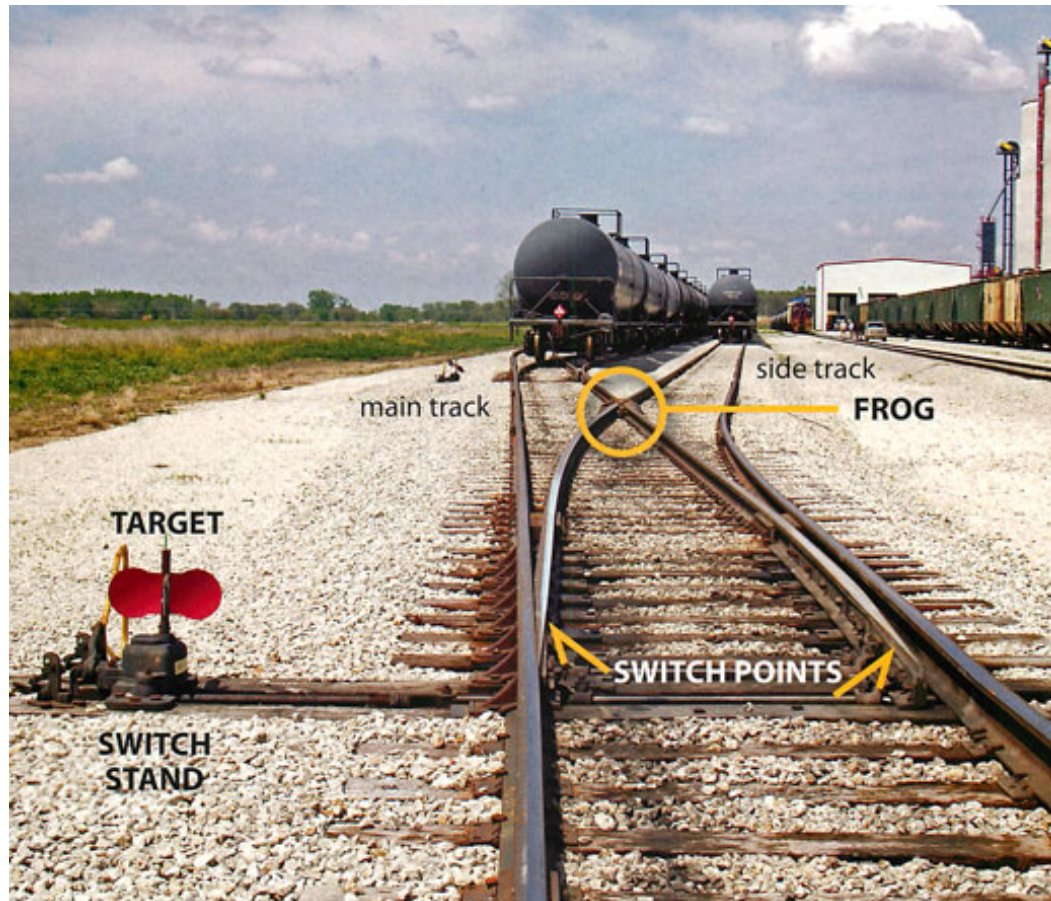
Design and training (cont'd)



Human-machine interface



Switches

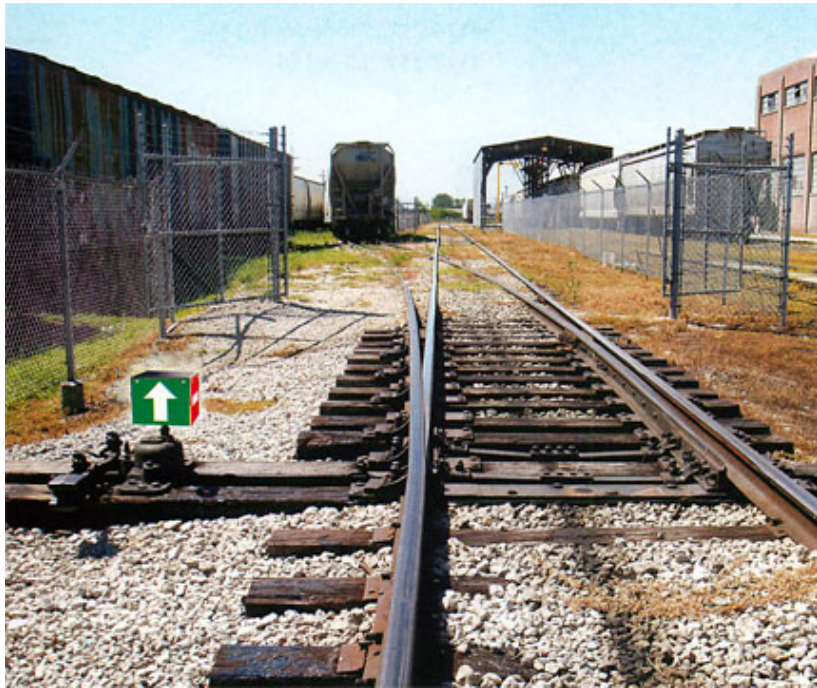


switch is lined for travel on main track

switch is lined for travel on right-hand turnout




Switches (continued)



Clearance point




Watchlist issue: Following signal indications

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KEY SAFETY ISSUES
in Canada's transportation system

2018

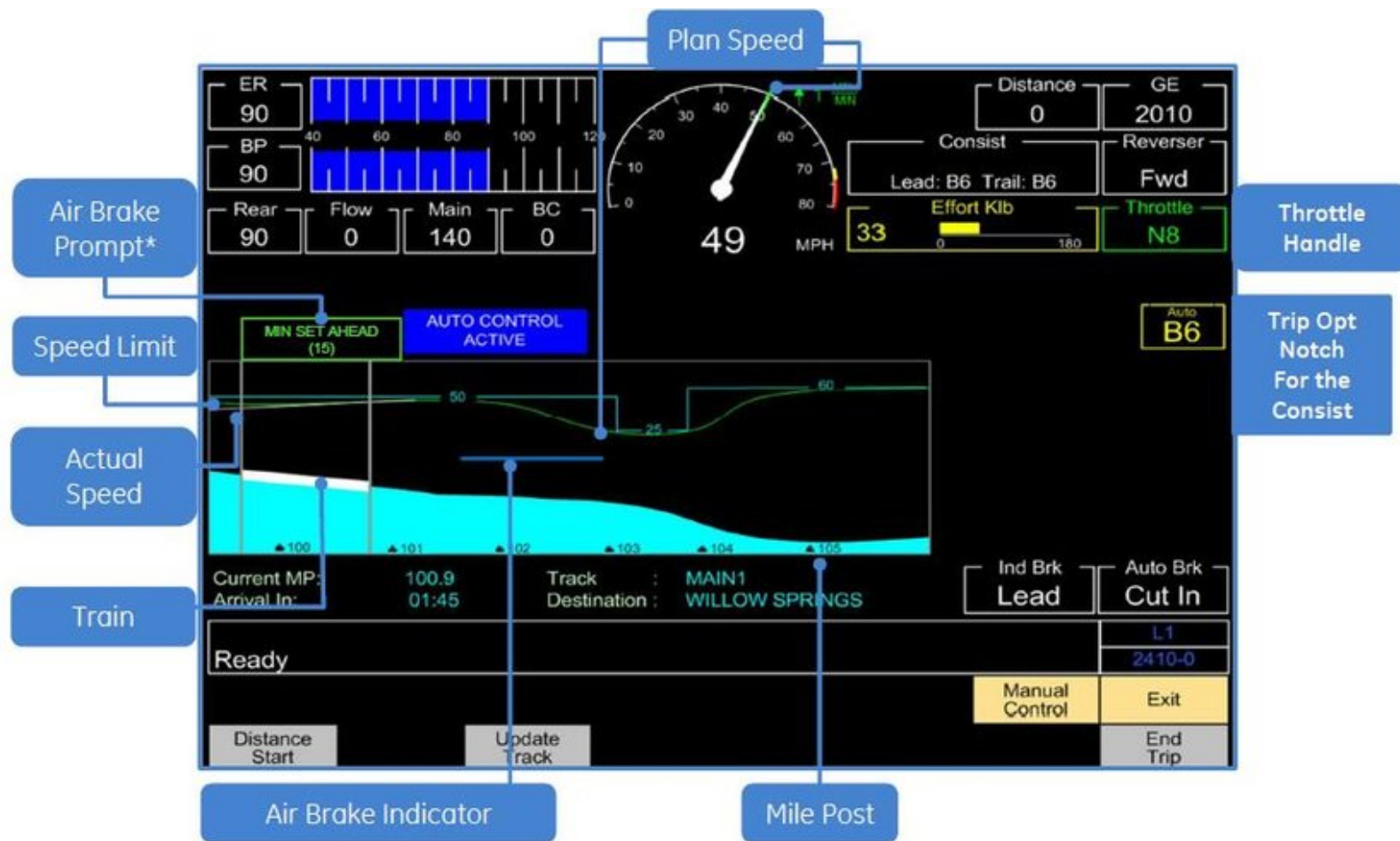
WATCHLIST



Canada



Looking ahead ...



Conclusions

- Today, the single largest cause of all train accidents is the “human element.”
- It’s not just the “newbies.” Even experienced employees can make mistakes.
- How can the system be made safer from those mistakes?



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QUESTIONS?



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