

# Industrial Switching Ops with Remote Crews

**“Operating is life.**

**Anything that happens before or after is just waiting.”**

*With apologies to Steve McQueen*

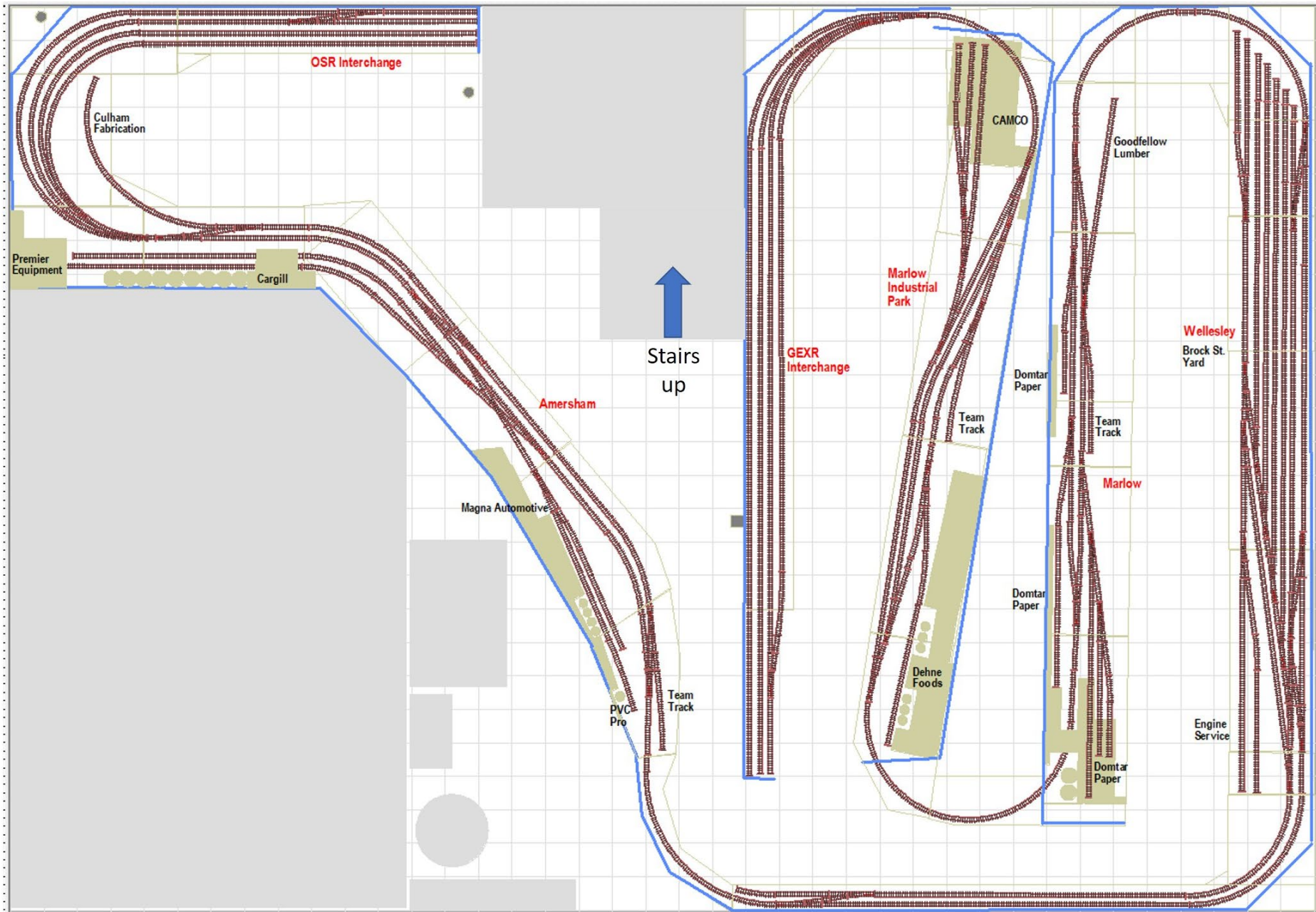
# Quick intro to the GHR



- O Scale freelance modern short line
- Loosely based on OSR and GEXR in Southern Ontario
- Still mostly Plywood Season
- Focus on replicating real crew's interaction to get the job done safely
- Yep, a niche within a niche in this great hobby. ;)
- ESU CabControl DCC
- ProtoThrottle
- LS5 DCC decoders, TCS KAs, Tang Band speakers
- JMRI DecoderPro, WiThrottle, Web Server
- Ship It! output to switch lists



# GHR Track Plan



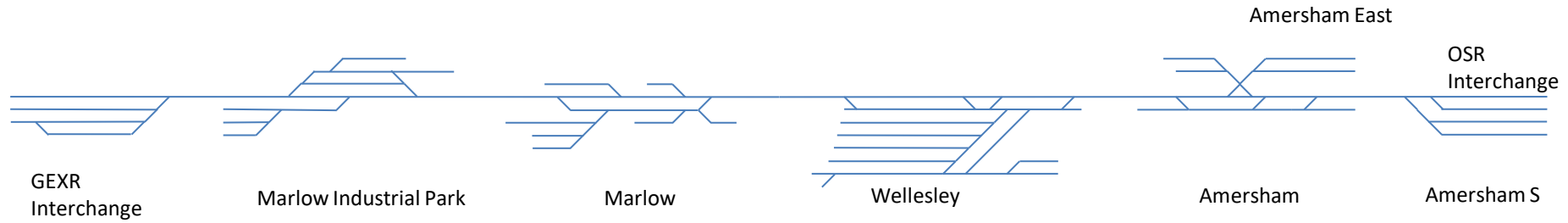


# GHR



← West

East →



← West

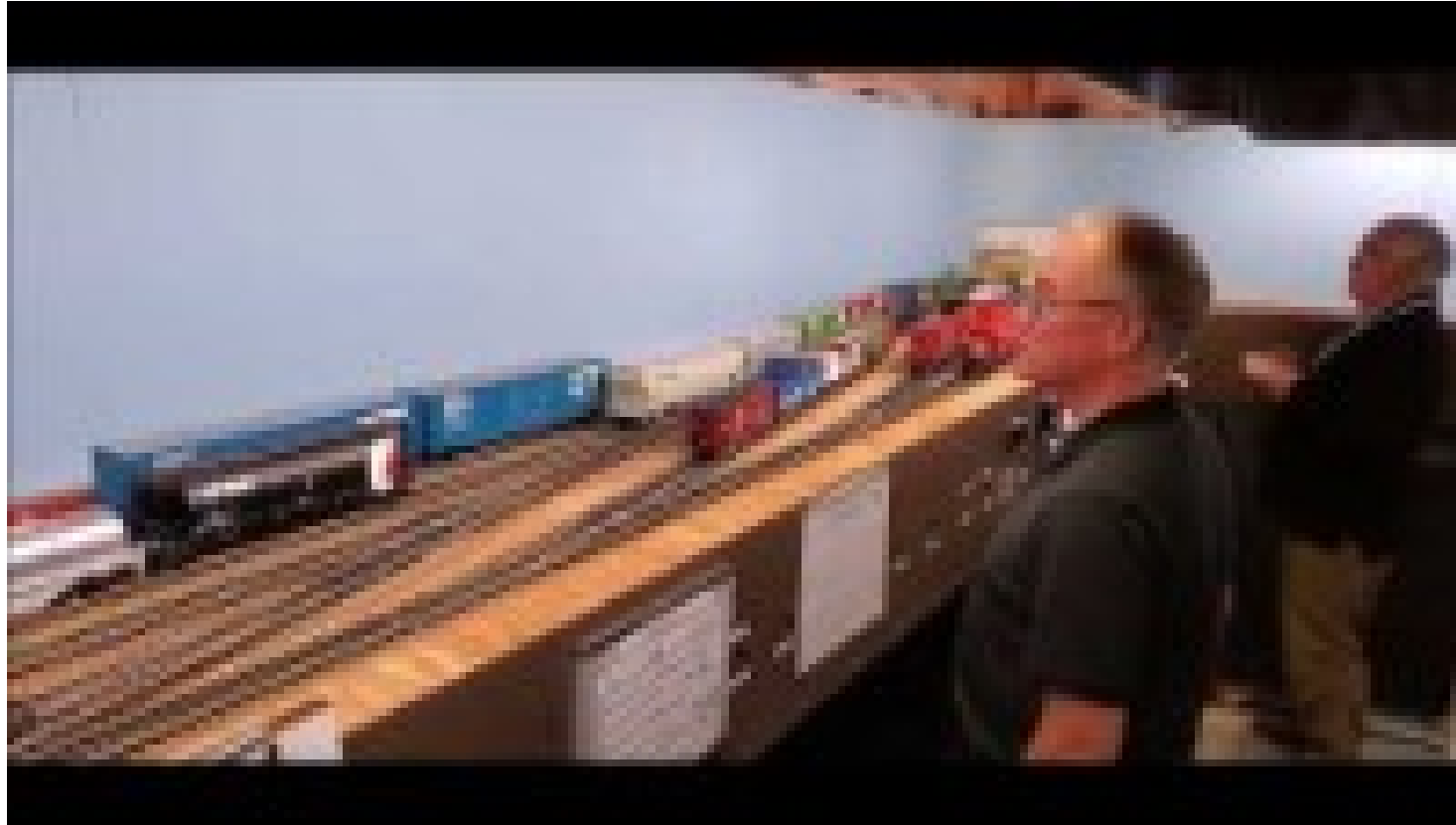
East →



# Pre-COVID ops sessions

- GHR runs 8 jobs per session: 6 local and 2 Interchange
- Each job takes roughly 90 minutes, plus some yard work
- Up to 3 x 2-person crews can run simultaneously
- Ship It! scheme allows sequential job operation if fewer than 3 crews available
- Sessions roughly once a month for ~4 hours
- Outcome: GHR operates ~50 hours per year

# Local crew switching WY Brock St.



[Click the image to open  
the video on YouTube](#)

# Remote ops sessions during COVID

- One job at a time
- Crew options:
  - Remote Engineer; I'm Conductor and YM
  - Remote Conductor; I'm Engineer, "brakeman in a truck" and YM
  - Both roles remote; I'm YM, "brakeman in a truck" and I get to railfan
- 3-4 x 90-minute sessions per week
- Early and late evenings Eastern Time to accommodate UK, Australian and North American crews
- Outcome: GHR has operated almost 250 hours under COVID.



# Remote crew switching WY Brock St.



[Click the image to open  
the video on YouTube](#)



# Enabling the remote crew experience for switching ops

1. Start simple: Smartphone on a mini-tripod using Zoom to provide video, crew calls and some loco sounds to remote Engineer and/or Conductor



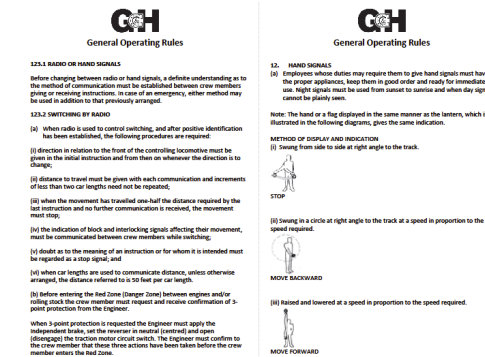
# Simple remote Engineer view



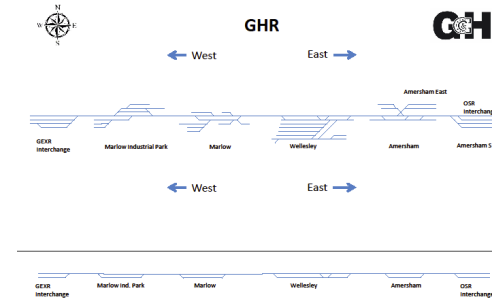
[Click the image to open  
the video on YouTube](#)

# Remote Engineer's paperwork

- Excerpt of General Operating Rules



- Track schematic with all points on the Main Track named



# Simple remote Conductor “on the ground” view

The screenshot displays a remote conductor interface with three main sections:

- Track Diagrams (Left):** Multiple schematic views of the Marlow Industrial Park and GEXR Interchange. Each diagram shows track layouts with labels like 'Main', 'Team Track', 'Back Track', and 'Interchange Track'. A red arrow points to a specific location on the tracks.
- Live Video Feed (Center):** A large window showing a red GHR locomotive (number 368) on the tracks. Above the video are three small thumbnail images of the conductor.
- Manifest Table (Right):** A table titled 'Train: 44' and 'MP Turn' showing the status of various railcars. The table includes columns for Road Number, AAR, Pickup, Setout, Lading, and Destination/Town/Industry.

Road	Number	AAR	Pickup	Setout	Lading	Destination/Town/Industry
NS	80902	SC	MP Interchange Track		Collet Deal	MP/Carroll Shipping
NS	80902	SC	MP Interchange Track		Empty	MP/Carroll Shipping 2
NS	80902	SC	MP Interchange Track		Empty	MP/Carroll Shipping 1
NS	80902	SC	MP Interchange Track		Empty	MP/Carroll Track MP
NS	80902	SC	MP Interchange Track		Phos. Phos.	MP/Carroll Phos.
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 6
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 1
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 2
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 3
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 4
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 5
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 7
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 8
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 9
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 10
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 11
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 12
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 13
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 14
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 15
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 16
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 17
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 18
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NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 27
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 28
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NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 33
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 34
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NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 48
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 49
NS	80902	SC	MP Interchange Track		MP/Carroll	MP/Carroll Track 50





# Example remote Conductor's schematic

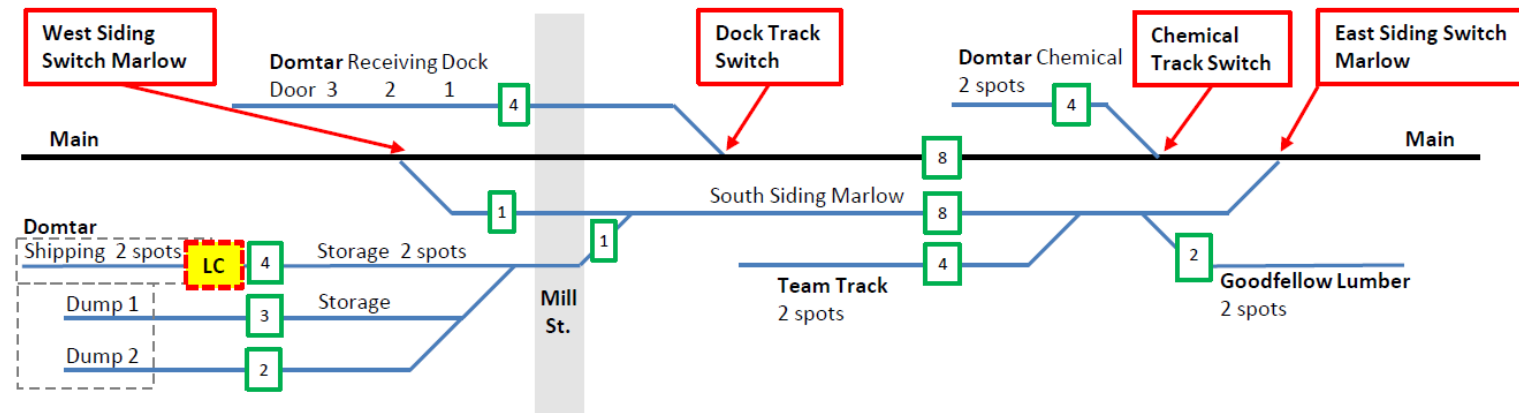


Marlow



← West

East →



← West

East →



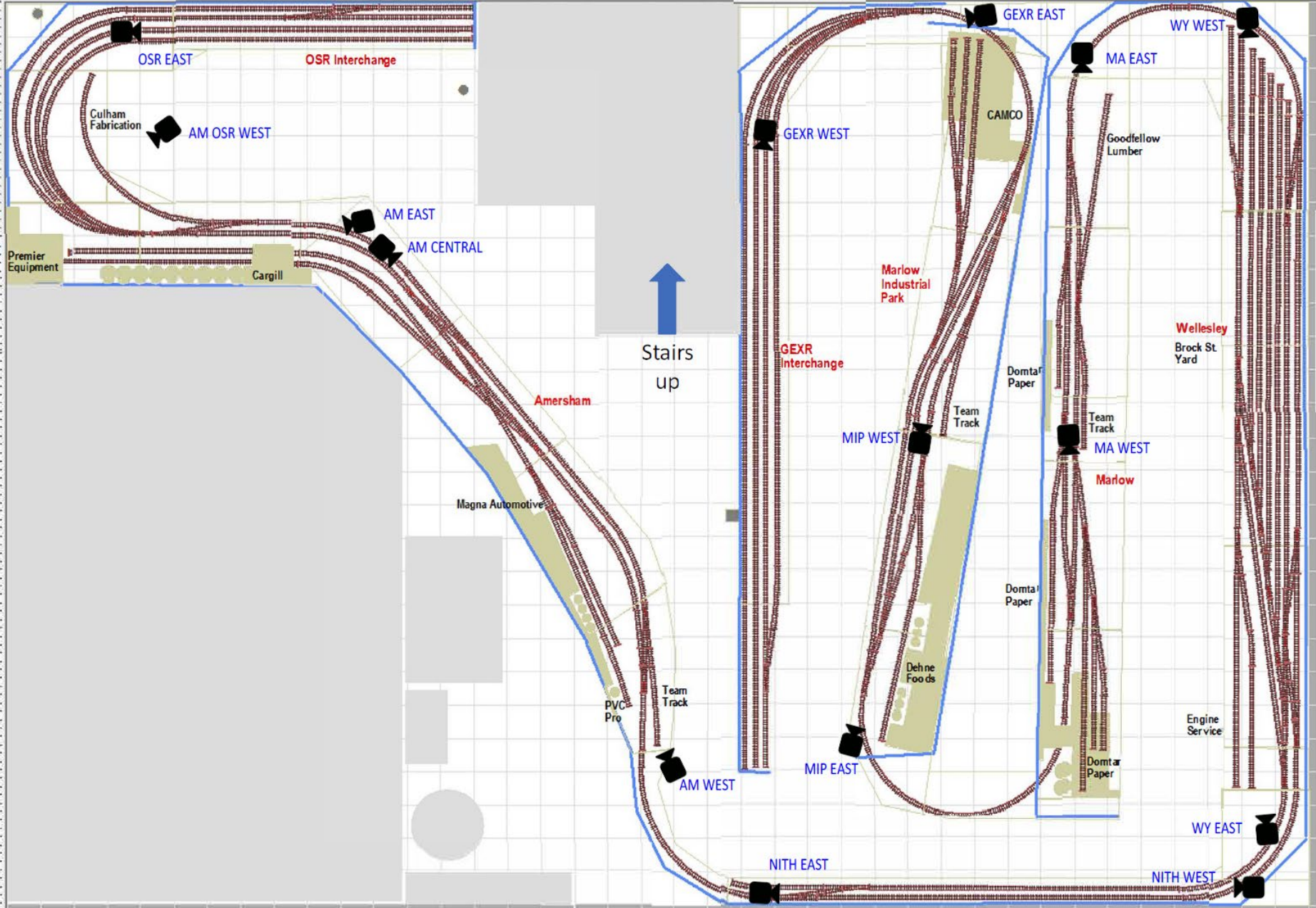
# Next level: Adding overhead cameras

- Cheap and cheerful Wi-Fi streaming security cameras
- I chose Reolink E1 and E1 Pro
- 3 or 4mp, pan and tilt, free remote viewing access through their app
- 2.4GHz and 5GHz Wi-Fi spreads the load
- Universal power adapter
- Lag typically under ~2 seconds even to Australia
- Better for remote Engineers
- Combine with Zoom call for Conductor's "last car to the joint" view



**BUT:** It's really just a better view of being in the room operating a model railroad, not a more realistic view for the remote Engineer and Conductor

# GHR Track Plan showing overhead cameras

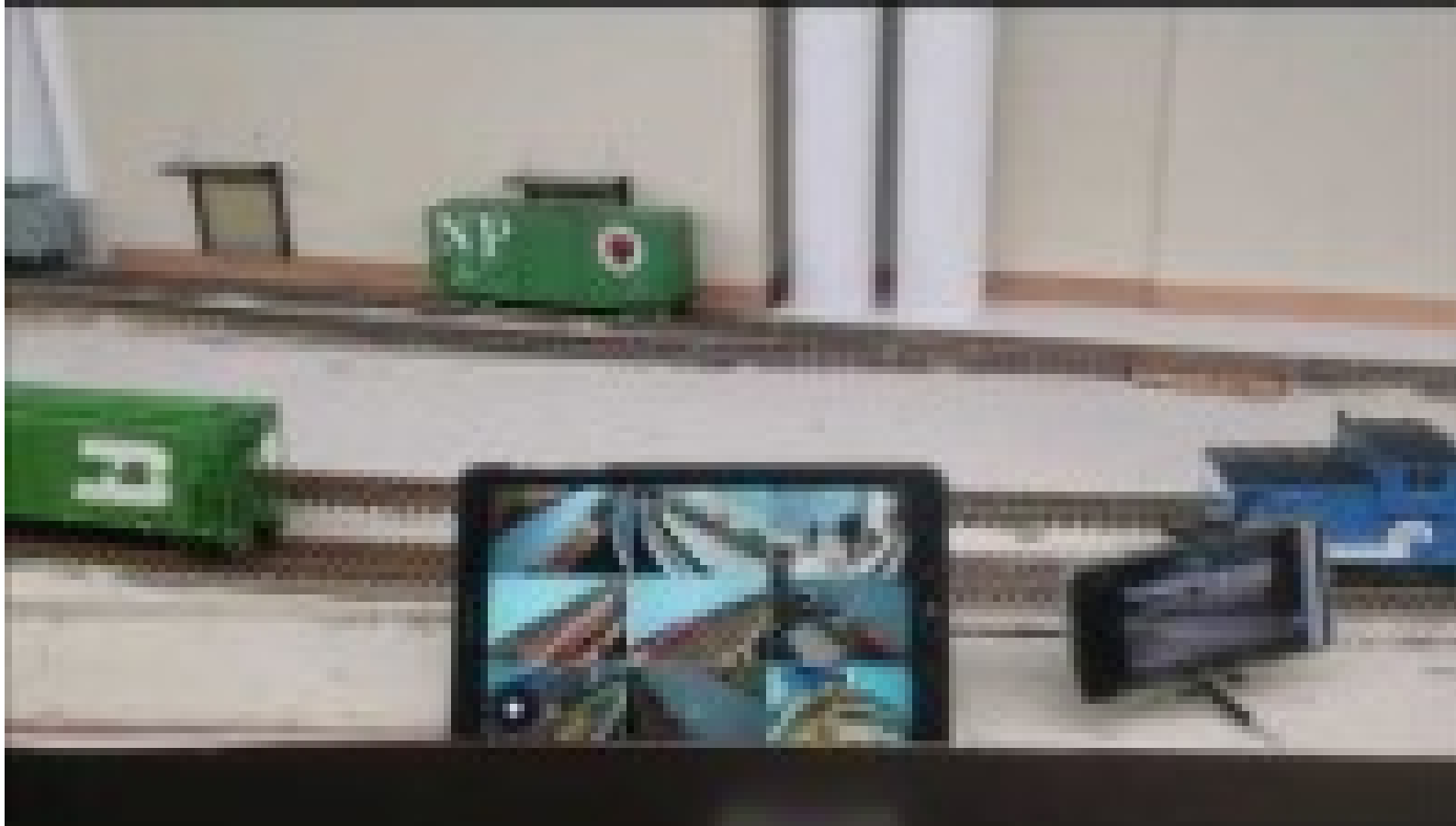




# Reolink overhead cameras



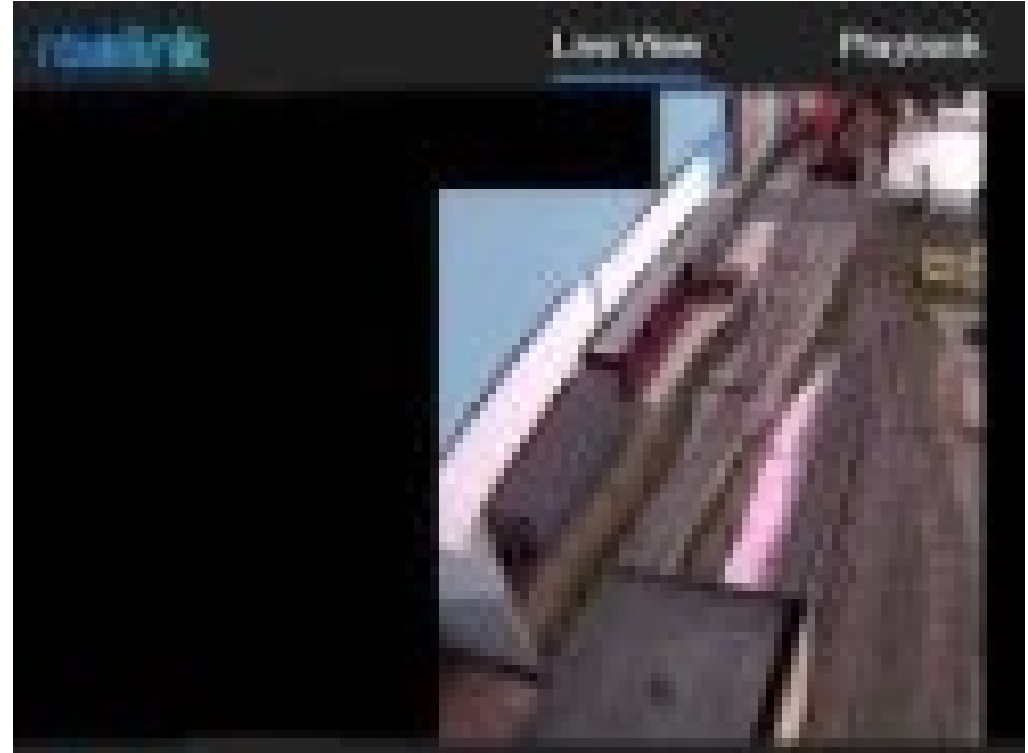
# Overhead cams and Zoom call in action



Click the image to open  
the video on YouTube

# Remote crew with overhead cameras

- Remote Engineer can follow his train between cameras with left and right arrow keys
- Sound from Zoom call when locos close enough to phone
- Remote Conductor can judge car counts more easily
- Remote Engineer can hide Zoom view for a bit more realism



Click the image to open  
the video on YouTube

# Overhead camera Remote Engineer's experience

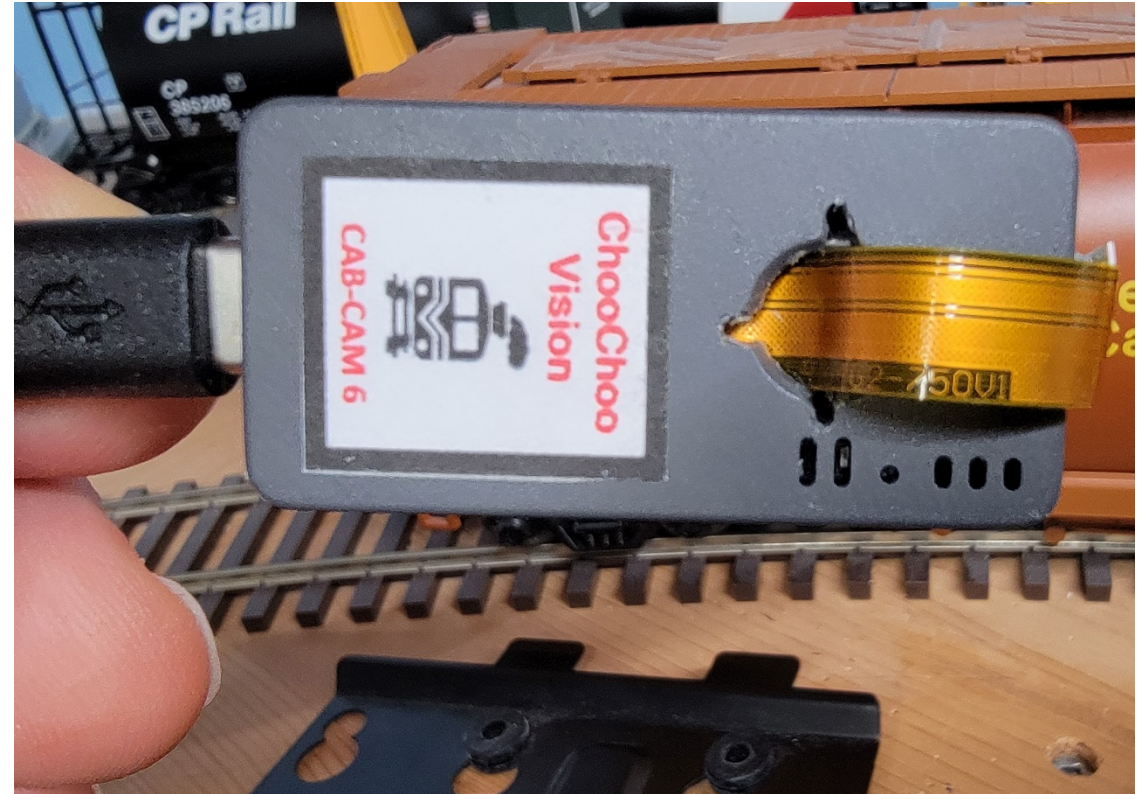
- Quite workable but not very realistic
- The Engineer “cheats” by getting the Conductor’s “Last car to the Joint” view
- Way too easy! Real Engineers don’t get that luxury
- No need to rely totally on the Conductor’s calls like in the real world
- Next level of difficulty required to make it more real!



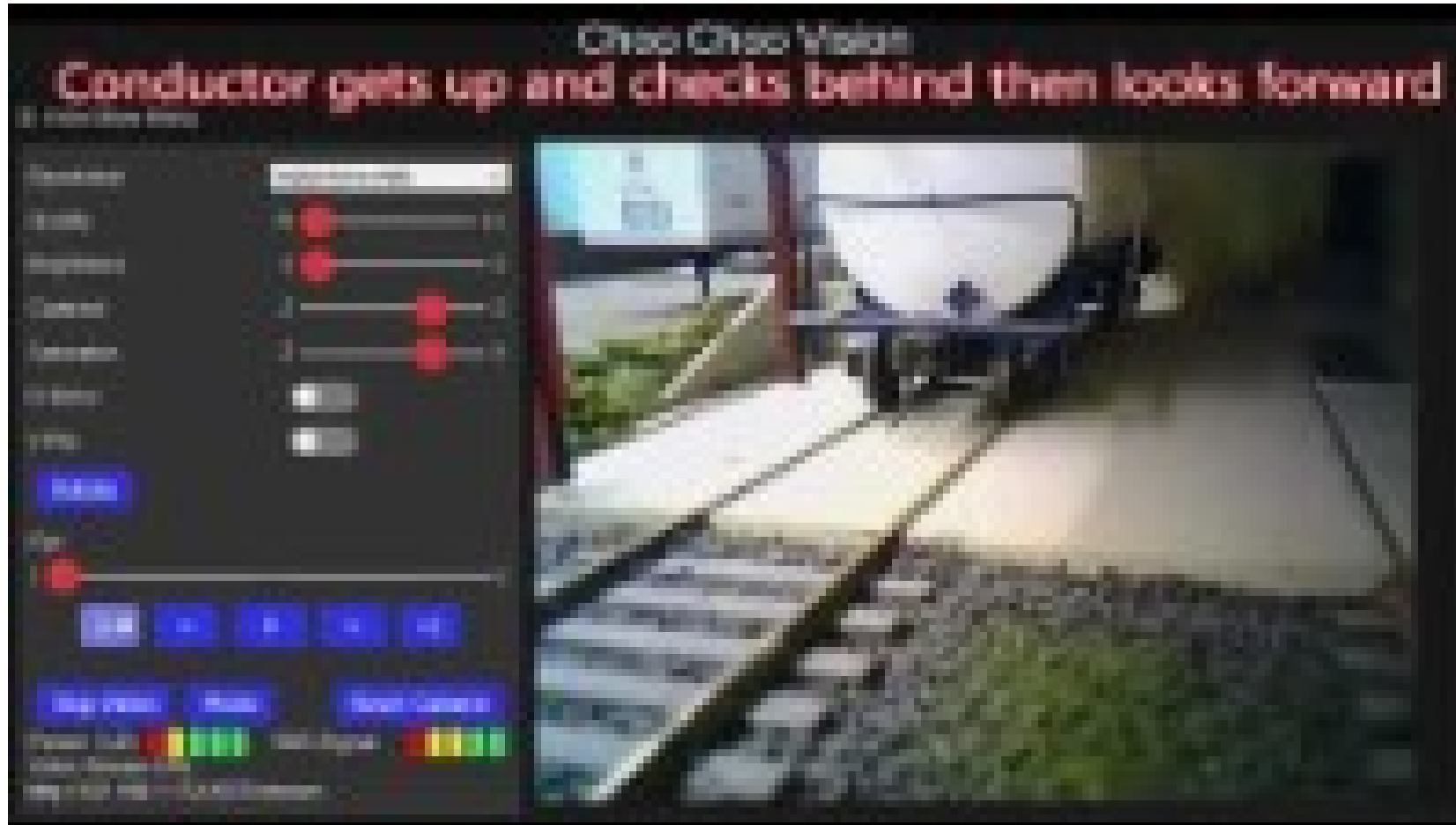
[Click the image to open the video on YouTube](#)

# Next Level: Miniature Wi-Fi streaming cameras

- Miniature Wi-Fi streaming cameras from Choo Choo Vision
- Small enough to position giving “from the cab” and “riding on car” views
- Wi-Fi streaming with remote viewing in any common browser
- Battery powered, self-contained or from USB-C power pack
- Optional extras include:
  - 3” and 8” lens ribbons
  - Various lens viewing angles
  - Adjustable focal point
  - Viewer controlled panning
  - In-loco kit with track power pickups and built-in battery keep-alive (HO and up)

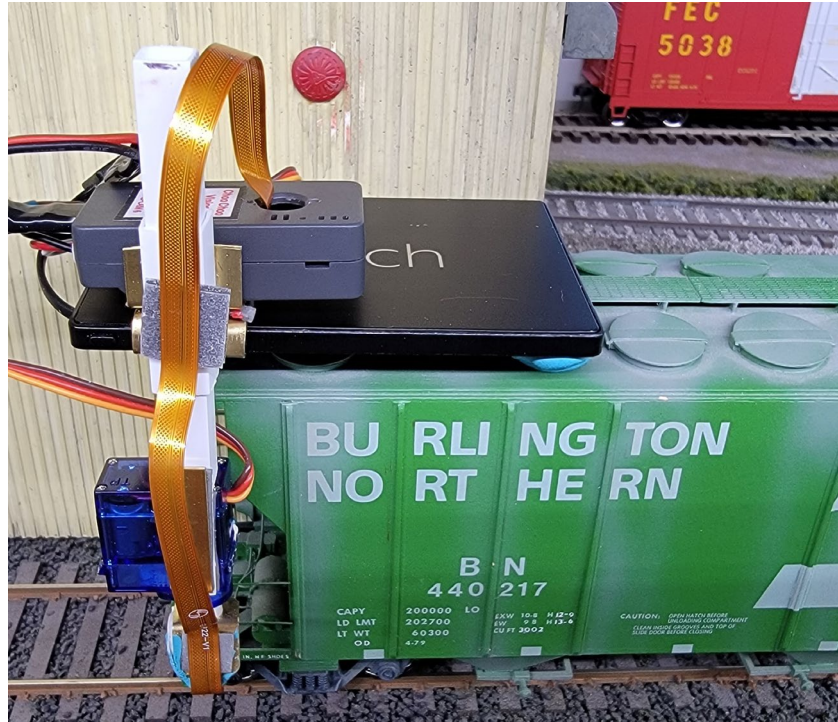


# Remote Conductor views



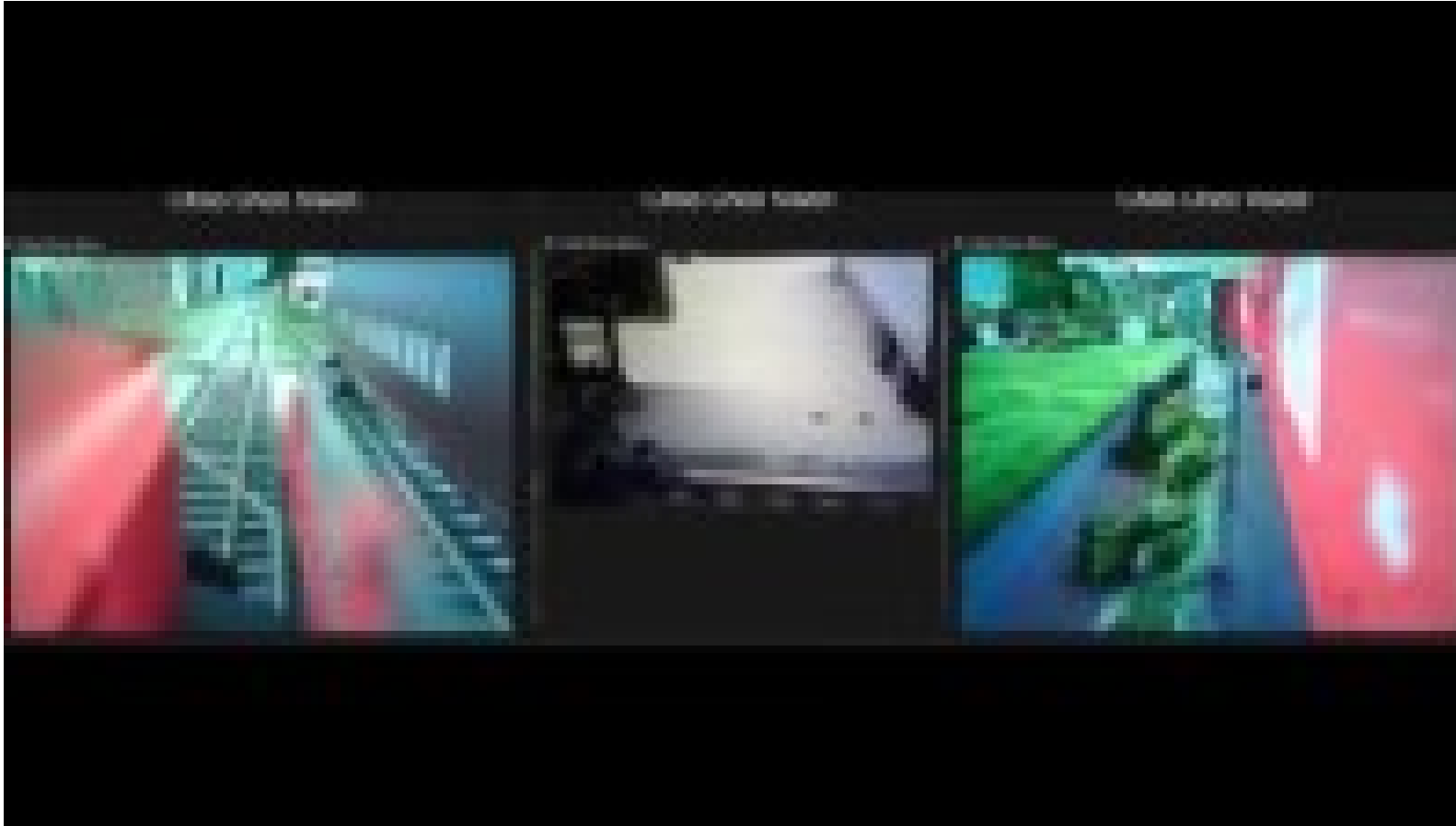
Click the image to open  
the video on YouTube

# Viewer controlled panning “riding-on-car-cam” from the GHR Skunkworks



[Click the image to open  
the video on YouTube](#)

# Remote Engineer views



Click the image to open  
the video on YouTube



# Video quality is better in direct browser view

Choo Choo Vision

≡ Hide/Show Menu



Choo Choo Vision

≡ Hide/Show Menu



Choo Choo Vision

≡ Hide/Show Menu



# 3-camera universal saddle for Engineer's view.

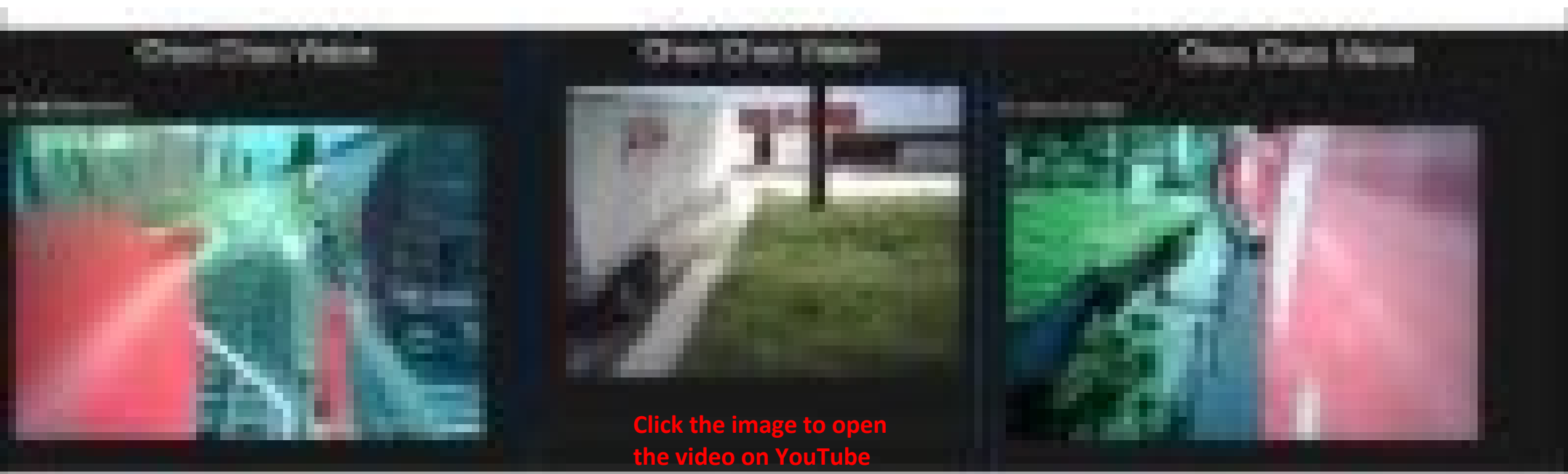
Another contraption from the GHR Skunkworks.



Next up, figure out

- proper crew radio (Dave Abeles' method?)
- continuous Hi-Fi loco sounds for the Engineer

[Below clip with phone on trailing unit demonstrates potential of Tang Band speakers]



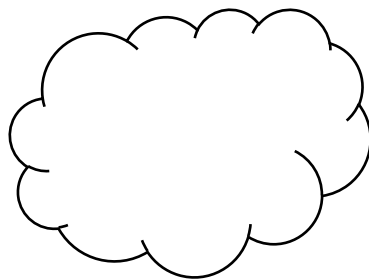
*Then we just have to persuade ESU to re-record all their sound files  
from inside the cab... ;)*



## Remote Throttles



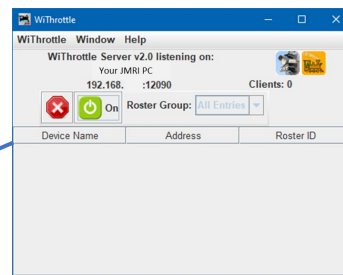
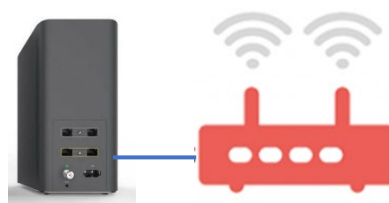
## Internet



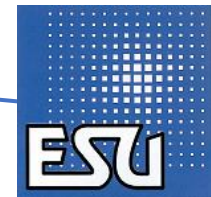
## Local layout

Find out your external IP address using WhatsmyIP or similar in your browser

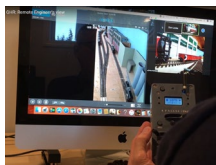
Open port (e.g. 12090) in your ISP/cable box firewall. Or bridge your cable box and open a port on your own router's firewall. Forward the port to your layout computer running JMRI WiThrottle server.



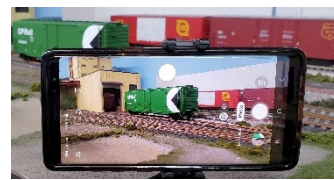
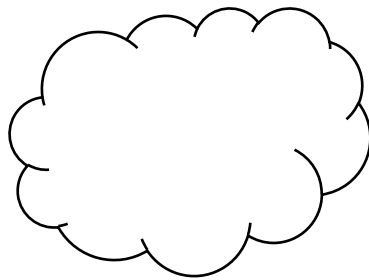
PC or Mac with JMRI WiThrottle server (can connect direct to ESU command station if using ESU-compatible throttle e.g. ESU MCII or ProtoThrottle).



## Remote Views



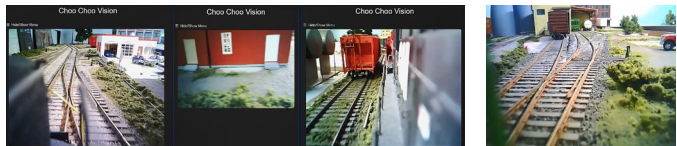
Zoom and Reolink client on PC or tablet



Zoom on Phone camera with mini-tripod for "last car to the joint" view and audio



Reolink Wi-Fi cameras above the layout



Zoom and browser on PC or tablet



Each Choo Choo Vision camera needs a port forwarded in your router



Choo Choo Vision cameras on cars and on/in locos

# Some inspirations and sources

## Prototype ops

- “Body cam” of 1:1 scale Conductor switching tank cars: <https://youtu.be/0u0cSOK1SbY>
- Falls Road Railroad makes a lift: <https://youtu.be/Q0NamgQsBW0>
- Jaw Tooth’s CCET switching videos such as: <https://youtu.be/nuMX0GV1QE8?t=502>
- It doesn’t always work perfectly for the pros either: [https://youtu.be/zj-NitO\\_XLQ?t=773](https://youtu.be/zj-NitO_XLQ?t=773)  
<https://youtu.be/nuMX0GV1QE8?t=792>
- OSR: <http://www.osrinc.ca/>

## Model ops

- Tim Garland’s Seaboard Central (Thomas Klimosky video): <https://youtu.be/lDgnFG0yM-4?t=113>
- Lance Mindheim: <https://lancemindheim.com/>
- Joe Atkinson: <https://model-railroad-hobbyist.com/blog/joe-atkinson>
- Thomas Klimosky: <https://www.thomasklimoski.com/>
- Serge Lebel: <https://www.youtube.com/channel/UCyjuCVikYlaZrkAhq6rGpkA/videos>
- Dave Abeles’ Onondaga Cutoff: <https://onondagacutoff.blogspot.com/>

## Sources

- ESU: <http://www.esu.eu/en/products>
- ProtoThrottle: <https://www.iascaled.com/store/MRBW-CST/>
- Tang Band: <https://www.parts-express.com/itemcategory/Speaker-Modules?order=relevance:desc&keywords=tang%20band>
- Reolink: <https://reolink.com/ca/product/e1/>
- Choo Choo Vision: <https://www.choochoovision.com/store>
- JMRI: <https://www.jmri.org/>
- Ship It!: <http://www.albionsoftware.com/shipit.html>



# **Thank you for watching**

**We have plenty of spots on the call board if you'd like to give it a try!  
All you need to get started is a smart phone and a PC or tablet with Internet access.**

**Pete Mulvany [gp9u@rogers.com](mailto:gp9u@rogers.com)**