Introduction to Model Railroad Operations

Welcome!

- Why Operations?
  - You've built your empire, what do you do now?
  - Running trains around in a circle, switching cars aimlessly can get boring
- Today you will learn the basics of model railroad operations.
- The clinic session will be followed by optional hands-on operating sessions
Agenda

- Model Railroad Operation Defined
- Car Forwarding Systems
- Railroad Traffic Control Systems
- Model Control Systems
- Communication Systems

- What an operator needs to know

- Resources
- Operating opportunities

Model Railroad Operation

- Model Railroad Operation is a fun and interesting role playing game where the players (operators) use model trains to simulate the movements of real trains and the actions of real railroad employees

- Complexity and realism related to ease of use
  - Generally, the more realistic the freight forwarding system is, the more complicated it becomes
  - We are here to have fun – at some point the trade off between complexity and ease, realism and fun must be made
  - It’s your decision
What’s to Enjoy?

- Running trains
- Camaraderie — sharing experiences with friends
- Intellectual challenge
  - Conducting the least number of moves to drop off & pick up cars
  - Space on siding to hold some cars while moving others
  - When you have a string of cars temporarily sitting on the mainline and the through freight comes by, what do you do?
- Adds purpose to car movements
  - Understanding and simulating prototype railroad operations for specific era & RR
  - Focus on the railroad business and the business of railroading
  - Roles include engineer, conductor, dispatcher, yard master, ...

Real Railroad Employees

- Executives
  - Leadership
- Administrators
  - Records
  - Finance
  - Sales
  - Human Resources
- Maintenance Workers
  - Track gangs
  - Bridge Repair
  - Signal Repair
- Operations Personnel
Operations Personnel
On Your layout

- Positions tend to get filled in following order
  - Depending on size of layout and number of people available

<table>
<thead>
<tr>
<th>Road Crews</th>
<th>Administration</th>
<th>Yard Crews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor (4)</td>
<td>Dispatcher (2)</td>
<td>Yardmaster (3)</td>
</tr>
<tr>
<td>Engineer (1)</td>
<td>Agent</td>
<td>Conductor</td>
</tr>
<tr>
<td>Brakeman</td>
<td>Towerman</td>
<td>Engineer</td>
</tr>
<tr>
<td>Fireman</td>
<td></td>
<td>Brakeman</td>
</tr>
</tbody>
</table>

Agenda

- Model Railroad Operation Defined
  - Car Forwarding Systems
  - Railroad Traffic Control Systems
  - Model Control Systems
  - Communication Systems
  - What an operator needs to know
  - Resources
  - Operating opportunities
Car Forwarding

- Car Forwarding is the purposeful movement of rail cars from one location to another.
- Prototype car forwarding is determined by customer needs.
- Types of model railroad car forwarding
  - Random
  - Wheel reports
  - Markers on cars
  - Car Card & Way Bill
  - Switch List

Random Car Forwarding

- Random Car Forwarding:
  - Pick up and deliver any car, anywhere, anytime

- Pros:
  - Easy to set up
  - Never make a mistake
  - No cost
  - “Outback” ops – no rules – just right

- Cons:
  - No purpose – boring
  - Does not simulate the prototype
Wheel Report

- One piece of paper per train
  - Does not require reading reporting marks
  - Indicates locations to be switched
  - Indicates car types to be switched
  - Pick up like cars to replace cars set out
  - Many ways of organizing the paper, for example:

<table>
<thead>
<tr>
<th>Car type</th>
<th>Destination 1</th>
<th>Destination 2</th>
<th>Destination 3</th>
<th>Destination i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gondola</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Markers on Cars

- Put markers on cars indicating where they are to be delivered
  - Cardstock: ¼ inch by ½ inch, place on car with tweezers
  - Plastic Tabs: use plastic H-column
  - Thumbtacks: drill hole in car
  - Magnetic strips: magnet or metal glued on underside of car roof
  - Stickies
- Generally incorporates color coding and lettering
  - Color can indicate town or train
  - Use single letter code on thumbtacks
- Very friendly for clubs and new operators
- Avoids having to read reporting marks
Car Card & Waybill

Car Forwarding

- Car Card & Way Bill:
  - Each car has an associated envelope labeled with the reporting remarks of the car.
  - A multi-sided way bill is inserted into the envelope that shows the car’s destination.
  - Multi-sided way bills can show a sequence of destinations.
  - Cards for cars not in trains are kept in boxes located along the railroad.

- Pros:
  - Easy to see where to deliver a car
  - Easy to see which cars to pick up
  - Automatic Synchronization
  - Low cost

- Cons:
  - Decks of cards are awkward to handle/sort during operations
  - No “look ahead” capability
  - Requires holding boxes and sorting racks

Switch List Car Forwarding

- Switch List Car Forwarding:
  - A single sheet of paper lists all switching activity

- Pros:
  - Easy to see where to deliver a car
  - Easy to see which cars to pick up
  - Only one paper to handle
  - Easy “look ahead” capability
  - No racks or holders required
  - Follows prototype practice

- Cons:
  - Significant set up time (manual or computer)
  - Manual synchronization

Pickups (4)

<table>
<thead>
<tr>
<th>Track Terminal</th>
<th>Code</th>
<th>Number</th>
<th>Type</th>
<th>Color</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck Terminal</td>
<td>BELX</td>
<td>3954</td>
<td>Box</td>
<td>Yellow</td>
<td>RACO Bell</td>
</tr>
<tr>
<td>Truck Terminal</td>
<td>ARE</td>
<td>254</td>
<td>Flat</td>
<td>Tuscan</td>
<td></td>
</tr>
<tr>
<td>Roy’s Place</td>
<td>GATX</td>
<td>39617</td>
<td>Tank</td>
<td>White</td>
<td>Michigan A&amp;I</td>
</tr>
<tr>
<td>Roy’s Place</td>
<td>NJIX</td>
<td>1035</td>
<td>Box</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>SetOuts (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck Terminal</td>
<td>NJIN</td>
<td>44657</td>
<td>Box</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td>Truck Terminal</td>
<td>ATSF</td>
<td>90396</td>
<td>Flat</td>
<td>Green</td>
<td>TOFC</td>
</tr>
</tbody>
</table>

Potomac Division, NMRA
Sample Switch List Printout

Manifest for Train 420 – 7:57 AM 1/17/2008

Castle Rock and Pacific RR Co.
MANIFEST for TRAIN 420
Train - Local North
North Bound FROM: Gal Yard TO: CR Yard
Departing at 6:52 on Route GA-OR Local

INSTRUCTIONS TO CREW
- If you have or pick-up a car for Milesboro, it must be the first car after the locomotive to make switching easy.
- Stock cars moved to the cow track in Santa Rosa go to the far end of the track, behind existing cars.

Gal Yard
Engine(s)
(DGW GPT # 5101) Consist 5101
(DGW GPT # 5103) Consist 5101

Pickups (3)
#1 track ATSF MT Tank, 98016 to IG
#2 Track CTIX MT Tank, 8906 to IG
#1 track NYC MT Box 167003 to MS
#1 track DRGW MT Box 66672 to BR
#2 Track Ri MT Box 262693 to SR
#1 track C&NW MT Box 108102 to TRB

--Depart at 9:34,
10 Cars Out, 602 Ft, 998 Tons, Power 3600 Tons

Santa Rosa – Arrive at 9:40

Local Moves (4)
#1 Track CGW MT Stock 823 to Cow Track
#1 Track ATSF MT Stock 26385 to Cow Track
#1 Track ATSF MT Stock 25417 to Cow Track
#1 Track DRGW MT Stock 36485 to Cow Track
#1 Track C&NW MT Stock 30212 to Cow Track
#1 Track DRGW MT Stock 64124 to Cow Track

Pickups (2)
Junk Yard MKT MT Gond 43001 to CRy
Junk Yard P&LE MT Gon-ac 947990 to CRy

Set Outs (2)
Transfer DRGW MT Box 66672
Transfer Ri MT Box 262693

--Depart at 10:28,
10 Cars Out, 602 Ft, 998 Tons, Power 3600 Tons

Trinidad – Arrive at 10:40

Pickups (3)
#1 Marble ATSF MT Gond 172249 to CRy CASWELL
#1 Marble ATSF MT Flat 297612 to CRy

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✔ Model Railroad Operation Defined
✔ Car Forwarding Systems
  • Railroad Traffic Control Systems
  • Model Control Systems
  • Communication Systems

• What an operator needs to know
• Resources
• Operating opportunities
Traffic Control

- Traffic Control is the purposeful movement of trains from one location to another
- Prototype traffic is determined by customer needs
- Some other scheme required for the model

Model RR Traffic Control Systems

- Random — Run anything, anytime
  - Free Form
- Sequential — Trains run in a specific order
  - Track Warrant
  - Centralized Traffic Control (CTC)
- Scheduled — Trains run by time (fast clock?)
  - Track Warrant
  - Time Table & Train Order (TT&TO)
- Real Time — Trains are generated as needed
  - Train order
  - TT&TO (Extras)
  - CTC
Free Flow Model Traffic Control

- Free Flow Traffic Control:
  - Operators run trains freely, without permission from a central authority
  - Operators are responsible for avoiding collisions and coordinating track usage
- Pros:
  - Easy to set up
  - No cost
  - No personnel overhead
- Cons:
  - Does not simulate prototype

Time Table & Train Order (Prototype & Model) (1 of 2)

- Operators run trains according to a time table
- A fixed schedule is drawn up with which every train crew must be familiar.
  - Trains may only run on each section of track at their scheduled time, during which they have 'possession'
  - No other train is permitted to use the same section.
- Right of way is determined by train class (1st class has priority over 2nd and 3rd class; 2nd class has priority over 3rd class) and direction (East bound trains have priority over westbound trains of same class)
- Right of way may be superseded by written train orders, introduced in 1851 on advent of telegraph
- All unscheduled trains (extras) are run exclusively by train order
- Follows prototype rule book for many situations
Time Table & Train Order
(Prototype & Model)

• Pros:
  – On-time scheduled trains run without oversight
  – Low cost
  – Simulates prototype operations for the chosen years

• Cons
  – Requires person to act as central authority
  – Lots of rules can be challenging
  – Paperwork intensive
  – Requires some pre-session effort
  – Error or malfunctions can cause extensive idle time

Track Warrant & Train Order

- Track Warrant / Train Order
  – Operators run trains with specific privileges over specified routes
  – Authority to move conveyed by tower operator
  – Written orders in telegraph/telephone era
  – May incorporate schedules

- Direct Traffic Control (DTC)
  – Oral order from central dispatcher by radio
  – Repeated by the train crew to confirm accuracy
  – May incorporate schedules and signals
Track Warrant & Train Order (2 of 2)

• Pros:
  – Can be easy to set up & low cost
  – Cost & complexity increase if communications added
  – Simulates prototype operations

• Cons
  – Requires person to act as tower operators or central dispatcher
  – Requires some pre-session effort

Car Forwarding & Traffic Control Pairings

• Car forwarding
  – Random

• Traffic control
  – Random

  • Any of the following car forwarding methods works with any of the traffic control methods
  – Pick one method from each column

  – Wheel reports
  – Markers on cars
  – Car Card & Way Bill
  – Switch List

  – Sequential
  – Scheduled
    • Track Warrant
    • Time Table & Train Order (TT&TO)

  – Real time
    • Train order
    • TT&TO (Extras)
    • CTC
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Model Control Systems

Track Control (Analog or DC): Sections of track are assigned to a controlling device. All trains on that track are controlled by the assigned device. Control of multiple trains requires independent control of multiple track sections. Example: Multiple MRC Power Packs

Train Control (Hybrid or DCC): Trains are controlled independent of each other on the same section of track.

Examples:
Hybrid: Rail Command
Digital Command Control: Digitrax

Both Track Control and Train Control may support forms of walk-around control and wireless control.
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Railroad Communication Systems

Communications are required:

- To convey authority to occupy tracks
- To convey authority to move
- To report location (OS)
- To report problems or status other than location

Always keep communication clear and concise
**Railroad Communication Systems**

- **Verbal**
  - Telegraph
  - Telephone
  - Radio
    - 5-Channel (Maxon)
    - FRS (GMRS)
  - Pre and Post Brief

- **Written**
  - Time Table
  - Train Order
  - Rule Book
  - Operators Handbook

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What an Operator Needs to Know About the Model Railroad

- Car Forwarding System
- Railroad control system
- Traffic control system
- How to operate a throttle
- How to acquire & dispatch a locomotive
- How to terminate a train
- When to communicate
- How to communicate
- How to operate turnouts?
- Track names (fascia information)
- Sequence of towns/stations
- Railroad direction (N, E, S, W)
- Locations and capacities of sidings
- Locations of Operators and Registers

What an Operator Needs to Know About the Train

- Train Name/Number/Type/Class
- Starting point
- Destination
- Current location
- Can I go? How far?
- Location of next work? Next stop?
- How to couple and uncouple cars
- Any special actions for this train? Speed? Coal? Water?
- What to do in case of a derailment or other problem
Hints for Better Operations

- Always check the track alignment around your train
- Count your cars before leaving every station!
- Compare car count to manifest before leaving every station
  - Resolve differences before continuing!
- Check where you are permitted to set down your drink

Operator Etiquette

- Arrive on time & stay for the entire session!
- Eat before you arrive – don’t bring a meal!
- Tune radio before arrival – fully charged or install fresh batteries
- Follow communications standards!
  - Minimize chatter
- Monitor the communication system!
  - Listen for your call sign!
- Don’t visit with other operators and distract them!
- Stay with your train!
- Treat rolling stock and other equipment with care!
- If you make a mess, clean it up!
- If something breaks – notify the owner!
- “Thank you” is always appreciated!
- If you don’t know – ask!
Host Etiquette

- Make sure the system is fully operational
  - Check for DCC gremlins
  - Clean your track and engine wheels beforehand. Dirty track and dirty wheels will result in poor operation and operator frustration.
- Check all your turnouts and make sure they are operating properly
  - Make sure the points fully throw
  - Roll a few cars over them to make sure everything is in gauge

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Internet Resources

- Operations Special Interest Group (Op SIG) – membership open
  http://www.opsig.org
- Op SIG PRIMER (FAQ) http://www.opsig.org/reso/primer/
- Op Sig Resource page http://www.opsig.org/reso/
- Gateway Division Operations articles
  http://groups.yahoo.com/group/CarCards/links
- Yahoo Car Cards group links – membership free
  http://groups.yahoo.com/group/CarCards/links
- Freight Forwarding Operations (multiple resources)
  http://home.cogeco.ca/~trains/rrftops.htm
- Basic Guide to Design Model Train Operations
  http://knol.google.com/k/model-railroad-operations#

Products

- Car cards
  - Car Cards Operations Group (CCOG) @ Yahoo
    http://groups.yahoo.com/group/CarCards/
    • Discussion, ways to create cards, links
  - MrTrains http://mrtrains.com/rr/layout/operations.html
    • Information, download templates
  - Micro-Mark http://www.micromark.com/
    • Car card system

- Software
  - Lists of products by category
    http://home.cogeco.ca/~trains/rrsoft.htm