Introduction to Model Railroad Operations

Based on original by: Dave Cochrun & Kathy Sparks
Revised by: Marshall Abrams

Potomac Division, NMRA

April 2, 2011

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, …

Potomac Division, NMRA 5

Real Railroad Employees

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

Potomac Division, NMRA 6

Operations Personnel On Your layout

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

Road Crews	Administration	Yard Crews
Conductor (4)	Dispatcher (2)	Yardmaster (3)
Engineer (1)	Agent	Conductor
Brakeman	Towerman	Engineer
Fireman		Brakeman
		Fireman
		Hostler (5)

Potomac Division, NMRA 7

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

Potomac Division, NMRA 8

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**

Potomac Division, NMRA 9

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**

Potomac Division, NMRA 10

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:**

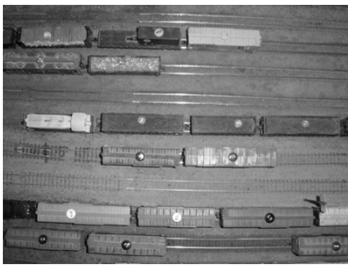
Train:	Engine:	DCC address:	Origin:	Destination:
Car type	Destination 1	Destination 2	Destination 3	Destination i
Box				
Flat				
Gondola				

Potomac Division, NMRA

11

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**

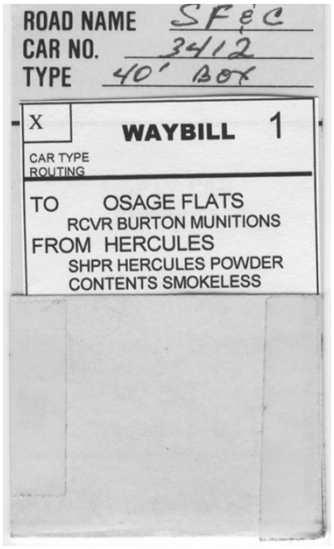


Potomac Division, NMRA

12

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**



Potomac Division, NMRA

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)					
Truck Terminal	BELX	3654	Box	Yellow	RACO Bell
Truck Terminal	ARE	254	Flat	Tuscan	
Roy's Place	GATX	39617	Tank	White	Michigan Akali
Roy's Place	NJDX	1035	Box	Yellow	
SetOuts (2)					
Truck Terminal	N&W	44657	Box	Black	
Truck Terminal	ATSF	90306	Flat	Green	TOFC

Potomac Division, NMRA

14

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
NorthBound FROM: Gal Yard TO: CR Yard
Departing at 6:52 on Route GA-CR Local

INSTRUCTIONS TO CREW
- If you have or pick-up a car for Muleshoe, 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)
{DRGW GP7 # 5101 } Consist 5101
{DRGW GP7 # 5103 } Consist 5101
PickUps (8)

#1 track	ATSF	MT Tank,	98016	to IG
#1 track	GATX	MT Tank,	16102	to IG
#2 Track	CTTX	MT Tank,	8506	to IG
#1 track	NYC	MT Box	167003	to MS
#1 track	DRGW	MT Box	69572	to SR
#2 Track	RI	MT Box	262953	to SR
#1 track	C&NW	MT Box	108102	to TRN

--Depart at 9:34,
10 Cars Out, 602 Ft, 998 Tons, Power 3500 Tons

Santa Rosa -- Arrive at 9:40
Local Moves (6)

#1 Track	CGW	MT Stock	823	to Cow Track
#1 Track	ATSF	MT Stock	26385	to Cow Track
#1 Track	ATSF	MT Stock	26417	to Cow Track
#1 Track	DRGW	MT Stock	36485	to Cow Track
#1 Track	D&RGW	MT Stock	39212	to Cow Track
#1 Track	DRGW	MT Stock	64124	to Cow Track

PickUps (2)

Junk Yard	MKT	MT Gondol	43001	to CRy
Junk Yard	P&LE	MT Gon-sc	S47999	to CRy

SetOuts (2)

Transfer	DRGW	MT Box	69572
Transfer	RI	MT Box	262953

--Depart at 10:28,
10 Cars Out, 602 Ft, 998 Tons, Power 3500 Tons

Trinidad -- Arrive at 10:40
PickUps (3)

#1 Marble	ATSF	MT Gondol	172249	to CRy	CASWELL
#1 Marble	ATSF	MT Flat	297012	to CRy	

Potomac Division, NMRA
15

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

Potomac Division, NMRA
16

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) (2 of 2)

- **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 (1 of 2)

- **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
  - Wheel reports
  - Markers on cars
  - Car Card & Way Bill
  - Switch List
- **Traffic control**
  - Random
  - Sequential
  - Scheduled
    - Track Warrant
    - Time Table & Train Order (TT&TO)
  - Real time
    - Train order
    - TT&TO (Extras)
    - CTC

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

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 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.

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

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**

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

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

Potomac Division, NMRA 31

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

Potomac Division, NMRA 32

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 you 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**

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

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/rrfrtops.htm
- **Basic Guide to Design Model Train Operations**
  http://knol.google.com/k/model-railroad-operations#

Potomac Division, NMRA

37

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

Potomac Division, NMRA

38