Customer Service, Operations and Security Committee

Information Item III-A

January 12, 2017

Train Reliability Program

Washington Metropolitan Area Transit Authority

Board Action/Information Summary

○ Action ◉ Information	MEAD Number: 201825	Resolution: ○ Yes ◉ No

TITLE:

Train Reliability Program

PRESENTATION SUMMARY:

The Board's Customer Service, Operations and Security Committee will receive a briefing on Metro's program to improve train reliability for customers.

PURPOSE:

To provide an overview of Metro's multi-pronged approach to improving train reliability. This includes changing the overall composition of the fleet to introduce 7000 series railcars and retire the oldest and least reliable railcars, maintenance campaigns to catch up on needed repairs and improvements to the quality of railcar maintenance in order to sustain railcar reliability improvements.

DESCRIPTION:

Metro has commenced the following initiatives to improve train reliability:

Key Highlights:

• Introduction of 7000 series railcars
• Retirement of the oldest and least reliable railcars
• Maintenance campaigns to catch up on needed repairs
• Improvements to the railcar maintenance program

Background and History:

Sixty percent of all rail delay minutes are caused by railcars. The impact to customers is significant, as trains may be offloaded, causing extended waits for customers not just on the offloaded train but for other customers down the line. In 2016, there have been 2,400 missed dispatches YTD (about eight per day) because railcars are not available, and 1,200 offloads YTD (four per day) due to railcar failures.

In the most recent Q3/2016 Vital Signs Report to the Board, rail fleet reliability (64,081 miles between delays) was improved from the same time last year, but below the CY2016 target of 65,000. Car availability dropped sharply in July and August as sustained temperatures above 90 degrees led to HVAC failures that took many cars out of service. As temperatures cooled by mid-September, availability improved and met system-wide targets most days.

Discussion:

72 Hours in the Life of a Railcar: Maintaining railcars in good condition requires a complex interplay between our customers who ride our trains, operations that put our trains in service and monitor train spacing, and maintenance staff that provide preventive and corrective repairs at nine different yards. The presentation will include a video to demonstrate one railcar's journey through the system to illustrate how many elements have to work together seamlessly to provide good performance for the customer.

Changing the composition of the fleet:

7000 Series: The first 7000 series railcar arrived at Metro in April 2015. As of November 18, 2016, 224 cars have been commissioned, which equates to 28 trains. The initial delivery pace was well below Metro expectation (approximately eight railcars/mo.). Increased focus and attention by Metro and Kawasaki leadership has improved recent delivery of 20 railcars/mo. Work is needed by Kawasaki with the support of Metro to sustain this improvement in CY2017.

In addition to delivery schedule adherence, Metro also tracks Kawasaki's performance to provide reliable cars. Reliability is measured by Mean Distance Between Delays or how long a railcar travels before having an incident that causes a delay to customers (such as an offload). In 2016, there have been five months when 7000 series met or exceeded 100,000 Miles Between Delays, significantly better than CY2015 results (36,000 average for the year). Results for a second measure, Mean Distance Between Failure (MDBF) indicate that Kawasaki still needs to make improvements. A failure occurs anytime a system on the railcar malfunctions that may or may not take a railcar out of service (for example, a "hot car" is a failure, but does not cause a delay). MDBF is important, as it reflects the totality of malfunctions occurring on a car, and is currently well below contract expectations of 20,800 miles between failures (currently ranges between 5,000 and 10,000 miles between failure for the 7000 series fleet). Metro also tracks Kawasaki's performance on a third measure, "% Cars Available," which is attained within the contract target most of the time.

To ensure continued improvement, Metro Quality Internal Compliance Operations group is monitoring performance in Lincoln and on-site at the Greenbelt Commissioning facility. In addition, Metro's COO and GM/CEO meet regularly with Kawasaki representatives.

Replacing Metro's oldest and least reliable railcars: The delivery of new 7000 series railcars provides the opportunity to retire Metro's oldest and least reliable railcars. The last of Metro's oldest railcars, the 1000 series, will be retired (a National Transportation Safety Board recommendation), followed later by the 4000 series, and then by the 5000 series. 7000 series cars are 25% more reliable than the 1000 series and four times, or 310% more reliable than the 4000 series. This change in the composition of the fleet is expected to produce notably better performance for customers.

Maintenance campaigns to address those failures that most commonly result in delays for our customers: Metro has commenced a very specific and directed

inspection of its older fleets to identify issues and complete repairs by the middle of 2017. Staff are completing repair campaigns during the SafeTrack program to take advantage of the lower demand for car availability. The fleet includes 346 of the 2000/3000 Series cars; 192 of the 5000 Series cars and 184 cars of the 6000 Series cars. The specific inspections are designed to cover critical sub-systems that cause the majority of railcar delays including HVAC, Doors, Pneumatic, Brakes and Propulsion. The program started November 1, 2016, and within nine months, all 740 cars will have undergone annual inspection and necessary repairs for the specific sub-systems targeted.

Improving the quality of railcar maintenance: While the maintenance campaigns will focus on some quick fixes to address common failures, the long-term strategy for improving railcar reliability is to strengthen preventive maintenance practices to prevent the failures from happening in the first place. Presently, 70% of railcar maintenance is corrective and only 30% preventive. To reverse this ratio, Metro is moving towards "smarter" maintenance, including strengthening mechanic training, the establishment of a Reliability Centered Maintenance Planning Office that uses a data-driven approach to evaluate and re-tool maintenance strategies, evaluating inspection intervals and advancing strategies to monitor condition to proactively prevent delays and strengthen mechanic training.

Metro is also working to improve railcar availability which is driven by how frequently railcars breakdown, how quickly repairs are made, whether parts are available and how well cars are balanced across nine yards. A shop-planning initiative is being extended to all shops to improve repair times. The parts procurement initiative to put long-term contracts in place to prevent part shortages is also being continued.

Summary: Short and Long Term Plan to Improve Train Reliability

To improve train reliability, Metro plans a number of short-term and long-term initiatives. In the near-term, introduction of more 7000 series cars to the fleet will reduce delays for customers as reliability of the new cars has improved significantly and is expected to continue getting better. Staff is also working to conduct campaigns on known defects for the existing fleet and to improve the quality of maintenance. Longer-term, replacement of the other series cars will be needed. Additionally, Metro will benefit from establishing mid-life overhaul programs in order to sustain railcar reliability and extend the life of the fleet.

FUNDING IMPACT:

No additional budget required.	
Project Manager:	Joseph Leader, Chief Operating Officer
Project Department/Office:	Operations

TIMELINE:

Washington Metropolitan Area Transit Authority

Train Reliability Program

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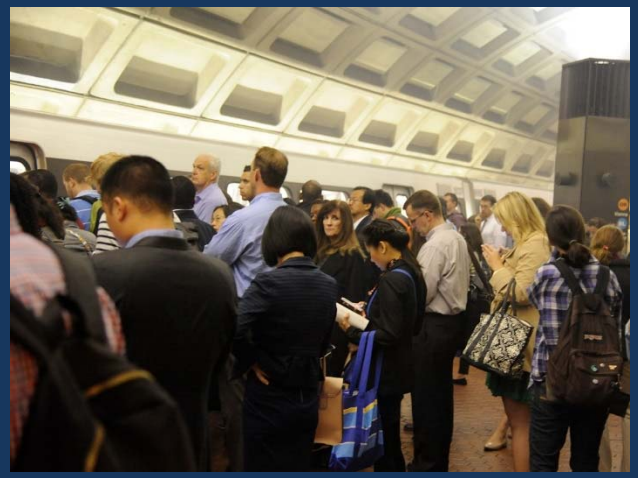
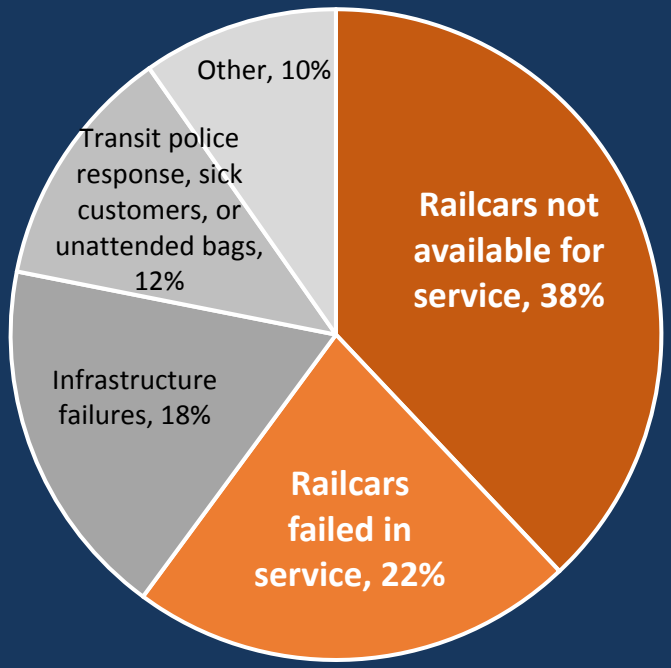
Railcars Cause Most Delays

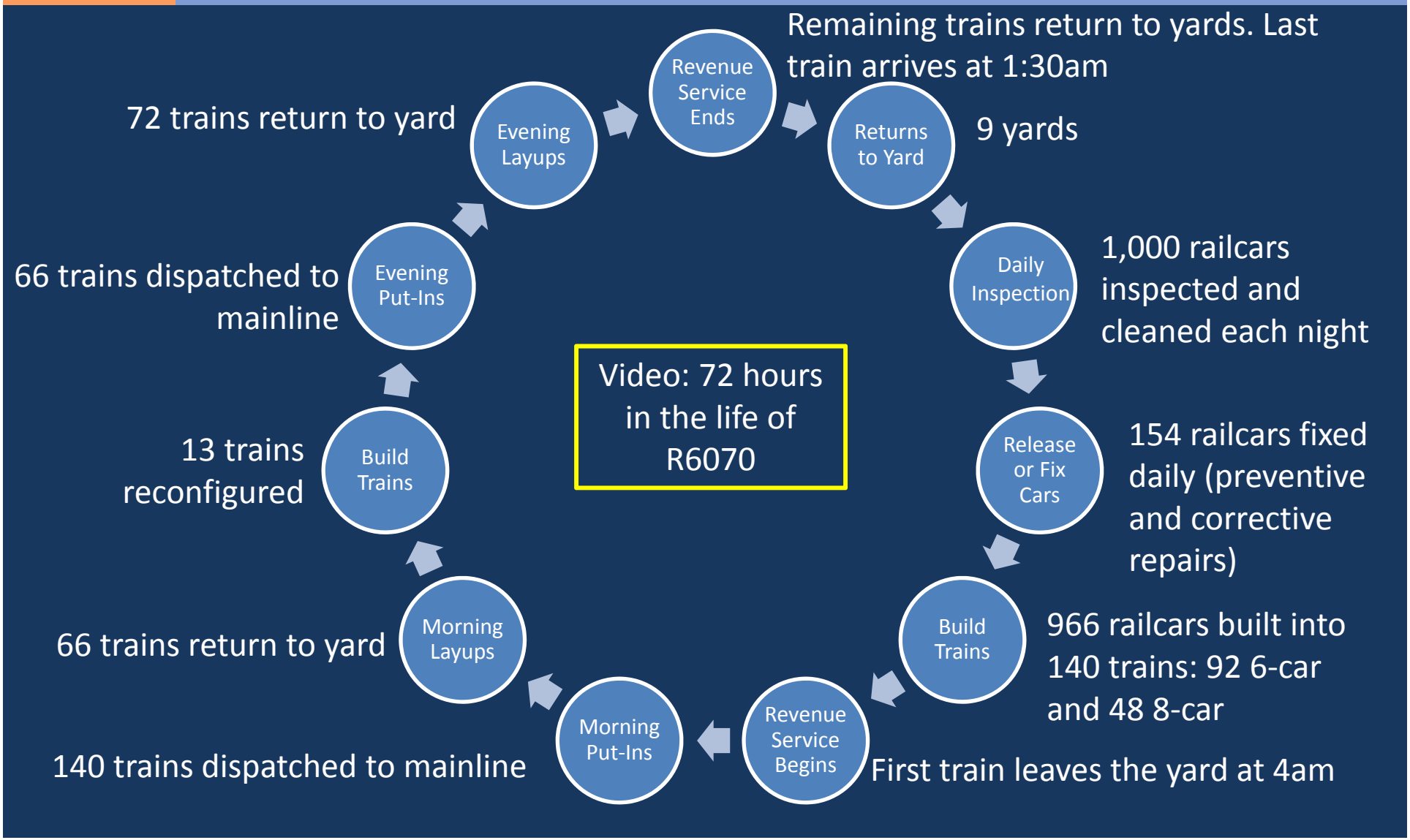
60% of all customer delays are caused by rail car breakdowns





- 2,400 missed dispatches CYTD (about 8 per day) because railcars aren't available
- 1,200 offloads CYTD (4 per day) due to railcar failures

Weekday Service Patterns



Improving Railcar Reliability Takes a Multi-pronged Approach

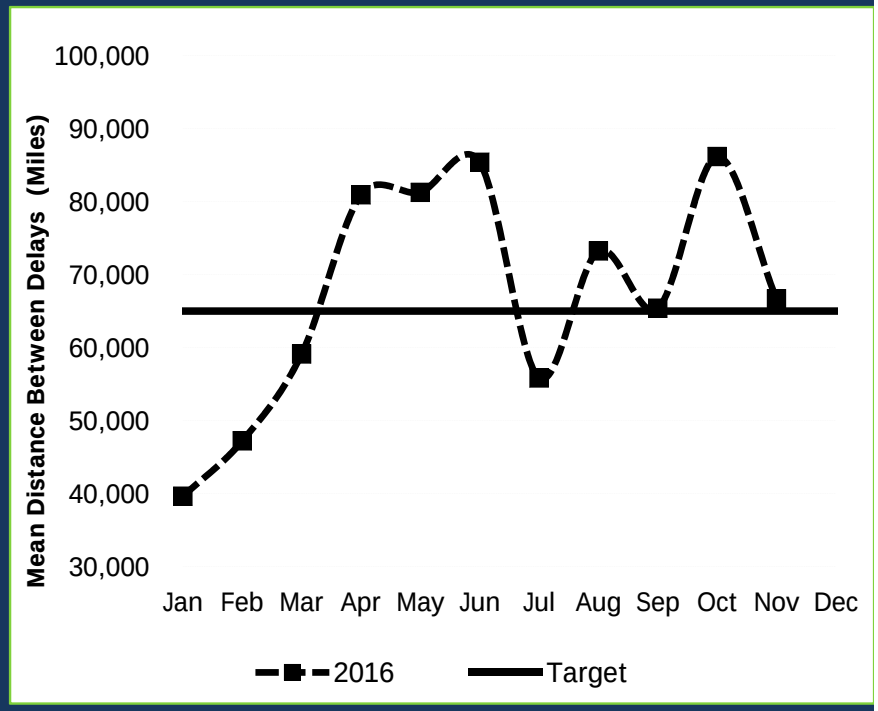
New 7000 series cars

Retirement of oldest & least reliable cars

Campaigns to correct known defects

Improving maintenance

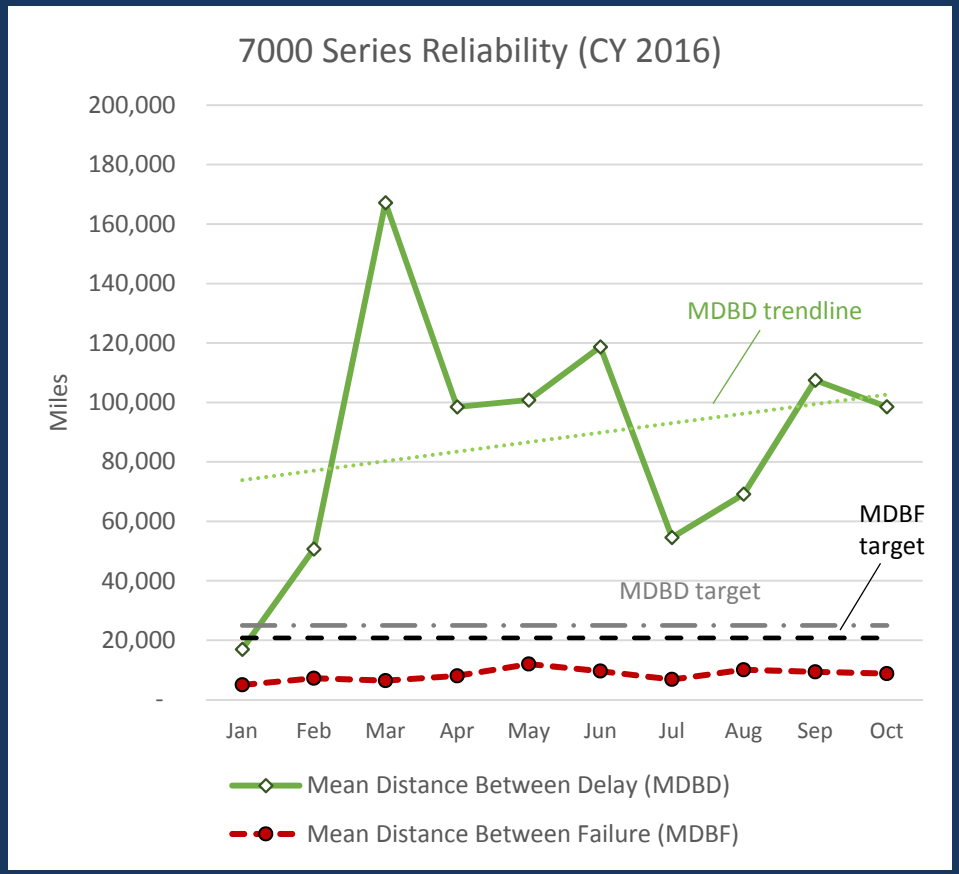
2016 Rail Fleet Reliability
(Mean Distance Between Delay)



7000 Series Delivery Improved

- Kawasaki pressed to catch up to contract schedule
- Acceptance rate improved 150% (8 to 20 cars/mo.)
- To sustain 20/mo., Kawasaki & Metro must:
  - Reduce commissioning from 21 to 16 days
  - Resolve quality issues at Lincoln, NE facility
  - Add Kawasaki manpower & WMATA inspectors

7000 Reliability Has Improved, But Better Performance Expected

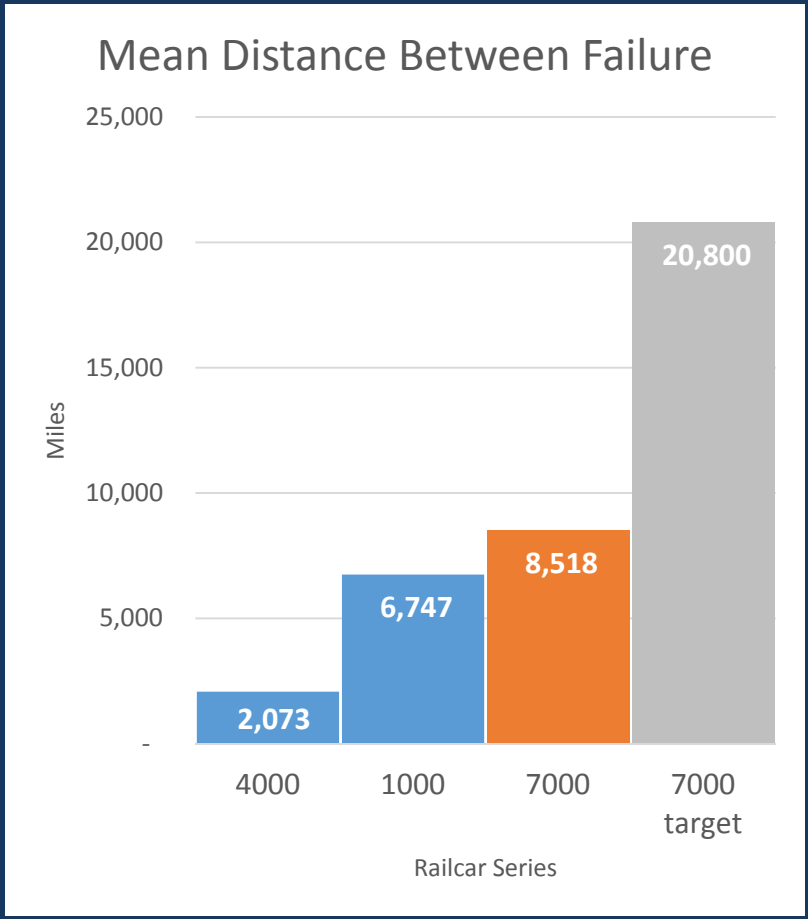


Measure	Target (Contract)	Status
Mean Distance Between Delays (≥ 4 min)	Graduated time-based scale from 25,000 – 200,000	Passing
Mean Distance Between Failures	20,800	Not Passing
% Cars Available	85%	Meeting most of the time

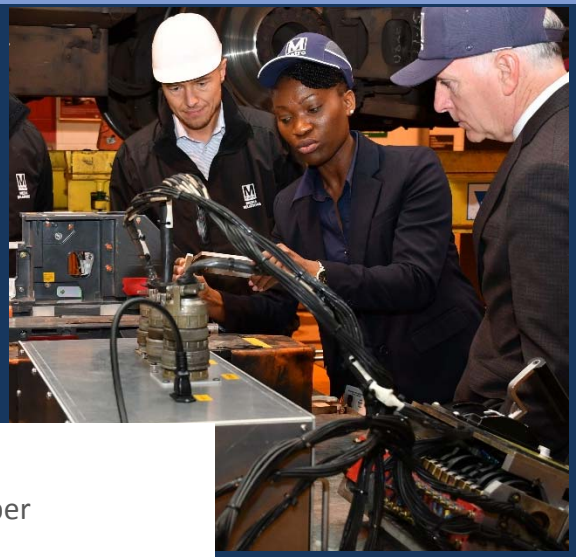
Retiring 1000 & 4000 Series Cars Addresses Safety and Reliability

NTSB Recommendation:
1000 Series

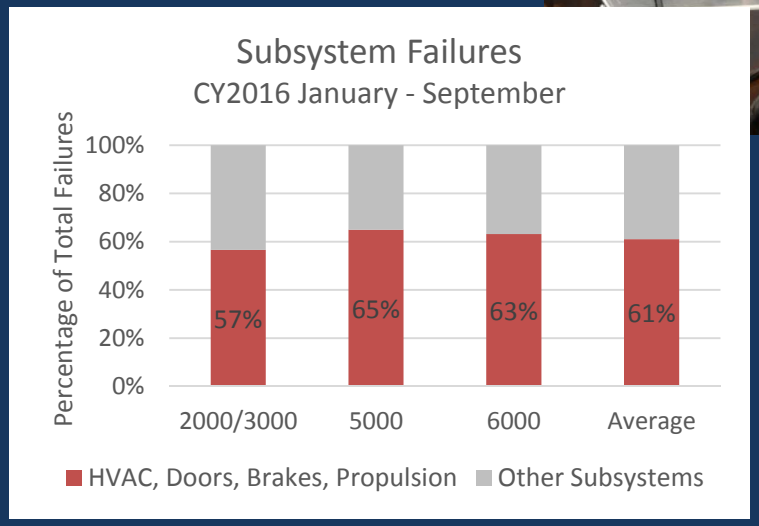
Least Reliable:
4000 Series



Existing Fleet: Campaign to Address Primary Causes of Railcar Failures



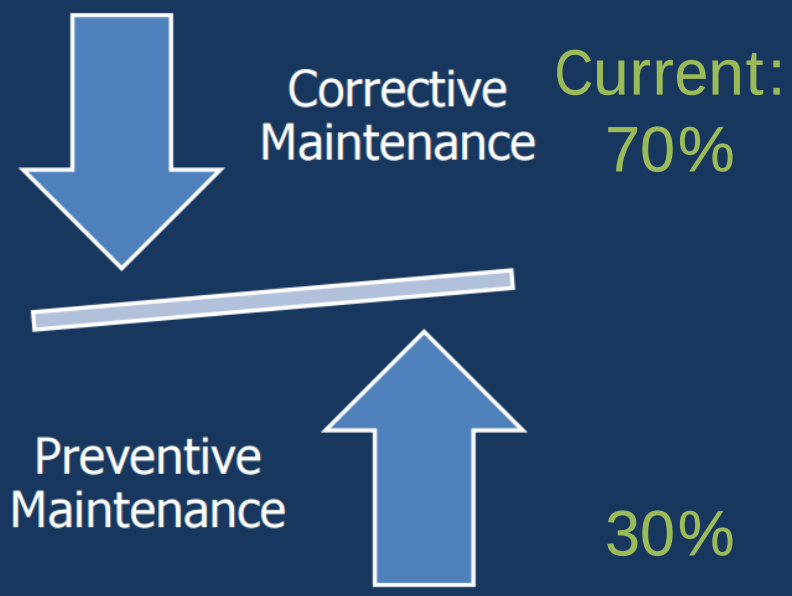
- 2000/3000, 5000 & 6000 series
- Focuses on improving:
  - HVAC
  - Doors
  - Brakes
  - Propulsion
- Started Nov 1st



- During 1st month, 9% of campaign completed

As With Track, Must Move From Corrective to Preventive Maintenance

How improve railcar <u>reliability</u>?



Root cause analysis

Adjust maintenance

Condition monitoring

Strengthen training

Enhance Planning to Optimize Resources (people, parts, equipment)

Current: 154 cars returned to service daily

How improve railcar <u>availability</u>?

- Extend shop planning initiative to all shops
- Cars in right yard
- Yard technicians troubleshoot at dispatch
- Parts available
  - **Dec 2015:** 70 railcars parked due to lack of parts
  - **Dec 2016:** No cars parked, establishing long-term parts contracts

Short and Long Term Plan to Improve Train Reliability

Short-Term: Initiatives in 2017	Customer Benefit
• Change fleet composition, putting new 7000 series cars in service • Campaign to correct known defects • Improving maintenance	Fewer railcar delays in 2017

Long-Term: Initiatives in 2018 & Beyond	
• Establish mid-life overhaul program to sustain reliability and extend life of the fleet • Fund $354M railcar procurement to replace 2000/3000 series railcars	Reduce Offloads