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WMSC Commissioner Brief: W-0257 Red Signal Overrun – Ballston Station – April 15, 2023

Prepared for Washington Metrorail Safety Commission meeting on March 5, 2024

Safety event summary:

During troubleshooting of an Orange Line train at Rosslyn Station on April 15, 2023, Automatic Train Protection[1] was cut out by a Car Maintenance Road Mechanic, and the Train Operator then moved the train (which had been taken out of service) without the required protections against collision (protective blocks). The train travelled up to 38 mph, above the 15-mph maximum permitted when moving without Automatic Train Protection. During this movement, the Train Operator moved from the area governed by the ROCC Ops 2 radio channel desk to the area governed by the ROCC Ops 4 radio channel desk. The Ops 4 Radio Rail Traffic Controller was not able to successfully contact the Train Operator or Rail Supervisor on board after the train departed Rosslyn Station. The Ops 4 Rail Traffic Controllers set a red signal near Ballston Station. The Train Operator operated past that red signal.

At 3:37 p.m. the Train Operator of Train 601 at Stadium-Armory Station reported to the Rail Operations Control Center that the Train Control Display had changed to a blue screen. The Radio Rail Traffic Controller attempted to dispatch a Car Maintenance Road Mechanic to meet the train at L'Enfant Plaza Station, but no mechanic met the train there. The train continued on with passengers aboard until a second Road Mechanic met the train at Rosslyn Station. This Road Mechanic attempted to troubleshoot the issue by resetting Vehicle Monitoring and Diagnostic System breakers. Riders on the train were offloaded to the platform.

The Road Mechanic and a Rail Transportation Supervisor continued troubleshooting. The Road Mechanic deactivated Automatic Train Protection with permission from the ROCC Radio Rail Traffic Controller. As the Road Mechanic continued to work on the issue, other personnel not directly involved in the event on the train or in the control center who did not identify themselves as required by Metrorail radio communications procedures provided suggestions on the radio. Among those suggestions were to deactivate the power knockout switch (allows train to take a point of power even if the brakes do not release or indicate being stuck) and to reset the battery circuit breaker. The Radio Rail Traffic Controller gave the Road Mechanic permission to try both, and the train brakes released, allowing the train to move.

The Train Operator of Train 601, which the Rail Traffic Controllers were now referring to as Train 701 (an ID in the 700s is used for out of service trains), took over operations from the Road Mechanic. The Train Operator did not receive instructions from the ROCC to reactivate Automatic Train Protection (ATP) or Power Knockout breakers and moved the train without a permissive or absolute block that would have provided assurance that there were no other trains in that section of track. An absolute or permissive block is required when ATP is deactivated to safeguard against train

[1] Automatic Train Protection (ATP) is a subsystem within the ATC System which enforces safe operation of the system. It imposes speed limits both to maintain safe train separation and to operate trains in accordance with civil speed restrictions. At interlockings, ATP ensures that train movement is permitted only when a route is available through the interlocking, and the switches are safely locked in position. In all cases where two or more trains request the use of a single segment of track or interlocking, the ATP prevents occupancy by more than one train. The system relies on both vehicle and wayside elements. "Cutting out" ATP on the railcar means that ATP's safety restrictions are not enforced. This can be necessary in certain circumstances in order to move a disabled train. In such circumstances, Metrorail requires other forms of protection to be in place, such as protective blocks that ensure only one train is in a specific section of track.

collision. Metrorail also requires the performance of a rolling test prior to moving a train that has had the power knockout bypass activated. This rolling test was not conducted prior to moving the train toward Ballston Station.

As outbound trains reach Clarendon Station, they cross from the territory controlled by Rail Ops 2 to territory controlled by Rail Ops 4, and Train Operators, Rail Supervisors, and other personnel must switch to the corresponding radio channel. In this case, the Train Operator and Rail Supervisor remained on Ops 2. The Radio Rail Traffic Controllers attempted to contact the Train Operator of Train 701 several times but did not get a response. The Ops 4 Radio and Button Controllers stated in investigative interviews that they were not provided with the details of the train malfunction resolution at Rosslyn Station. The Ops 4 Button Controller changed the lunar (proceed) signal on track 2 in approach to Ballston Station to red (stop) when they were unable to reach the Train Operator. Metrorail generally requires controllers to communicate with Train Operators prior to placing a red signal. The Train Operator passed the red signal. The Train Operator stated in an investigative interview that they were distracted by the Rail Supervisor who they were talking with in the operating cab.

The train travelled up to 38 miles per hour in the 5 minutes of travel from Rosslyn Station toward Ballston Station. The train was traveling at 36.6 miles per hour when the Train Operator applied B5 (maximum normal) braking 314 feet before the red signal. Approximately 3 seconds later, the train operator applied emergency braking 186 feet before the Red Signal when the train was travelling 32 mph. The train passed the red signal at 12.8 mph, and stopped 24 feet beyond the signal.

Metrorail policy requires trains to be operated at a speed no greater than 15 miles per hour when ATP is deactivated. The Rail Supervisor had not identified the excessive speed or movement without required protection. The Train Operator and Rail Supervisor did not report the emergency braking application or red signal overrun. They did make contact with the Ops 4 Radio Rail Traffic Controller, who informed the Train Operator that the signal was red, their Train ID had changed, and that they had appeared to overrun a red signal.

This signal is at a switch location. The train passed the switch point. Therefore, switch inspections were required to verify that it would be safe to move the train. Metrorail Automatic Train Control personnel conducted these inspections and clamped the switches for normal movement.

Vehicle data review showed that the initial train control display failure on Car 7000 was due to a Logic Control Unit error detected by the secondary Logic Control Unit. This led to failed inauguration cycles of the Train Control Network, and a loss of communication between the Vehicle Monitoring and Diagnostic System and the Train Control Display. The initial step of resetting the circuit breaker aligned with the initial step in the troubleshooting maintenance manual. After this step, the train experienced problems with door closing, public address systems, and the brakes remaining applied. These issues led to the train being placed out of service prior to the improper movement with ATP cut out and the subsequent red signal overrun. The Rail Supervisor assisted with closing the doors from the fifth car of the train as the troubleshooting continued.

Probable Cause:

The probable cause of this event was noncompliance with written rules, procedures and manuals, including as it relates to communication, troubleshooting, operating, and supervisory oversight requirements.

Corrective Actions:

The Rail Operations Control Center developed a lessons learned document that outlines the proper steps to be taken when troubleshooting faults.

WMATA distributed a memorandum to Rail Operations Control (ROC) staff, emphasizing that Rail Traffic Controllers (RTC) shall not cancel routes or fleets or take interlocking signals out of automatic to display red signals in front of train operators unless it is deemed an emergency.

Example of other related open CAP

- C-0181 addresses the 2022 audit of Metrorail's rail operations finding that elements of Metrorail have a culture that accepts noncompliance with written operational rules, instructions and manuals. (Scheduled completion date October 2024)

WMSC staff observations:

Although the suggestions of the unidentified personnel proved to be helpful, radio communications by personnel not directly involved in an event has the potential to cause or contribute to confusion and prevent timely transmission of pertinent information and instruction if the transmissions are not identified and conducted in the manner required by Metrorail's communication procedures.

Washington Metropolitan Area Transit Authority
Department of Safety (SAFE)
Office of Safety Investigations (OSI)

FINAL REPORT OF INVESTIGATION A&I E23258

Date of Event:	April 15, 2023
Type of Event:	Red Signal Overrun
Incident Time:	16:31 hours
Location:	Ballston Station, Track 2, Red Signal 08
Time and How received by SAFE:	16:58 hours/ Mission Assurance Coordinator (MAC)
WMSC Notification Time:	16:58 hours
Responding Safety Officers:	Office of Safety Investigations (OSI)
Rail Vehicle:	Train ID 701 (L7000/01X7325/24X7524/25X7151/50T)
Injuries:	None
Damage:	None
Emergency Responders:	Emergency Response Team (ERT)
SMS I/A Incident Number:	20230415#107749MX

April 15, 2023
Table of Contents

Abbreviations and Acronyms

AIMS	Advanced Information Management System
ARS	Audio Recording System
ATCM	Automatic Train Control Maintenance
ATP	Automatic Train Protection
CAP	Corrective Action Plan
CCTV	Closed-Circuit Television
CMNT	Office of Car Maintenance
COMR	Office of Chief Mechanical Officer
ER	Event Recorder
ERT	Emergency Response Team
ETO	Exclusive Track Occupancy
IIT	Incident Investigation Team
LCU	Logic Control Unit
MAC	Mission Assurance Coordinator
MSRPH	Metrorail Safety Rules and Procedures Handbook
NOAA	National Oceanic and Atmospheric Administration
NVR	Network Video Recorder
OSI	Office of Safety Investigations
RM	Road Mechanic
RTC	Rail Traffic Controller
RTRA	Office of Rail Transportation
ROCC	Rail Operations Control Center
SAFE	Department of Safety
SMS	Safety Measurement System
TCD	Train Control Display
TCN	Train Control Network
VMDS	Vehicle Monitoring and Diagnostic System
WMATA	Washington Metropolitan Area Transit Authority
WMSC	Washington Metrorail Safety Commission

Executive Summary

**Note that all times listed are approximate and may contain minor variations due to differences between systems of record. **

On Saturday, April 15, 2023, at 15:37 hours, the Rail Operations Control Center (ROCC) received a notification that Train ID 601 experienced a fault message (blue screen) on the Train Control Display (TCD) at Stadium-Armory Station on track #2. The Office of Rail Car Maintenance (CMNT) dispatched a Road Mechanic (RM) 2 from an unknown location to meet the train at L'Enfant Plaza. However, the RM assigned initially was unsuccessfully at meeting the train at L'Enfant Plaza Station. As a result, a second RM 3 stationed at Rosslyn Station responded to track #2. At 16:05 hours, the RM 3 boarded Train ID 601 at Rosslyn Station to assist with the TCD fault problem. With permission from the Radio Rail Traffic Controller (RTC), the RM 3 attempted to fix the issue by resetting Vehicle Monitoring and Diagnostic System (VMDS) breakers 1 & 2. Still, the fault persisted on the TCD screen. The RM recommended removing the train from service at the end of the line. The Radio RTC instructed that the train should be offloaded at 16:08 hours.

While at Rosslyn Station during troubleshooting, it was discovered that Train ID 601 could not close the platform doors from the lead car. The Office of Rail Transportation (RTRA) Supervisor followed the troubleshooting procedures and successfully closed the doors from the fifth car of the train. The RM 3 then attempted to troubleshoot the train by resetting the VMDS again, resulting in the train brakes' failure to release. With permission from the Radio RTC, the RM 3 deactivated the Automatic Train Protection (ATP), but the train brakes still did not release.

At this point, an unidentified party suggested cutting out the power knockout via radio, which the Radio RTC confirmed. The RM 3 cut out the power knockout, but the train brakes continued to hold. Finally, after another unidentified party suggested doing so, the RM 3 reset the battery circuit breaker with permission from the Radio RTC. As a result, Train ID 601 achieved a brakes-off condition and reported being able to move at 16:25 hours. The RM 3 then cut out the ATP and Power Knockout circuit breakers again because they were concerned that they would be unable to move the train again without returning to the same state they were in before cutting the battery circuit breaker. Train ID 601 did not receive instructions from ROCC to reactivate the ATP or Power Knockout circuit breakers. The Train Operator then took over operations.

After reporting the brakes-off condition, the Train Operator was given permission to move the train but the Radio RTC did not provide a permissive or absolute block to the Train Operator.

According to the formal interview with the Train Operator, when the Train Operator departed Rosslyn Station they switched radio Ops from Ops2 to Ops 4. Despite attempts by the Ops 4 Radio RTC to contact the Train Operator multiple times, there was no response. The train continued to travel at speeds of up to 38 miles per hour until it encountered a red signal outside Ballston Station on track #2. The train passed the red signal, which the Ops 4 Radio RTC set due to the inability to reach the Train Operator.

The probable cause for this Red Signal Overrun Event was that the Radio RTC and Train Operator failed to follow established troubleshooting and operating procedures. Specifically, the Train Operator moved the train with ATP cut-out and no Permissive Block was given. The Radio RTC did not give the Train Operator a Permissive Block to move the train after ATP was cut out. The RM 3 did not get permission to cut ATP and power knockout a second time. After several unsuccessful attempts to make radio contact with Train ID 701, the Button RTC pulled the lunar

signal causing K04-08 signal to be red. The Train Operator was distracted while operating and talking with the Rail Supervisor, whose radio was on Ops 2, when they passed K04-08 signal.

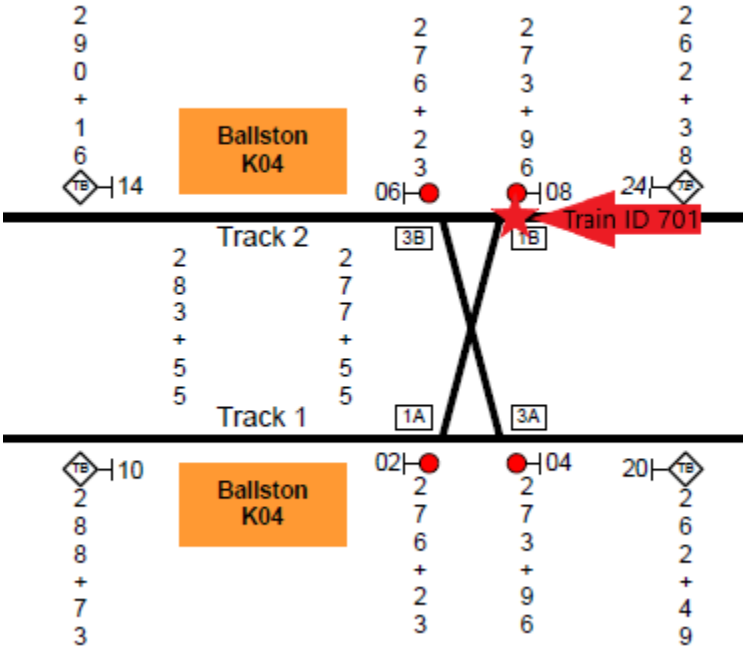
Contributing factors to the Red Signal Overrun event were inconsistent communications between the Train Operator, Road Mechanic, Rail Supervisor, and RTCs. Further contributing to the event were interjected radio communications and interruptions by uninvolved personnel.

A fault message on the TCD screen triggered the sequence of events that resulted in the station overrun.

Incident Site

Ballston Station, Track 2, Red Signal K04-08
CM K2 273+96

Field Sketch/Schematics



The above depiction is not to scale.

Purpose and Scope

The purpose of this accident investigation and candid self-evaluation is to collect and analyze available facts, determine the probable cause(s) of the incident, identify contributing factors, and make recommendations to prevent a recurrence.

Investigative Methods

The investigative methodologies included the following:

- Physical Site Assessment

- Formal Interviews – SAFE interviewed eight individuals as part of this investigation. The interview included persons present at, during, and after the incident, those directly involved in the response process, and representatives from the Washington Metrorail Safety Commission (WMSC). SAFE interviewed the following individuals:
    - Road Mechanic 3 – Stadium-Armory Station
    - AOM – ROCC (Eisenhower)
    - Ops 2 Radio RTC – ROCC (Eisenhower)
    - Ops 2 Button RTC – ROCC (Eisenhower)
    - Ops 4 Button RTC – ROCC (Eisenhower)
    - Ops 4 Radio RTC – (Carmen Turner Facility)
    - Rail Supervisor – (West Falls Church)
    - Train Operator – (West Falls Church)

- Informal Interviews – Collected through conversations with individuals during the investigation to provide background and supporting information. Written statements were reviewed from personnel present during the event.
    - Train Operator
    - Road Mechanic

- Documentation Review – Collection of relevant work history information and process documentation contained in WMATA systems of record. These records include the following:
    - Metrorail Safety Rules and Procedures Handbook (MSRPH)
    - National Oceanic and Atmospheric Administration (NOAA)
    - Maximo Data
    - Rail Operations Control Center (ROCC) Incident Report
    - Employee Training Procedures & Records
    - Employee 30-Day work history review
    - Rail Car Maintenance Series 7000 Introduction & Overview guide

- System Data Recording Review – Collection of information contained in Metro Data Recording Systems. This data includes:
    - Audio Recording System (ARS) playback
    - Closed-Circuit Television (CCTV)
    - Advanced Information Management System (AIMS)
    - Vehicle Monitoring & Diagnostic System (VMDS)
    - Event Recorder (ER)
    - Network Video Recorder (NVR)

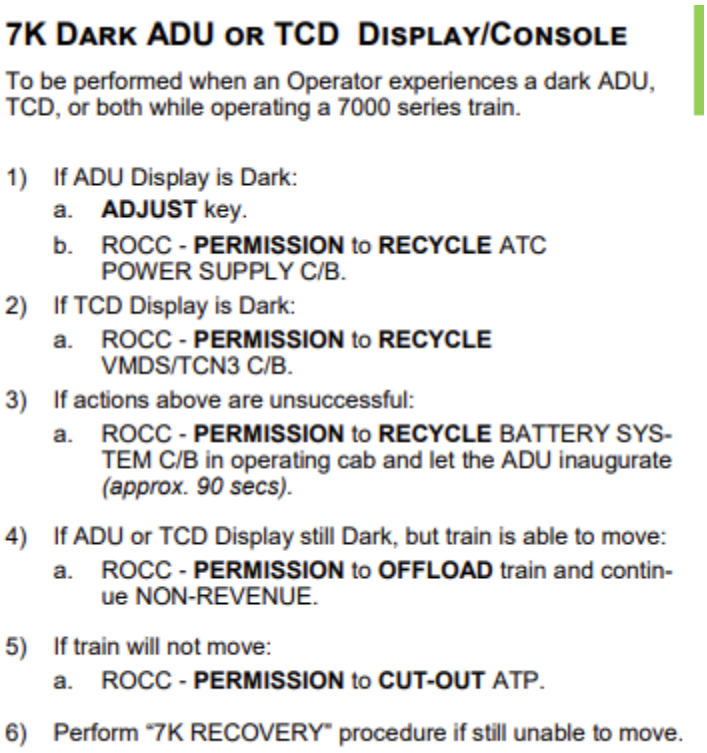
Investigation

On Saturday, April 15, 2023, at 15:37 hours, the Train ID 601 notified the ROCC that their train was experiencing a TCD fault message (blue screen) at Stadium-Armory Station on track #2. A CMNT RM 3 was dispatched to meet the train at L'Enfant Plaza. However, the dispatched RM 3 did not intercept the train. The train did not meet a Road Mechanic until arriving at Rosslyn Station on track #2.

According to ARS playback at 16:05 hours, the CMNT RM 3 boarded the train at Rosslyn Station to assist with the TCD fault problem. With permission from the Radio RTC, the RM 3 recycled VMDS 1 & 2, but the fault remained on the TCD screen. The RM 3 recommended to Radio RTC that the train be removed from service at the end of the line at 16:06 hours.

At 16:07 hours, the Train Operator could not close its doors from the lead car. The RTRA Supervisor stated in the formal interview they boarded the train at Rosslyn Station was able to close the train doors from the fifth car of the consist. At 16:08 hours, the Radio RTC instructed the Train Operator to offload the train. The RM 3 attempted to troubleshoot the train by recycling the VMDS, which resulted in the train brakes not releasing. With permission from the Radio RTC, the RM 3 cut out ATP, and the train brakes still did not release. At 16:15 hours, an unidentified party suggested, via radio, cutting out the power knockout via radio, and Radio RTC confirmed the suggestion. At 16:16 hours, the RM 3 cut out the Power Knockout breaker, and the train brakes continued to hold. Finally, the RM 3 recycled the battery circuit breaker after another unidentified party suggested doing so at 16:22 hours. This was done with permission from the RTC. After recycling the battery circuit breaker, the ATP and power knockout were reset by automatically as a default and was cut out a second time by the RM without permission or notifying the Radio RTC.

At 16:25:38 hours, the RM 3 notified the Radio RTC that they were able to get the brakes to release on Train ID 601, simultaneously the Train Operator took over operations of the train and was instructed by the Radio RTC to move the train. The Radio RTC did not give the Train Operator a permissive block.



7K DARK ADU OR TCD DISPLAY/CONSOLE

To be performed when an Operator experiences a dark ADU, TCD, or both while operating a 7000 series train.

1) If ADU Display is Dark:
   a. **ADJUST** key.
   b. ROCC - **PERMISSION** to **RECYCLE** ATC POWER SUPPLY C/B.
2) If TCD Display is Dark:
   a. ROCC - **PERMISSION** to **RECYCLE** VMDS/TCN3 C/B.
3) If actions above are unsuccessful:
   a. ROCC - **PERMISSION** to **RECYCLE** BATTERY SYSTEM C/B in operating cab and let the ADU inaugurate *(approx. 90 secs)*.
4) If ADU or TCD Display still Dark, but train is able to move:
   a. ROCC - **PERMISSION** to **OFFLOAD** train and continue NON-REVENUE.
5) If train will not move:
   a. ROCC - **PERMISSION** to **CUT-OUT** ATP.
6) Perform "7K RECOVERY" procedure if still unable to move.

Figure 1 - 7000-series Troubleshooting Guide Section on TCD faults.

After reviewing the available Ops 2 radio traffic, no instructions were observed to cut in ATP or Power Knockout circuit breakers after achieving the brakes-off condition. In addition, the Radio RTC did not provide permissive or absolute blocks to the Train Operator.

According to the formal interview with the Train Operator, when the Train Operator departed Rosslyn Station, they switched radio Ops from Ops2 to Ops 4. The train traveled up to 38 miles

per hour until they encountered a red signal outside Ballston Station on track #2. The train overran the red signal, which the Ops 4 Button RTC set after being unable to contact the Train Operator.

Based on the AIMS playback, it was observed that at 4:30 PM, signal K04-08 was changed to red.

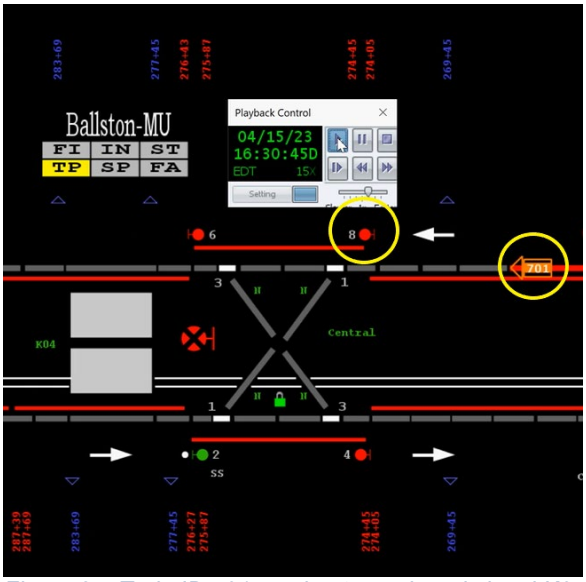


Figure 2 – Train ID 701 moving towards red signal K04-08 with ATP cutout (Train ID White font) at 16:30 hours.

According to the AIMS playback, at 16:31 hours, Train ID 701 overran Signal 08 at Ballston Station, track 2. At 16:52 hours, the RTRA Supervisor verified that the train passed the switch point.

Train ID 701 was in an "emergency" braking mode and came to a complete stop 24 feet beyond signal K04-08, according to the Event Recorder (EV).

At 17:22 hours, ATCM and Emergency Response Team (ERT) entered the roadway to conduct an interlocking inspection. At 17:53 hours, ERT confirmed there was no damage to the switchgear. At 18:02 hours, all personnel and Train 701 were clear from the interlocking at Ballston Station.

At 18:04 PM, as per the ARS report, the Rail Supervisor started operating Train ID 701 towards West Falls Church rail yard. The Train Operator was taken out of service at Ballston Station, and the Rail Supervisor was removed from service upon reaching West Falls Church Rail Yard.

After reviewing the available Ops 2 radio traffic, no instructions were observed to cut out ATP or Power Knockout circuit breakers a second time. In addition, the Radio RTC did not provide permissive or absolute blocks to the Train Operator, who traveled from Ops 2 to Ops 4 area.

The AIMS display showed the train operating without ATP (white colored Train ID font); however, RTCs reported being focused on alleviating the backups that occurred as a result of the delay. The train traveled up to 38 miles per hour until they encountered a red signal outside Ballston Station on track #2. The train overran the red signal, which the Ops 4 Button RTC set after being unable to contact the Train Operator.

In a phone conversation with the CMNT Desk, the RM 3 stated that they were not in the operating cab when the overrun and were “80% sure” that the ATP was still cut out on the train.

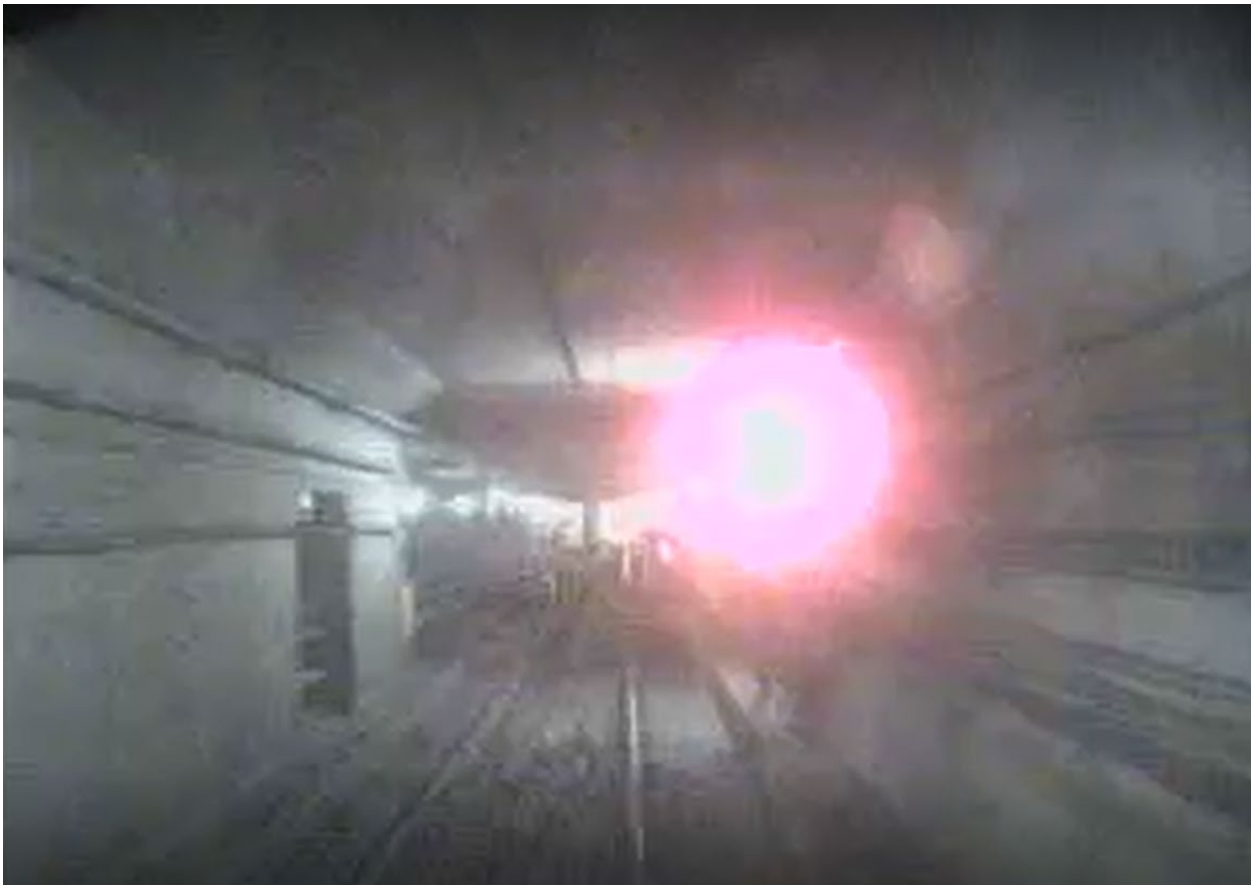


Figure 3 - Footage taken from the forward-facing camera of Train ID 701 determined the train observed Red Signal K04-08 at 16:31 hours, failing to stop.

Reviewing previous work orders found that a blue TCD screen was reported on the same car on the previous day, April 14, 2023. CMNT investigated and troubleshot but could not reproduce the failure and released the car to service on April 15, 2023.

Chronological Event Timeline

A review of ARS playback, i.e., phone and radio communications, revealed the following timeline:

Time	Description
15:37:24 hours	Train Operator: Notified Radio RTC that Train ID 601, track 2 at Stadium Armory that they had a transmission error was displayed on the TCD screen. Radio RTC: Acknowledged and requested if RM 1 was still at Stadium Armory Station, but response. RM 2 was requested from unknown location to meet Train ID 601 at L'Enfant Plaza Station, track 2. RM 2: Acknowledged with 100% repeat back. Radio RTC: Instructed Train ID 601 to continue in revenue service to L'Enfant Plaza where RM 2 would check the train. Train Operator: Acknowledge with 100% repeat back and continued in revenue service. [Radio, Ops 2]
16:05:33 hours	RM 3: Notified Radio RTC that they were onboard Train ID 601. Requested permission to recycle VMS 1 & 2. [Radio, Ops 2]

Time	Description
16:06:08 hours	RM 3: Reported recycling of VMS 1 & 2 did not clear the transmission error and recommend Train ID 601 be removed from service at the end of the line. Radio RTC: Instructed the Train Operator to close the train door and continue in revenue service to the end of the line. RM 3 was instructed to stay onboard Train ID 601 until relieved further down the line. Train Operator & RM 3: Acknowledged instruction with 100% repeat back [Radio, Ops 2]
16:07:40 hours	Radio RTC Ops 2: Advised the Train Operator of Train ID 601 to close their doors and leave their current station. Train Operator Train ID 601: Advised that they were having issues operating their doors. Radio RTC Ops 2: Acknowledged and advised the Train Operator to notify of issues immediately in the future. [Radio, Ops 2]
16:08:40 hours	Radio RTC Ops 2: Requested if the Train Operator of Train ID 601 had recycled their doors on the platform side. Train Operator Train ID 601: Advised doors recycled, still unable to close doors. RM 3: Reported they were unable to close the train doors from the lead car recommended fifth car operations. Radio RTC Ops 2: Acknowledged and advised the Train Operator to offload the train and instructed RM 3 to attempt to close the train doors from the fifth car. Rail Supervisor: Advised Radio RTC that they were on the platform. [Radio, Ops 2]
16:10:33 hours	Radio RTC Ops 2: Requested the Train Operator of Train ID 601 verify that the train was clear of customers. *Requested twice, the second-time answer given.* Train Operator Train ID 601: Advised train was cleared of customers. Radio RTC Ops 2: Advised Train ID 601 is now re-blocked as Train ID 701 and out of service and to continue. *No repeat back* [Radio, Ops 2]
16:11:40 hours	*Radio RTC attempted to contact Train ID 601 initially; however, they then used the 701 callsign multiple times to negative effect.* [Radio, Ops 2]
16:12:14 hours	Radio RTC: Advised the GAP Train Operator of Train ID 775 to clear the interlocking at Ballston Station, pick up an operator from the platform and reblock Train ID 601. Train Operator of Train ID 775: Acknowledged with 100% repeat back. [Radio, Ops 4]
16:13:43 hours	Rail Supervisor: Advised the Radio RTC that the train was clear of customer and will be moving in 30 seconds. RM 3: Advised that Train ID 601 was clear of customers, and the train doors closed. Radio RTC: Acknowledged and requested the train to move. Train Operator: Advised that the train was still unable to move. Radio RTC: Requested RM 3 to close the train doors from the fifth car. RM 3: Advised that the train doors have been closed from the fifth car, the train is clear of customers, and they will assist the TO with moving the train. Radio RTC: Requested confirmation from Train ID 701 if they could not get all doors closed; second request confirmation from Train ID 601 if they could get all doors closed. Train Operator: Advised Radio RTC that the train could close all doors but could not release the train's brakes. [Radio, Ops 2]

Drafted By: SAFE 710 – 06/16/2023
Reviewed By: SAFE 71 – 06/20/2023
Approved By: SAFE71 – 06/20/2023

Time	Description
16:14:44 hours	Radio RTC: Advised the RTRA Supervisor at Ballston that the Train Operator for 775 would take Train ID 701 to West Falls Church Yard. RTRA Supervisor: Acknowledged and repeated back. [Radio, Ops 4]
16:15:11 hours	Radio RTC: Requested the TO five primary console indications. Unknown Transmission: (voice was not distinct to incident personnel) Stated: "to ask permission to activate power knockout." Radio RTC: Granted permission to activate power knockout. [Radio, Ops 2]
16:16:35 hours	RM 3: Advised power knockout was activated on rail car 7000, and the brakes failed to release. Radio RTC: Requested the five primary console indications. RM 3: Confirmed Brakes, All Doors Closed, and Brake Pipe Pressure. When the train is placed in a point of power, the Brake Cylinder Pressure holds. [Radio, Ops 2]
16:17:34 hours	Radio RTC: Instructed RM to cut out ATP. Unknown Party: (voice was not distinct to incident personnel) Stated: "Trip the battery circuit breaker for 30 seconds to reboot the train and get it moving". Radio RTC: Acknowledged transmission and granted permission. [Radio, Ops 2]
16:19:01 hours	RM 3: Requested permission to recycle VMDS. Radio RTC: Acknowledged and granted permission. [Radio, Ops 2]
16:19:17 hours	Radio RTC: Blanket announcement to all trains on track #2, disabled train at Rosslyn Station. [Radio, Ops 2]
16:22:15 hours	RM 3: Advised that the train's brakes did not release after the VMDS was recycled and had a transmission error. Radio RTC: Requested confirmation that power knockout was activated. RM 3: Confirmed power knockout and ATP are cut out; the train can still not move. Unknown Transmission: (voice was not distinct to incident personnel) Stated, "They were trying to tell you central." Radio RTC: Advised if RM 3 copied the unknown transmission instruction. RM 3: Acknowledged and confirmed. [Radio, Ops 2]
16:23:36 hours	Radio RTC: Requested Train ID 455 to prepare to recover Train ID 701 and requested the lead car number. Train ID 455: Advised Radio RTC their lead car was 3238. [Radio, Ops 2]
16:25:38 hours	RM 3: Advised the train brakes released after recycling the battery circuit breaker. Radio RTC: Acknowledged and instructed RM to move the train. [Radio, Ops 2]
16:29:40 hours	Radio RTC: Advised Train ID 701 will be changed off at Ballston Station, track 2 no response from Train ID 701. Several attempts to reach Train ID 701 were made without success. [Radio, Ops 4]
16:31:00 hours	*The forward-facing camera of Train ID 701 observed the overrun of Red Signal 08*
16:31:23 hours	Radio RTC: Requested confirmation if Train ID 701 was still on Ops 2. [Radio, Ops2]
16:31:30 hours	Buttons RTC: Advised the AOM that Train ID 701 overran a red signal. AOM: Acknowledged. [Phone, Rail 3]
16:31:36 hours	Radio RTC: Advised that the K04-08 signal was red. [Radio, Ops 4]

Drafted By: SAFE 710 – 06/16/2023
Reviewed By: SAFE 71 – 06/20/2023
Approved By: SAFE71 – 06/20/2023

Time	Description
16:31:45 hours	Radio RTC: Blanket announcement normal operations on Blue Line. [Radio, Ops 2]
16:31:57 hours	Buttons RTC: Advised the AOM that Train ID 701 overran a red signal. AOM: Acknowledged. Advised the RTC to stop Trains at Court House Station. Buttons RTC: Acknowledged. [Phone, OPS 4 Phone]
16:31:59 hours	Train Operator: Reported to Radio RTC and stated, “this Train 601”. Radio RTC: Informed the TO that their ID was 701 and non-revenue. They asked the TO if they passed the K04-08 signal. Instructed to stop the train. [Radio, Ops 4]
16:52:02 hours	Radio RTC: Asked RTRA Supervisor to verify if the train passed the switch point. Rail Supervisor: Verified that the train passed the switch point. [Radio, Ops 4]
17:13:22 hours	RTRA Director arrived Ballston Station. [Radio, Ops 4]
17:21:13 hours	ATCM Unit: Contacted Radio RTC to request permission to enter the roadway to inspect the interlocking. [Radio, Ops 4]
17:22:10 hours	ATCM and Emergency Response Team (ERT) personnel got permission to conduct interlocking and track inspections simultaneously under Exclusive Track Occupancy (ETO) protection. [Radio, Ops 4]
17:30:38 hours	Radio RTC: Blanket announcement that manual terminals are in effect and trains are turning back at Clarendon Station and East Falls Church Station. [Radio, Ops 4]
17:41:47 hours	ATCM Unit: Informed the Radio RTC that moving the train to the platform was okay. [Radio, Ops 4]
17:45:09 hours	ATCM: Request permission to clamp switches 1B and 3B in the normal position. Radio RTC: acknowledge and request personnel to standby and clear of the train. [Radio, Ops 4]
17:45:26 hours	ATCM: Advised Radio RTC that switch 3B was clamped normal for safe movement for a straight through train movement. Radio RTC: Acknowledged with 100% repeat back. [Radio, Ops 4]
17:46:48 hours	SAFE: Advised Radio RTC that switched 1B and 3B were clamped in the normal position for straight through train movement. Radio RTC: Acknowledged with 100% repeat back [Radio, Ops 4]
17:48:04 hours	Radio RTC: Granted Train ID 701 a permissive block, no closer than 10 feet of K06-58 signal “red” verifying lunar signals along the way with train speeds no greater than 45 MPH on the roadway and 25 MPH within the stations. Rail Supervisor: Acknowledge with 100% repeat back. [Radio, Ops 4]
17:50:44 hours	Radio RTC: Granted ATCM permission to unclamp switches 1B and 3B when Train ID 701 cleared the interlocking. ATCM: Acknowledged with 100% repeat back. [Radio, Ops 4]
17:53:35 hours	ERT: Informed the Radio RTC they were cleared from the roadway and confirmed no damage to the switchgear. They were advised that ATCM and SAFE were still on the roadway. Confirmed no damaged to the switches. [Radio, Ops 4]
17:55:28 hours	ATCM: Confirmed track 1 was clear for normal service. Radio RTC: Acknowledged. Train ID 614 was the first train through Ballston station, track 1. [Radio, Ops 4]

Drafted By: SAFE 710 – 06/16/2023
Reviewed By: SAFE 71 – 06/20/2023
Approved By: SAFE71 – 06/20/2023

Time	Description
18:02:49 hours	ATCM Unit: Informed the Radio RTC that all personnel were clear from the roadway and the switches were clamped in normal. [Radio, Ops 4]
18:04:25 hours	Radio RTC: Requested conformation if the train was moving. Rail Supervisor: Acknowledged that the train was moving. [Radio, Ops 4]

Note: Times above may vary from other systems' timelines based on clock settings.

Advanced Information Management System (AIMS)

AIMS Playback determined that at approximately 16:30 hours, Train ID 701 approached Red Signal K04-08.

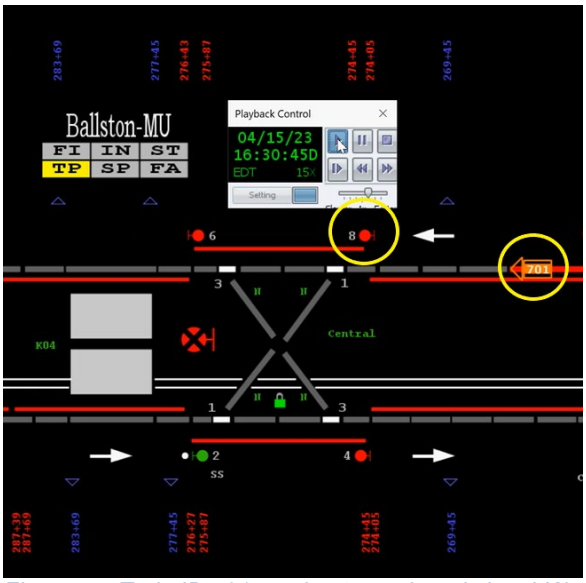


Figure 4 – Train ID 701 moving towards red signal K04-08 with ATP cutout (Train ID White font) at 16:30 hours.

At approximately 16:31 hours, Train ID 701 traveled past Red Signal K04-08 without permission from the ROCC.

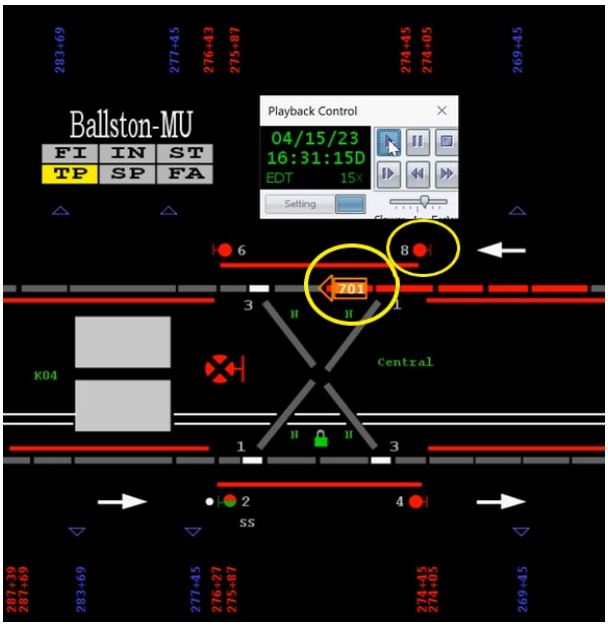


Figure 5 - Train ID 701 moved past the red signal K04-08 at 16:31 hours while the signal was still red.

Office of Chief Mechanical Officer (CMOR), Incident Investigation Team (IIT)
Adopted from CMOR IIT report with minor formatting and grammatical edits:

"The Office of the Chief Mechanical Officer (COMR), Incident Investigation Team (IIT) reported that based on the Event Recorder (ER), VMDS, and Network Video Recorder (NVR) video, no fault with the train contributed to the Red Signal overrun. "The train performed as designed. Based on the ER and ATP data, the ATP cutout was activated at 16:25 while the train was stopped at Rosslyn, and therefore, no ATP Speed limit or regulated speed was reported to the Event Recorder. The train departed Rosslyn toward West Falls Church Yard with the ATP cutout.

The Master controller moved to Coast, 645 feet before the K04-08 signal; the train speed was 36 MPH. The Master Controller was moved to the B5 Braking position 314 feet before the K04-08 Signal; the train speed was 36.6 MPH then. The Master Controller was moved to the EMERGENCY position, initiating emergency braking 186 feet before the K04-08 signal, eventually passing the RED K04-08 signal at 12.8 MPH in emergency braking mode. The train came to a complete stop 24 feet beyond the K04-08 signal."

Time	Description of Events	Train Speed	Master Controller
16:25:16 hours	ATP cutout activated while stopped at Rosslyn.	0 MPH	B5
16:25:43 hours	Master Controller is moved to a P1-P5 power position, and Train departs Rosslyn Out of Service in the direction of WFC Yard, with the Master Controller in a P1-P4 power position.	>1 MPH	P1-P4
16:25:43 hours-16:30:44 hours	The train traveled from Rosslyn towards WFC at speeds up to 38 MPH.	up to 38 MPH	***VARIOUS***
16:30:44 hours	Master Controller moved to Coast; train speed was 36 MPH. 645 ft. before Signal K04-08	36 MPH	Coast
16:30:50 hours	Master Controller placed in B5, Train speed was 36.6 MPH, 314 ft. before Signal K04-08	36.6 MPH	B5
16:30:53 hours	Master Controller placed in the Emergency position, initiating emergency braking and dumping the Brake Pipe, 186 ft. before Red Signal K04-08.	32 MPH	EMER
16:30:53 hours	Master Controller moved to B5 Braking Position	30 MPH	B5
16:30:59 hours	Train passes Red Signal K04-08, train speed was 12.8 MPH, Master Controller in the EMER Position.	12.8 MPH	B5
16:31:03 hours	The train comes to a complete stop 24 ft. beyond Signal K04-08	0 MPH	B5
16:35:32 hours	Car 7000 is keyed down.	0 MPH	B5

Table 1 – Timeline depicting the route for Train ID 701 with ATO cutout.

Drafted By: SAFE 710 – 06/16/2023
Reviewed By: SAFE 71 – 06/20/2023
Approved By: SAFE71 – 06/20/2023

ATC LOGS

7000,ATC,--,2023-04-15,20:25:14,2023-04-15,16:25:14,146,**ATP Cutout**,0,0
7000,ATC,--,2023-04-15,20:35:30,2023-04-15,16:35:30,146,**ATP Cutout**,1,0

Figure 6 - ATC Log depicts times when ATP was cut out.

CMOR-IIT completed an analysis of data collected from Railcar 7000. Based on the data, the Logic Control Unit (LCU) Secondary detected an "LCU Main CPU Error" during the incident. Subsequently, the Train Control Network (TCN) had several failed inauguration cycles. The loss of communication between the VMDS and the TCD was a symptom of these faults. The RM reportedly performed the first troubleshooting step suggested in the running maintenance manual (resetting the circuit breaker) but did not solve the problem. Unfortunately, the LCU/VMDS did not recover. IIT suspected the LCU/VMDS was defective.

VMDS Running Maintenance Manual pg. 141.

ID	Fault Name	Fault Abbreviation (Max character 28)	Detailed Description	Trigger/Reset Conditions	
				Trigger /Reset	Conditional Equation
LCU001	LCU MAIN CPU ERROR	LCU MAIN CPU ERROR	The CPU error occurred at the LCU MAIN.	T	When LCU secondary detects this situation by the WD (Watchdog) as except during the act of TCN inauguration.
				R	When latching condition is cleared.

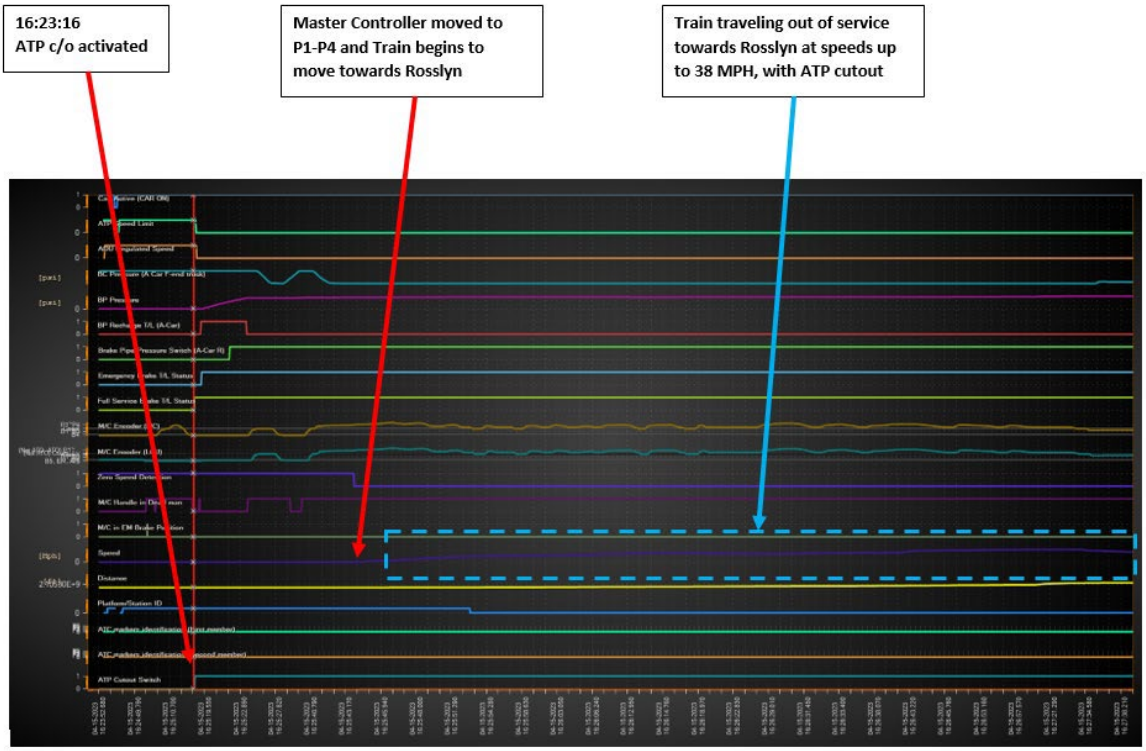
Causes Subsystem Lockout	Conditions to reset the lockout	A car	B car	Remark/Attributes	Corrective Actions
N	N/A	X	---	Show on TCD ID: LCU001 Trouble Message: LCU/VMDS-ONE SYS.FAILURE and ID: TCN001 Trouble Message: TCN NETWORK SINGLE FAULT	1) Turn off/on VMDS1 C/B and VMDS2 C/B. 2) Test by BTE.

Figure 7 - VMDS Running Maintenance Manual pg. 141 - corrective action for LCU main CPU error.

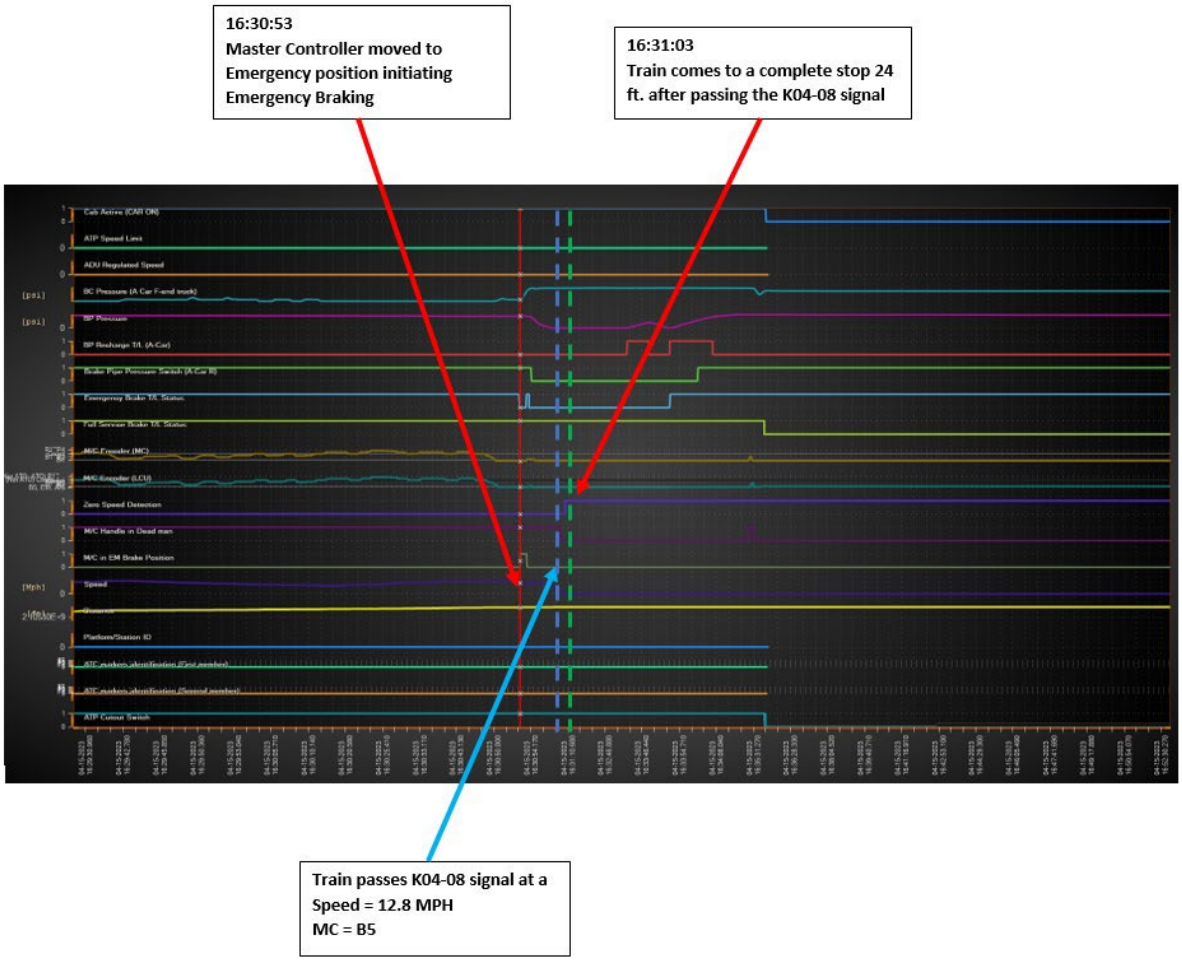
LCU Secondary Logs.

7000	LCU	SECONDARY	4/15/2023	16:05:25	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:05:23	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:05:20	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:05:15	LCU285	TCN INAUGURATION START
7000	LCU	SECONDARY	4/15/2023	16:05:08	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:05:06	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:04:55	LCU286	TCN INAUGURATION END
7000	LCU	SECONDARY	4/15/2023	16:04:44	LCU285	TCN INAUGURATION START
7000	LCU	SECONDARY	4/15/2023	16:03:54	LCU001	LCU MAIN CPU ERROR

Figure 8 - LCU Secondary Logs depicting LCU main CPU error at 16:03:53.



Graph 1 - Graphs depicting the location of Train ID 701 when ATP was cut out and when the train moved.



Graph 2 - depicted when Train 701 passed the K04-08 signal red and the train speed.

Office of Systems Maintenance, Office of Radio Communications (COMR)

The Office of Radio Communication completed comprehensive radio transmission checks between Rosslyn & Ballston Stations, track 2. Radio checks concluded that no problems were found, and the transmitted load and clear.

Office of Rail Transportation (RTRA)
Adopted from RTRA report:

The Train Operator received a Ten-Day Suspension and must attend refresher training.

Interview Findings

As part of the investigation launched into the event, SAFE interviewed eight people. The interviews identified the following key findings associated with this event. Findings detailed below include reported information from involved personnel and may conflict with other data sources contained in the report.

Train Operator

- Train ID 601 initially reported a TCD screen fault while approaching Stadium-Armory Station.
- Train ID 601 operated with a TCD from Stadium-Armory to Rosslyn Station without any other malfunction.
- The Train Operator reported they were rushed by the Radio RTC and told to move the train, not given an absolute block.
- The Train Operator stated that when the VMS 1 & 2 was recycled, it caused the train door to fail to close, the PA became inoperable, and the train brakes would not release.
- The Train Operator stated that when Train ID 701 was able to move from Rosslyn Station, the original TCD fault remained active.
- The Train Operator stated that as they operated from Rosslyn Station, they were distracted by talking to the Rail Supervisor.

Road Mechanic

- The RM stated they requested Train ID 601 to continue to the end of the line and be removed from service after recycling VMDS Breakers 1 & 2.
- The RM stated that the door interlock bypass, ATP, and power knockout were cut out once, and the train could not move.
- The RM stated they recycled the battery circuit breaker, which reset (cut in) the sealed switches that were cut out the first time, and then cut them out a second time.
- The RM was concerned that they would lose the All Doors Closed or Brakes Off condition if they cut the ATP and Power Knockout breakers back in.
- After achieving the brakes-off condition, the RM stated they left the cab area and were unaware of the instructions or interactions between the Train Operator, Rail Supervisor, and ROCC.

Rail Supervisor

- The Rail Supervisor stated they were operating a train from Pentagon Station and were relieved at Rosslyn Station when they noticed the incident train on the platform and assisted in troubleshooting.
- The Rail Supervisor stated they closed the train doors from the fifth car.
- The Rail Supervisor stated they were unaware that the door interlock bypass, ATP, and power knockout were cut out a second time after the battery circuit breaker was recycled.
- The Rail Supervisor stated they heard Radio RTC calling Train ID 701 after leaving Virginia Square Station on Ops 2.

Radio RTC Ops 2

- The Ops 2 Radio RTC stated that the RM cut out the door interlock bypass, ATP, and power knock out a second time after recycling the battery circuit breakers without notifying them. They assumed the RM would leave the breakers cut in after recycling the battery circuit breaker. Therefore, they did not provide block permissions to move.

Buttons RTC Ops 2

- Previous incidents caused a hectic start to the RTC's shift, with trains being turned back at various locations.
- Train ID 601 reported a lack of communication on the TCD screen and they instructed them to continue to Rosslyn for CMNT intervention.
- RM contacted RTC via landline and reported that the train needed to be taken out of service due to door malfunctions.
- Train ID 601 was offloaded and cleared of passengers.
- RM had difficulties releasing train brakes and closing doors in the fifth railcar.
- Radio RTC felt overwhelmed due to increased activity and poor radio communications.
- RTC instructed RM to deactivate the door interlock bypass, power knockout, and ATP, but the train still didn't move.
- CMNT suggested recycling the battery circuit breaker to resolve issues, which successfully moved the train.
- Ops 4 Buttons RTC informed RTC that the train operator on Train ID 601 would be relieved.
- RTC informed Ops 4 Buttons RTC about ATP and power knockout deactivation but didn't know RM had deactivated switches again after recycling the battery circuit breaker.
- RTC didn't receive any response to radio calls after Train ID 601 departed from the platform at Rosslyn.

Buttons RTC Ops 4

- Dispatched a gap train to Ballston Station and was placed in revenue service towards Ashburn Station.
- The RTC stated they were unaware of the malfunctions on Train ID 701.
- The RTC stated they were unaware of any switches cut out on the train, but the AIMS displayed a white train ID number.
- The RTC stated that when the train left Rosslyn Station, the Train ID was 701, not 601.
- The RTC stated it was not a common practice to pull a lunar signal if a train is not responding to the radio calls from ROCC.

Radio RTC Ops 4

- The RTC stated they were on personnel time away from the console when Train ID 601 became disabled at Rosslyn Station and returned when the AOM was monitoring the incident from Ops 2 console.
- The RTC stated they made several attempts to contact Train ID 701 when it entered Ops 4.
- The RTC stated that Ops 4 Buttons contacted Ops 2 to inquire about what was wrong with Train ID 701 and what actions were taken to resolve the problem. However, no detailed information was relayed to them. They were told it was busy and they would be contacted later.
- The RTC recommended that the Ops 4 Buttons RTC remove the speed commands at the Ballston Station turnback. However, it was agreed to turn the signal red at Ballston to get the train operators' attention to stop the train.
- The RTC stated that after Train ID 701 passed the red signal at Ballston Station, Ops 2 could contact the Train Operator via the radio.

AOM

- The AOM stated they walked down to the Ops 2 console when they overheard radio communication that CMNT boarded the train at Rosslyn. The Train Operator reported that they could not perform a door operation from the lead car.

- The AOM stated they saw the RTC begin to get frustrated and advised them to remain calm and focused throughout the situation.
- The AOM stated that CMNT cut out power knockout, ATP, and Door Interlock Bypass to no avail. CMNT then recommended recycling the VMDS to no avail.
- The AOM stated that the ATP was normalized once the battery circuit breakers were recycled.
- The AOM stated that later they received a call from Ops 4 RTC informing them that a train overran a red signal at Ballston Station. The RTC reported that they canceled the lunar signal because they could not communicate with the Train Operator.

Weather

On Saturday, April 15, 2023, at the time of the incident, NOAA recorded the temperature as 75° F, with cloudy skies. The weather did not contribute to this incident (Weather source: NOAA – Location: Ballston, Va.)

Related Rules and Procedures

- MSRPH OR. 3.24 - Use of Mode 3 shall be accomplished only after receiving specific authorization from ROCC or the Interlocking Operator to "CUT OUT ATP." Speed shall be restricted to 15 mph unless otherwise authorized by ROCC.
- MSRPH OR 3.27 - After a Class I vehicle has been operated in Mode 3, or when the ATP C/O switch has been moved to the CUT-OUT position for any reason, the train must be moved under a permissive or absolute block not to exceed 15 mph or less, or as directed by ROCC. The train operator must be prepared to stop within half the range of vision, short of any train, obstruction, broken rail, or improperly aligned switch.
- MSRPH OR 3.29 - When in Mode 3, a Class I vehicle shall be operated using absolute block procedures as defined in SOP # 15 and SOP # 4.6 through 4.9 (related rules 3.1 and 3.30).
- MSRPH OR 3.39 - Following POWER KNOCKOUT BYPASS activation, the Train Operator shall perform a Rolling Test before operating the train.
- MSRPH OR 1.79.1 - Positive Identification must be established prior to transmitting a message. Positive identification includes the transmitter stating their Train/Equipment Number or Unit ID Number, location, and track number at the beginning of a transmission and the receiver repeating back the Train/Equipment Number or Unit ID Number, location, and track number when acknowledging the radio call.

Human Factors

<u>Evidence of Fatigue</u>

Train Operator

We evaluated conditions at the time of the incident to distinguish whether evidence of fatigue was present. The available data indicated no sign of fatigue. Train Operator reported feeling Fully Alert at the time of the incident. Train Operator reported experiencing no symptoms of fatigue in the time leading up to the incident.

Road Mechanic

We evaluated conditions at the time of the incident to distinguish whether evidence of fatigue was present. The available data indicated no sign of fatigue. RM reported feeling Fully Alert at the time

of the incident. RM reported experiencing no symptoms of fatigue in the time leading up to the incident.

Buttons RTC Ops 4

We evaluated conditions at the time of the incident to distinguish whether evidence of fatigue was present. The available data indicated no sign of fatigue. The video of the incident was reviewed for behaviors suggesting fatigue. No indications of fatigue were evident from the video. The employee reported feeling Fully Alert at the time of the incident. The employee reported experiencing no symptoms of fatigue in the time leading up to the incident.

Fatigue Risk

Train Operator

We evaluated incident data for fatigue risk factors. No significant risk was identified. The incident time of day did not suggest an increased risk of fatigue-related impairment. The Train Operator reported a regular sleep schedule in the days leading up to the incident. The Train Operator worked days shift in the days leading up to the incident. The Train Operator was awake for 10 hours and 51 mins during the incident. The employee reported 9 hours and 30 minutes of sleep in the 24 hours preceding the incident. The off-duty period was 15 hours 26 minutes, providing an opportunity for 7-9 hours of sleep. This was 1 hour more than the employee's regular workday sleep durations. The employee reported no issues with sleep. The employee worked the day shift in the days leading up to the incident.

Road Mechanic

We evaluated incident data for fatigue risk factors. No significant risk was identified. The incident time of day did not suggest an increased risk of fatigue-related impairment. The RM reported a regular sleep schedule in the days leading up to the incident. The RM worked the evening shift in the days leading up to the incident. The RM was awake for 5 hours 51 mins at the time of the incident. The RM reported 8 hours of sleep in the 24 hours preceding the incident. The off-duty period was 12 hours, providing an opportunity for 7-9 hours of sleep. This was 4 hours more than the employee's regular workday sleep durations. The employee reported no issues with rest. The employee worked the evening shift in the days leading up to the incident.

Buttons RTC Ops 4

We evaluated incident data for fatigue risk factors. Risk factors for fatigue were present. The incident time of day did not suggest an increased risk of fatigue-related impairment. The employee reported some variation in the sleep schedule in the days leading up to the incident. The employee worked the evening shift in the days leading up to the incident. The employee was awake for 5 hours and one minute at the time of the incident. The employee reported twelve hours of sleep in the 24 hours preceding the incident. The off-duty period was fifteen hours, providing an opportunity for 7-9 hours of sleep. This was more than the employee's usual workday sleep durations. The employee reported no issues with sleep. The employee worked evenings in the days leading up to the incident.

Post-Incident Toxicology Testing

WMATA's Drug and Alcohol Program determined that the Train Operator did not violate the Drug and Alcohol Policy and Testing Program 7.7.3/6.

Findings

- At 15:37 hours, a report was received at Stadium-Armory regarding a screen problem with the Train Control TCD). A Road Mechanic from L'Enfant was dispatched to investigate. No transmissions were found documenting the initial encounter of the first Road Mechanic with Train ID 601.
- During the troubleshooting process facilitated by the Radio Rail Traffic Controller (RTC), the RTC requested information regarding the indications on the console. Out of the eight Prime Console Indicators, only five were provided.
- At 16:17 hours, Radio RTC Ops 2 was granted permission to deactivate the ATP and Power Knockout features during troubleshooting. This condition was confirmed at 16:22 hours.
- Train ID 701 operated without ATP and a permissive or absolute block, exceeding speeds of 15 mph and reaching up to 38 mph.
- Before operating the train, Train ID 701 did not conduct a Rolling Brake Test.
- Car 7000 experienced a TCD blue screen failure on a preceding day, with reports indicating a non-reproducible fault (NTF) that was subsequently resolved, allowing the car to return to service.
- Multiple instances were observed where uninvolved parties, namely Train Operators, made comments, whistled, or otherwise interrupted the communication between the Radio RTC and Road Mechanic during the troubleshooting process.
- Parties involved in the incident failed to provide accurate radio identification consistently. Train ID intermittently responded to ID 601 and 701 when communicating with Ops 2 and 4.
- Throughout the incident, incomplete communications were noted between Train ID 601/701 and the Radio RTC.

Immediate Mitigation to Prevent Recurrence

- RTRA removed the Train Operator from service for post-incident toxicology testing.
-
- The train was removed from service for investigation.

Probable Cause Statement

The probable cause for this Red Signal Overrun Event was that the Radio RTC and Train Operator failed to follow established troubleshooting and operating procedures. Specifically, the Train Operator moved the train with ATP cut-out and no Permissive Block was given. The Radio RTC did not give the Train Operator a Permissive Block to move the train after ATP was cut out. The RM 3 did not get permission to cut ATP and power knockout a second time. After several unsuccessful attempts to make radio contact with Train ID 701, the Button RTC pulled the lunar signal causing K04-08 signal to be red. The Train Operator was distracted while operating and talking with the Rail Supervisor, whose radio was on Ops 2, when they passed K04-08 signal.

Contributing factors to the Red Signal Overrun event were inconsistent communications between the Train Operator, Road Mechanic, Rail Supervisor, and RTCs. Further contributing to the event were interjected radio communications and interruptions by uninvolved personnel.

A fault message on the TCD screen triggered the sequence of events that resulted in the station overrun.

Recommended Corrective Actions

Corrective Action Code	Description	Responsible Party	Estimated Completion Date
107749MX_SAFECAPS_ROCC_001	Develop a comprehensive lesson learned from the recent event, which will outline the proper steps to be taken when troubleshooting faults. These corrective measures will help to prevent similar situations from occurring in the future.	ROCC SRC	Completed
107749MX_SAFECAPS_ROCC_002	Distribute a memorandum to Rail Operations Control (ROC) staff, emphasizing that Rail Traffic Controllers (RTC) shall not cancel routes or fleets or take interlocking signals out of automatic to display red signals in front of train operators unless it is deemed an emergency. This action will help to prevent unnecessary delays and disruptions to rail operations, ensuring the safety and efficiency of the rail infrastructure for all stakeholders involved.	ROCC SRC	Completed

Appendices

Appendix A – Interview Summaries

The below narratives summarize the incident and represent the statements made by the involved individual. As such, times and details may present a conflict with the data contained in systems of record.

Train Operator

The Train Operator has been a WMATA employee for seven years and has been in their current position for four months. They are certified as RWP Level 2, with an expiration date of 08/31/2023. Their last certification date was 01/04/2023, with a QL-1.

According to the Train Operator, when they departed Benning Road Station, the TCD screen flashed blue and displayed a transmission error message. They notified ROCC of the issue and proceeded to recycle the train (by keying it down and up) at Stadium-Armory Station. However, the TCD screen continued to show the transmission error, and ROCC was informed that the fault persisted. They were then instructed to hold at Stadium-Armory for a Road Mechanic (RM), but the Radio RTC needed help to contact a nearby RM. Subsequently, they were asked to continue operating. Upon arrival at Rosslyn Station, an RM was present at the eight-car marker and mentioned that they would recycle a train component. The Train Operator stated they needed clarification on which circuit breaker or switch the RM recycled behind their seat. After the train was recycled, the Train Operator informed the RM that the train had been operated from Stadium-Armory with the TCD screen issue and assumed it would be removed from service at the end of the line. The RM asked if they wanted to continue to the end of the line and then notified ROCC that the train would proceed to the end and be taken out of service. The Radio RTC requested the RM to remain aboard the train until it reached the terminal station in case further problems occurred.

The Train Operator mentioned that whatever the RM did caused the train doors to not close, rendered the intercom inoperable, and prevented the train brakes from releasing. The Radio RTC instructed them to offload passengers and cut out the door interlock bypass. However, the RM could not move the train and requested permission to cut out ATP. Even after ATP was cut out, the train brakes still did not release, and they [RM] spent 25 minutes trying to find a solution to get the train in motion. The Train Operator stated that they heard another Train Operator advise via the radio to recycle the battery breaker. After the RM recycled the battery breaker, ATP was cut out again. Following this, the train brakes finally released, and the Radio RTC instructed them to move the train. The Train Operator mentioned that the Rail Supervisor and the RM were on the train when it began moving from Rosslyn Station. While operating the train, the Train Operator reported conversing with the Rail Supervisor, who was seated outside the operator's cab in the seat opposite the cab, with the cab door partially open. While in non-revenue mode, they continued talking and occasionally looked back at the Rail Supervisor just before entering the interlocking at Ballston Station. It was at that moment that they noticed the red signal.

The Train Operator stated that they did not perform any further troubleshooting actions apart from keying the train down and up. The blue TCD screen prevented them from seeing the time and mode of propulsion and braking.

Road Mechanic

Drafted By: SAFE 710 – 06/16/2023
Reviewed By: SAFE 71 – 06/20/2023
Approved By: SAFE71 – 06/20/2023

The Road Mechanic has been a WMATA employee for 18 years and has been in their current position for eight years. The Road Mechanic is certified as RWP Level 2, with an expiration date of 07/31/2023. Their last certification date was 02/15/2023.

According to the Road Mechanic, they boarded the train at Rosslyn when the Train Operator reported an error code on the TCD screen. The code indicated a lack of communication with the VMDS and the TCD screen. The Road Mechanic stated that Central requested them to check the train system, and they asked for permission to recycle VMS 1 & 2 to restore communication. After normalizing VMS 1 & 2, the Road Mechanic noticed that the train doors would not close from the lead railcar (7000), the Public Announcement (PA) system had failed, and the intercom system was also not functioning. None of these issues were present before recycling the VMS systems.

The Road Mechanic attempted operations from the fifth railcar to close the train doors. The train was offloaded, and the doors successfully closed from the fifth railcar. However, once the doors were closed and the train had been offloaded, the train brakes would not release when operating from the lead railcar. The Road Mechanic requested permission from the Radio RTC to cut out Power Knockout and ATP to get the train moving. They also mentioned speaking with their supervisor, who recommended recycling VMS 3. Despite recycling VMS 3, the TCD screen shut down and reinitialized, but the same error message persisted. The train remained immobile even after the system recycling. It was then suggested to recycle the battery breaker. After recycling the battery breaker, the train could move with Power Knockout, and ATP still cut out. The Road Mechanic was given permission to move the train toward the West Falls Church rail yard.

The Road Mechanic reported receiving a call from their supervisor once the train started moving. They were seated in the first railcar and looking toward the train's rear when they observed the Rail Supervisor interacting with the Train Operator from the seat directly behind the Operator's cab.

Rail Supervisor

The Rail Supervisor has been a WMATA employee for 19 and a half years and has been in their current position for ten years. The Rail Supervisor is certified as RWP Level 2, with an expiration date of 02/29/2024. Their last certification date was 10/1/2022.

According to the Rail Supervisor's report, they operated a train from Pentagon Station. They were relieved at Rosslyn Station when they noticed a train on the platform experiencing a mechanical issue. They approached the operator's cab window and observed the Train Operator and RM attempting to recycle the Automatic Train Control (ATC) system due to a malfunctioning TCD screen. The Rail Supervisor mentioned that the train doors would not close even after recycling the system. They entered the fifth railcar, closed the train doors, offloaded the train, and checked for customers. They then returned to the lead railcar and spoke with the RM, who made further attempts to get the train moving.

The Rail Supervisor stated that the RM recycled Power Knockout, VMS, and ATP to move the train. When these attempts failed, they returned to the fifth railcar to prepare for operating the train from an interior car. While returning to the fifth railcar, the RM mentioned their intention to recycle the battery circuit breaker. The Rail Supervisor waited for the battery circuit breaker to be recycled, then returned to the lead car and found that the train brakes were released after the battery circuit breaker was recycled. The Rail Supervisor reported that they had initially planned to exit the train at Rosslyn Station now that it could move. Still, they remained aboard to avoid causing any further malfunctions upon exiting. After passing Virginia Square Station, they received communication from the RTC asking if Train ID 701 was on OPS 2. They informed the RTC that the train had passed a red signal. The Rail Supervisor stated that they asked the Train

Operator why they didn't receive an overspeed alarm, as everything should have been normal after the RM recycled the battery circuit breaker. The Train Operator responded, "No, Central told me to continue."

The Rail Supervisor mentioned that they waited for Automatic Train Control Maintenance (ATCM) to respond to the scene. They reported that after the train had been stationary in the interlocking area for some time, they attempted to move it to the railyard, at which point the TCD screen returned to normal status. They operated the train to West Falls Church railyard under an absolute block.

The Rail Supervisor advised that they were in the operator's cab when the RM first recycled the door interlock bypass, ATP, and power knockout. However, they were not in the operator's cab when the battery circuit breaker was recycled. The Rail Supervisor reported that they assumed all the switches were reset to their normal (cut-in) positions because everything should return to normal when the battery circuit breaker is recycled. They were unaware that the switches had been deactivated for a second time. The Rail Supervisor also mentioned hearing several unwanted interruptions of radio comments from train operators during the incident. They stated they did not hear the RTC instruct the Train Operator to continue to the next station after the brakes were released.

Radio RTC (Ops 2)

The RTC has been a WMATA employee for three and a half years and has been in its current position for two years. The RTC is certified as RWP Level 4, with an expiration date of 04/31/2024. Their last certification date was 06/01/2022.

According to the RTC, Train ID 602 reported a blue TCD screen near Smithsonian Station and requested an RM at L'Enfant Plaza Station to intercept the train upon its arrival. However, the RM missed the train. The RM at Rosslyn Station was notified and boarded the train. The RTC mentioned that the RM reported recycling VMS 1 & 2 and declared the train fit for revenue service, with instructions to remove it from service at the end of the line. The train was held on the platform for several minutes, and the RTC could not contact the Train Operator. The RM was instructed to relay this information through Radio Ops 2. The Train Operator communicated via Ops 2 radio that the train couldn't close all doors and was instructed to recycle the door on the platform side of the station, which failed. The RTC requested primary console indicators and instructed the Train Operator to offload the train and deactivate the door interlock bypass. The Rail Supervisor arrived and assisted with the offloading process.

After offloading the train and deactivating the door interlock bypass, the train couldn't release its brakes. The RM was instructed to deactivate the power knockout and then asked to deactivate ATP. The RTC stated that while these instructions were given, the AOM was present. After the ATP and power knockout switches failed to move the train, they instructed the RM to recycle the battery circuit breaker. They asked the Train Operator if they could move the train after recycling the battery circuit breaker, and the Train Operator responded, "Yes." The next thing they knew, the train moved off the platform without further instructions from them.

The RTC reported that, as far as they understood, ATP was reactivated because the RM had to deactivate it again after recycling the battery circuit breaker without notifying them. They could not communicate with anyone on the train and assumed that the Train Operator had switched their radio to Ops 4.

The RTC mentioned that Ops 4 could not contact the train and placed a red signal at Ballston Station in front of the train.

Button RTC (Ops 2)

The Button RTC has been an employee of WMATA for four and a half years and has held its current position for the same duration. The Button RTC is certified as RWP Level 2, with an expiration date of 11/30/2023. Their last certification date was 09/01/2022.

According to the RTC's report, their shift began hectic due to a previous incident that resulted in trains being turned back at various locations. Train ID 601 reported a lack of communication on the TCD screen. However, since the train was still moving, they were instructed to continue to Rosslyn, where CMNT would intervene.

The RTC reported that Train ID 601 was offloaded and confirmed to be clear of passengers. The RM went to the fifth railcar and attempted to close the train doors but encountered difficulties releasing the train brakes. The RTC noticed that their partner, the Radio RTC, began to feel overwhelmed due to the increased activity and poor radio communications. The RTC instructed the RM to activate the door interlock bypass, power knockout, and ATP. However, these actions failed to get the train moving.

The RTC mentioned that they overheard CMNT suggesting recycling the battery circuit breaker, which should resolve the issues and enable the train to resume its movement. Following this advice, the train was able to start moving again.

The RTC reported that an Ops 4 Buttons RTC approached their workstation and informed them that the train operator on Train ID 601 would be relieved at some point along the line. They told the Ops 4 Buttons RTC that ATP and power knockout had been deactivated on the train. However, they did recall that the cutout switches are automatically reactivated when the battery circuit breaker is recycled. The RTC stated that they were unaware that the RM had deactivated the switches for a second time after recycling the battery circuit breaker.

The RTC advised that once Train ID 601 departed from the platform at Rosslyn, they had yet to receive a response to their radio calls.

Button RTC (Ops 4)

The RTC has been an employee of WMATA for eight and a half years and has been in its current position for one and a half years. The RTC is certified as RWP Level 4, with an expiration date of 02/29/2024. Their last certification date was 01/02/2022.

According to the RTC, they received a phone call from Ops 2 Buttons RTC, who informed them that Train 601 might need to be removed from the line upon its arrival at Ashburn Station. When asked about the issue with the train, Ops 2 Buttons RTC stated that they needed clarification and were waiting for an update from the RM. In response, the RTC contacted Dulles Rail Yard to arrange for a replacement train. While doing so, they noticed that Train ID 601 was already on the platform at Rosslyn, and a gap had formed on the silver line. Consequently, a gap train was dispatched from West Falls Church, track 3, and put into revenue service from Ballston Station to Ashburn Station.

The RTC mentioned that they called Ops 2 Buttons RTC again when they noticed Train ID 701 starting to move to find out if there was any issue with the train and if they had informed the operator to contact the RTC. However, Ops 2 Button RTC responded that they did not ask the operator to contact Ops 4 due to being occupied with other tasks at that time.

The RTC further explained that they attempted to reach Train ID 701 multiple times at Clarendon Station but had not received a response. Nonetheless, there was a supervisor and an operator present at Ballston Station. The RTC and their partner discussed whether they should take the turnback to gain the attention of Train ID 701 or rely on the lunar signal. They used the lunar signal when Train ID 701 reached Virginia Square Station. Later, they observed that Train 701 was in the interlocking area at Ballston Station, and the console indicated signal overrun alarms.

According to the RTC, they made several calls to Train 701 to confirm whether the train had overrun the red signal. In response, they initiated signal overrun procedures involving turning back trains, contacting nearby supervisors, and contacting an available RM. The RTC mentioned that they were unaware that a Rail Supervisor and an RM were on board Train ID 701, as they have yet to respond to the initial rail calls from the RTC.

Radio RTC (Ops 4)

The RTC has been an employee of WMATA for eleven years and has been in its current position for three years. The RTC is certified as RWP Level 4, with an expiration date of 02/29/2024. Their last certification date was 06/01/2022.

According to the RTC, they returned from a personal break and saw management staff staged at Ops 2 desk. They stated that they typically help colleagues (from other Ops) by taking their notes for reports because Ops 4 is usually uneventful. They knew that a train at Rosslyn Station was experiencing a mechanical issue and that the Ops 4 Radio RTC placed a Gap Train in service at Ballston Station.

The RTC further explained that the Ops 2 Radio RTC made several attempts to contact the previously disabled train that departed Rosslyn Station. This instructed them on what they needed to do now that the train was on Ops 4. The Ops 4 Radio RTC stated that their partner (Ops 4 Button RTC) called Ops 2 Buttons RTC to confirm what was wrong/happened with the previously disabled train. They needed to be informed if any switches were cut out, that support staff was on board the train, or what was done to get the train moving. The RTC stated they were told a lot was happening and that someone would call them back.

The RTC recommended that the Ops 4 Button take the turnback at Ballston Station (remove speed commands) since they could not communicate with the train. However, they agreed that since the train had yet to arrive at Virginia Square, the signal at Ballston would be changed to red.

The RTC stated they know that train identification numbers are displayed in black on the AIMS screen when ATP is cut in and white when it is cut out. However, due to the busyness in the control center, they did not pay particular attention to the trains' identification number or color.

Assistant Operation Manager (AOM)

AOM has been a WMATA employee for twenty-one year and in their current position for four years.

According to the AOM, the Train Operator reported a blue screen at Smithsonian Station, where they overheard the radio chatter from the RTC. Once the train arrived at Rosslyn, CMNT boarded the train. The Train Operator reported that they could not perform a door operation from the lead car. The AOM stated that is when they walked down to the Ops 2 console.

The AOM stated they heard CMNT report that the train needed to be offloaded because the doors could not be closed from the lead car. The RTC instructed CMNT to attempt to close the train doors from the fifth car as the Train Operator walked through the consist checking for customers. Several minutes later, the Train Operator returned to the lead car and could not get the train brakes to release.

The AOM stated they saw the RTC began to get frustrated and advised them to remain calm and focused throughout the situation. The AOM said they instructed the RTC to retrieve the five primary console indicators, to which they only retrieve three.

The AOM stated that CMNT cut out power knockout, ATP, and Door Interlock Bypass to no avail. CMNT then recommended recycling the VMDS to no avail. Finally, the battery circuit breaker was recycled, the train rebooted and was able to get the brakes to release.

The AOM stated that the ATP was normalized once the battery circuit brakes were recycled. The AOM said that they departed from the console to continue their duties once the Train Operator got the brakes to release.

The AOM later said they received a call from Ops 4 RTC informing them that a train overran a red signal at Ballston Station. The RTC reported that they canceled the lunar signal because they could not communicate with the Train Operator.

View Approved Incident Report

INCIDENT ID: 2023105SILVER7

DATE	TIME	LINE	ITEM
2023-04-15	1602	Silver	7

LOCATION (STATION/YARD)	LOCATION/CHAIN MARKER (If Applicable)	REPORTED BY
C05		[redacted]

TRAIN ID	DIRECTION	TRACK NUMBER	DEPTS NOTIFIED
601	O/B	2	Everbridge Alert/Messaging

CAR NUMBERS (XXXX-XXXX)
Lead Car

7000-7001	7325-7324	7524-7525	7151-7150
Caused Issue ☑	Caused Issue ☐	Caused Issue ☐	Caused Issue ☐

TRBL CODE	RESP CODE
TCNM-TRAIN CONTROL NETWORK MALFUNCTION	CMD

TYPE INCIDENT
Door Malfunction, No Transmission indication on TCD Screen.

ACTION PLAN
Dispatch Car Maintenance, Dispatch RTR Supervisor, Begin Trouble Shooting Procedures

DELAYS IN MINUTES

LINE	INCIDENT	TRAIN	TOTAL DURATION
25	25	20	0

TRIPS MODIFIED

PARTIAL	GAP TRAIN	LATE DISPATCHES	REROUTED	NOT DISPATCHED	OFFLOADS
2	0	0	0	0	1

FIVE PRIMARY CONSOLE INDICATIONS

BCP	BRAKES ON ILLUMINATED	ALL DOORS CLOSED ILLUMINATED	AUTO\MANUAL ILLUMINATED	BPP
Yes	Yes	No	MANUAL	Yes

INCIDENT CHRONOLOGY

TIME	DESCRIPTION
1549	Train Operator [redacted] on train 601, notified ROCC that the TCD was indicating No Transmission.

Figure 9 - ROCC report summarizing TCD malfunction incident page 1 of 2.

View Approved Incident Report

1602	CMNT [redacted] at Rosslyn Station boarded the train and informed ROCC that he recycled VMDS 1+2+3 and to remove train 601 from revenue service at the end of the line.
1608	CMNT [redacted] notified ROCC, via landline, that the doors were unable to close, the train needed to be offloaded, and have the doors closed from the fifth car. ROCC instructed CMNT [redacted] to contact ROCC via Handheld radio in the future.
1609	Train 601 was instructed to make good announcements, key down, secure the cab, offload the train, and verify clear of customers. Assistant Rail Operations Manager, ROIC, MTPD and all concerned personnel were notified.
1617	Train 601 notified ROCC that the train was offloaded, verified clear of customers and the doors were closed from the fifth car but the train could not get a brakes off. ROCC instructed CMNT [redacted] to activate Door Interlock Bypass.
1619	CMNT [redacted] notified ROCC that Door Interlock Bypass was activated but the train still couldn't move. ROCC instructed Train 601 to activate Power Knockout.
1620	CMNT [redacted] notified ROCC that Power Knockout was activated but the train still couldn't get a brakes off. ROCC asked what the brake cylinder pressure does when the train goes to a point of power. CMNT [redacted] reported it held. ROCC instructed Train 601 to cut out ATP and attempt to get a brakes off.
1621	CMNT [redacted] reported to ROCC that the train was still unable to move. ROCC instructed CMNT [redacted] to recycle the battery circuit braker.
1622	Train 601 began moving in the direction of West Falls Church.
1627	Train 602 serviced Rosslyn Station on track two ending the longest customer delay.

MAXIMO TICKET#
8664831

REPORT PREPARED BY	NAME	CLICK TO SIGN
RADIO CONTROLLER 1	[redacted]	✓
BUTTON CONTROLLER 1	[redacted]	✓
RADIO CONTROLLER 2		
BUTTON CONTROLLER 2		

SUPERINTENDENTS OR ASSISTANTS SECTION

ADDITIONAL FOLLOW-UP CORRECTIVE ACTIONS OR REMARKS	
FOLLOW-UP INFORMATION OBTAINED FROM SUPPORT DEPARTMENTS	
NOTIFICATIONS/PAGE GROUPS	#1/CEO ☐ #2/DGM &BELOW ☐
ADDITIONAL NOTIFICATIONS MADE BY PHONE	

APPROVED BY	NAME	CLICK TO SIGN
REPORT APPROVED BY SUPT. OR ASST SUPT.	[redacted]	✓

Figure 10 - ROCC Report summarizing TCD malfunction incident page 2 of 2.

View Approved Incident Report

INCIDENT ID: 2023105SILVER3

DATE	TIME	LINE	ITEM
2023-04-15	1630	Silver	3

LOCATION (STATION/YARD)	LOCATION/CHAIN MARKER (If Applicable)	REPORTED BY
Ballston-MU (K04)		AIMS DISPLAY

TRAIN ID	DIRECTION	TRACK NUMBER	DEPTS NOTIFIED
908	I/B	1	Everbridge Alert/Messaging

CAR NUMBERS (XXXX-XXXX)
Lead Car

7000-7001	7325-7324	7524-7525	7151-7150
Caused Issue ☑	Caused Issue ☐	Caused Issue ☐	Caused Issue ☐

TRBL CODE	RESP CODE
RSIG-RED SIGNAL OVERRUN	RTR

TYPE INCIDENT
Red Signal Overrun

ACTION PLAN
Service Suspended, Shuttle Bus Service, Terminals Established, ATC Dispatched, ERT Dispatched

DELAYS IN MINUTES

LINE	INCIDENT	TRAIN	TOTAL DURATION
35	35	62	0

TRIPS MODIFIED

PARTIAL	GAP TRAIN	LATE DISPATCHES	REROUTED	NOT DISPATCHED	OFFLOADS
0	0	0	0	0	0

FIVE PRIMARY CONSOLE INDICATIONS

BCP	BRAKES ON ILLUMINATED	ALL DOORS CLOSED ILLUMINATED	AUTO\MANUAL ILLUMINATED	BPP
			AUTO	

INCIDENT CHRONOLOGY

TIME	DESCRIPTION
1630	AIM and alarm screen displayed a red signal overrun at Ballston interlocking track two. Train 701 a disabled train was in route to West Falls Church Yard over ran K04-08 signal inertly. AOM, ROIC, MTPD, MOC, ERT and all concerned personnel were notified.

Figure 11 - ROCC Report summarizing Red Signal Overrun at Ballston Station page 1 of 2.

View Approved Incident Report

1635	Train 908 Operator [redacted] K99) was instructed to offload the train at Ballston track one and go back in service to Vienna Station. RTRA Supervisor [redacted] arrived on the scene to assist as the On Scene Commander. Train service suspended between Ballston and Clarendon. Shuttle bus service requested.
1651	Unit [redacted] RTRA Supervisor [redacted] reported being on incident train 701. ROCC instructed Unit [redacted] to verify, train 701 was past the switch point track two Ballston interlocking.
1655	Director [redacted], ERT [redacted], and ATC [redacted] arrived on the scene at Ballston to assist.
1700	ATC [redacted] and ERT [redacted] were granted permission to go roadway to inspect the interlocking and complete their investigation under foul time.
1710	Shuttle bus service established, bus 3183 with 60 customers transported from Ballston to East Falls Church.
1720	ERT [redacted] notified ROCC that they need train 701 to clear track two Ballston Interlocking.
1735	ATC [redacted] requested to clamp the interlocking at Ballston.
1747	ATC [redacted] notified ROCC no damage to the switch, 3B and 1B track two where clamped and tucked at Ballston. Incident Train 701 moving under a permissive block to clear the interlocking with speed no greater then 5mph. After incident train clears the interlocking, attempts will be made to restore lunars.
1749	Train 701 cleared Ballston track two under a permissive block in the direction of West Falls Yard, ATC [redacted] notified ROCC that switches 1B and 3B where unclamped track two Ballston.
1754	ERT [redacted] notified ROCC that they where clear of the roadway at Ballston. ATC [redacted] stayed on the scene to continue their investigation.
1803	ATC [redacted] notified ROCC that the interlocking has been restored, no damage to the switch, all personnel and equipment where clear of the roadway at Ballston. Normal service resumed tracks one and two.
0000	NOTE: Train 701 was stored track 6 at West Falls Yard.

MAXIMO TICKET#
8664852

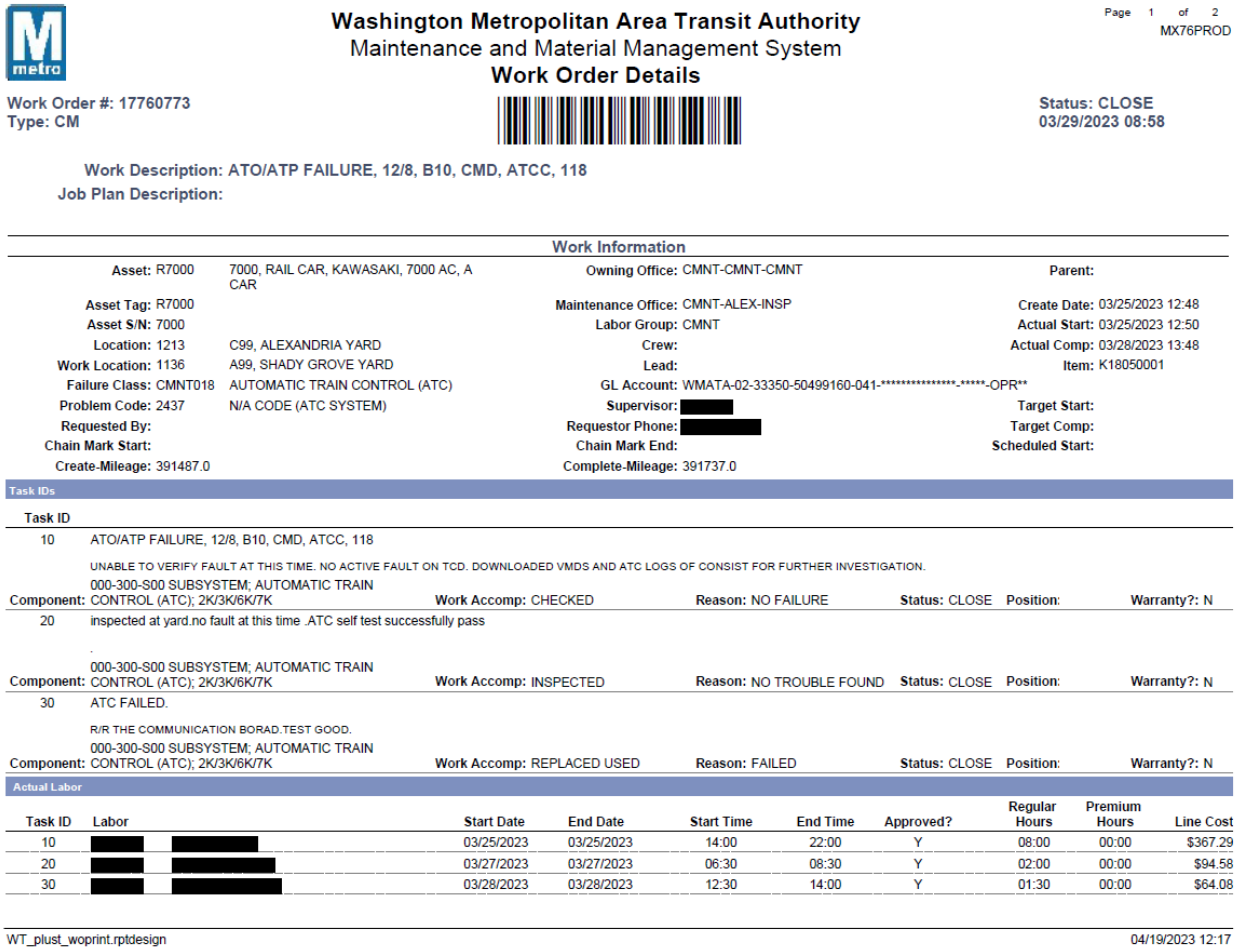
REPORT PREPARED BY	NAME	CLICK TO SIGN
RADIO CONTROLLER 1	[redacted]	✓
BUTTON CONTROLLER 1	[redacted]	✓
RADIO CONTROLLER 2		
BUTTON CONTROLLER 2		

SUPERINTENDENTS OR ASSISTANTS SECTION	
ADDITIONAL FOLLOW-UP CORRECTIVE ACTIONS OR REMARKS	
FOLLOW-UP INFORMATION OBTAINED FROM SUPPORT DEPARTMENTS	
NOTIFICATIONS/PAGE GROUPS	#1/CEO ☐ #2/DGM &BELOW ☐
ADDITIONAL NOTIFICATIONS MADE BY PHONE	

APPROVED BY	NAME	CLICK TO SIGN

Figure 12 - ROCC Report summarizing Red Signal Overrun at Ballston Station page 2 of 2.

Appendix C – Work Orders



Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Page 1 of 2
MX76PROD

Work Order #: 17760773
Type: CM

Status: CLOSE
03/29/2023 08:58

Work Description: ATO/ATP FAILURE, 12/8, B10, CMD, ATCC, 118
Job Plan Description:

Work Information

Asset:	R7000	7000, RAIL CAR, KAWASAKI, 7000 AC, A CAR	Owning Office:	CMNT-CMNT-CMNT	Parent:
Asset Tag:	R7000		Maintenance Office:	CMNT-ALEX-INSP	Create Date: 03/25/2023 12:48
Asset S/N:	7000		Labor Group:	CMNT	Actual Start: 03/25/2023 12:50
Location:	1213	C99, ALEXANDRIA YARD	Crew:		Actual Comp: 03/28/2023 13:48
Work Location:	1136	A99, SHADY GROVE YARD	Lead:		Item: K18050001
Failure Class:	CMNT018	AUTOMATIC TRAIN CONTROL (ATC)	GL Account:	WMATA-02-33350-50499160-041-**********-*****-OPR**	
Problem Code:	2437	N/A CODE (ATC SYSTEM)	Supervisor:	[redacted]	Target Start:
Requested By:			Requestor Phone:	[redacted]	Target Comp:
Chain Mark Start:			Chain Mark End:		Scheduled Start:
Create-Mileage:	391487.0		Complete-Mileage:	391737.0	

Task IDs

Task ID						
10	ATO/ATP FAILURE, 12/8, B10, CMD, ATCC, 118 UNABLE TO VERIFY FAULT AT THIS TIME. NO ACTIVE FAULT ON TCD. DOWNLOADED VMDS AND ATC LOGS OF CONSIST FOR FURTHER INVESTIGATION.					
Component:	000-300-S00 SUBSYSTEM; AUTOMATIC TRAIN CONTROL (ATC); 2K/3K/6K/7K	Work Accomp: CHECKED	Reason: NO FAILURE	Status: CLOSE	Position:	Warranty?: N
20	inspected at yard.no fault at this time .ATC self test successfully pass .					
Component:	000-300-S00 SUBSYSTEM; AUTOMATIC TRAIN CONTROL (ATC); 2K/3K/6K/7K	Work Accomp: INSPECTED	Reason: NO TROUBLE FOUND	Status: CLOSE	Position:	Warranty?: N
30	ATC FAILED. R/R THE COMMUNICATION BORAD.TEST GOOD.					
Component:	000-300-S00 SUBSYSTEM; AUTOMATIC TRAIN CONTROL (ATC); 2K/3K/6K/7K	Work Accomp: REPLACED USED	Reason: FAILED	Status: CLOSE	Position:	Warranty?: N

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10	[redacted]	03/25/2023	03/25/2023	14:00	22:00	Y	08:00	00:00	$367.29
20	[redacted]	03/27/2023	03/27/2023	06:30	08:30	Y	02:00	00:00	$94.58
30	[redacted]	03/28/2023	03/28/2023	12:30	14:00	Y	01:30	00:00	$64.08

WT_plust_woprint.rptdesign 04/19/2023 12:17

Figure 13 - Replaced Communication Board Work Order page 1 of 2.

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Work Order #: 17760773
Type: CM

Status: CLOSE
03/29/2023 08:58

Work Description: ATO/ATP FAILURE, 12/8, B10, CMD, ATCC, 118
Job Plan Description:

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
						Total Actual Hour/Labor:	11:30	00:00	$525.95

Related Incidents

Ticket	Description	Class	Status	Relationship
8660616	ATO/ATP FAILURE, 12/8, B10, CMD, ATCC, 118	SR	CLOSED	ORIGINATOR

Failure Reporting

Cause		Remedy		Supervisor	Remark Date
2349	MATERIAL FAILURE	0004	REPLACED	[redacted]	03/28/2023
Remarks:	COMPLIED WITH CENV RECOMMENDATIONS, REPLACED ATC COMM. BOARD, MAINT TEST PASSED PART FROMMRO SHOP				

WT_plust_woprint.rptdesign 04/19/2023 12:17

Figure 14 - Replaced Communication Board Work Order page 2 of 2.

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Work Order #: 17805363
Type: CM

Status: COMP
04/14/2023 14:08

Work Description: OPERATOR REPORTED ADU SCREEN BLUE.
Job Plan Description:

Work Information

Asset: R7000	7000, RAIL CAR, KAWASAKI, 7000 AC, A CAR	**Owning Office:** CMNT-CMNT-CMNT		**Parent:**	
Asset Tag: R7000		**Maintenance Office:** CMNT-ALEX-INSP		**Create Date:** 04/14/2023 07:00	
Asset S/N: 7000		**Labor Group:** CMNT		**Actual Start:** 04/14/2023 07:01	
Location: 1213	C99, ALEXANDRIA YARD	**Crew:**		**Actual Comp:** 04/14/2023 14:08	
Work Location: 1213	C99, ALEXANDRIA YARD	**Lead:**		**Item:** K18050001	
Failure Class: CMNT002	CAR LOGIC	**GL Account:** WMATA-02-33350-50499160-041-**********-*****-OPR**			
Problem Code: 2427	N/A CODE (LOGIC SYSTEM)	**Supervisor:** [redacted]		**Target Start:**	
Requested By:		**Requestor Phone:** [redacted]		**Target Comp:**	
Chain Mark Start:		**Chain Mark End:**		**Scheduled Start:**	
Create-Mileage: 394870.0		**Complete-Mileage:** 394870.0			

Task IDs

Task ID	
10	IN THE YARD UNABLE TO VERIFY ANY FAULTS ON TCD SCREEN AND FOUND ADU WORKING PROPERLY. CHECKED VMDS, LCU LOG SHOWS AS ATC AND PIS CIRCUIT BREAKERS WERE RESET. BUT NO ACTIVE FAULT WAS FOUND. CHECKED WIRING, CONNECTORS, ATC, VMDS, RELAYS, OK. PERFROMED EQIUPMENT MAINTENANACE TEST WITHOUT FAILURE. CYCLED MASTER CONTROLLER MULTIPLE TIMES GOOD BRAKES ON AND OFF. COULDN'T DUPLICATED FAILURE AT THIS TIME. 000-300-L10-008 PNEUMATIC SYSTEM; **Component:** AUTOMATIC COUPLER; 7K **Work Accomp:** TROUBLE SHOT **Reason:** NO TROUBLE FOUND **Status:** COMP **Position:** **Warranty?:** N

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10	[redacted]	04/14/2023	04/14/2023	06:30	09:30	Y	03:00	00:00	$147.37
						Total Actual Hour/Labor:	03:00	00:00	$147.37

Related Work Orders

WO	Description	Class	Status	Relationship
17807467	No Dispatch due to shortage of trains	WORKORDER	COMP	RELATED

Failure Reporting

Cause		Remedy		Supervisor	Remark Date
2475	NO DEFECT; NO REPAIRS PERFORMED	3192	TESTED / INSPECTED	[redacted]	04/14/2023
Remarks:	UNABLE TO VERIFY REPORTED PROBLEM. PERFROMED EQIUPMENT MAINTENANACE TEST WITHOUT FAILURE.				

WT_plust_woprint.rptdesign 04/19/2023 12:16

Figure 15 - Latest test 04/14/2023 before the incident - operator reporting ADY screen blue - No active faults were found.

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Work Order #: 17809194
Type: CM

Status: INPRG
04/15/2023 18:16

Work Description: OPERATOR REPORTED A BLUE TCD SCREEN, 25/20, C05, CMD, TCNM, 601
Job Plan Description:

Work Information

Asset:	R7000	7000, RAIL CAR, KAWASAKI, 7000 AC, A CAR	**Owning Office:**	CMNT-CMNT-CMNT	**Parent:**
Asset Tag:	R7000		**Maintenance Office:**	CMNT-ALEX-INSP	**Create Date:** 04/15/2023 18:15
Asset S/N:	7000		**Labor Group:**	CMNT	**Actual Start:** 04/15/2023 18:16
Location:	1213	C99, ALEXANDRIA YARD	**Crew:**		**Actual Comp:**
Work Location:	2494	K99, WEST FALLS CHURCH YARD	**Lead:**		**Item:** K18050001
Failure Class:	CMNT002	CAR LOGIC	**GL Account:**	WMATA-02-33350-50499160-041-**********-*****-OPR**	
Problem Code:	1432	CONSOLE DARK	**Supervisor:**		**Target Start:**
Requested By:			**Requestor Phone:**	[redacted]	**Target Comp:**
Chain Mark Start:			**Chain Mark End:**		**Scheduled Start:**
Create-Mileage:	394873.0		**Complete-Mileage:**	0.0	

Related Incidents

Ticket	Description	Class	Status	Relationship
8664837	OPERATOR REPORTED A BLUE TCD SCREEN, 25/20, C05, CMD, TCNM, 601	SR	INPROG	ORIGINATOR

Failure Reporting

Cause	Remedy	Supervisor	Remark Date

Remarks:

WT_plust_woprint.rptdesign 04/19/2023 12:15

Figure 16 - Open Work Order 04/15/2023 for Blue TCD Screen Error.

Page 1 of 1
MX76PROD

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Work Order #: 17809238
Type: CM

Status: INPRG
04/15/2023 19:47

Work Description: Train 701 overran Ballston track tw0. K04-08 was red., 35/20, K04, RTR, RSIG, 701
Job Plan Description:

Work Information

Asset:	R7000	7000, RAIL CAR, KAWASAKI, 7000 AC, A CAR	**Owning Office:**	CMNT-CMNT-CMNT	**Parent:**
Asset Tag:	R7000		**Maintenance Office:**	CMNT-ALEX-INSP	**Create Date:** 04/15/2023 19:47
Asset S/N:	7000		**Labor Group:**	CMNT	**Actual Start:** 04/15/2023 19:47
Location:			**Crew:**		**Actual Comp:**
Work Location:	2494	K99, WEST FALLS CHURCH YARD	**Lead:**		**Item:** K18050001
Failure Class:	CMNT018	AUTOMATIC TRAIN CONTROL (ATC)	**GL Account:**	WMATA-02-33350-50499160-041-**********-*****-OPR**	
Problem Code:	2437	N/A CODE (ATC SYSTEM)	**Supervisor:**		**Target Start:**
Requested By:			**Requestor Phone:**	[redacted]	**Target Comp:**
Chain Mark Start:			**Chain Mark End:**		**Scheduled Start:**
Create-Mileage:	394873.0		**Complete-Mileage:**	0.0	

Task IDs

Task ID	
10	INSPECTED FOR WHEEL FLATS. NO WHEEL FLATS FOUND. INSPECTION DONE ON TRACK 18W LEAD.

Component: 000-300-K03-002 WHEEL; TRUCK; 2K/3K/6K/7K **Work Accomp:** INSPECTED **Reason:** FLAT **Status:** APPR **Position:** 213 **Warranty?:** N

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10	[redacted]	04/16/2023	04/16/2023	10:30	12:00	N	01:30	00:00	$69.56
						Total Actual Hour/Labor:	01:30	00:00	$69.56

Related Incidents

Ticket	Description	Class	Status	Relationship
8664852	Non-revenue Train 701 passed K04-08 signal red in approach to Ballston track two., 35/20, K04, RTR, RSIG, 701	SR	INPROG	ORIGINATOR

Failure Reporting

Cause	Remedy	Supervisor	Remark Date

Remarks:

WT_plust_woprint.rptdesign 04/19/2023 12:14

Figure 17 - Ballston Station Red Signal Overrun Work Order.

Washington Metropolitan Area Transit Authority
Maintenance and Material Management System
Work Order Details

Work Order #: 17919477
Type: CM

Status: CLOSE
06/02/2023 22:10

Work Description: C05, Safety request radio operational test between CC05 & K04 Track#2
Job Plan Description:

Work Information

Asset:	60335 RADIO, CRCS, REMOTE SITE, T38	**Owning Office:**	COMM-TSSM-RADO	**Parent:**	
Asset Tag:		**Maintenance Office:**	COMM-TSSM-RADO	**Create Date:**	06/02/2023 09:24
Asset S/N:	CRCSRST38	**Labor Group:**	COMMR3RADO	**Actual Start:**	06/02/2023 21:22
Location:	3952 T38, CARMEN TURNER FACILITY, BUILDING (G) SVMT BODY, 2ND FLOOR	**Crew:**		**Actual Comp:**	06/02/2023 21:22
Work Location:		**Lead:**	[redacted]	**Item:**	N60040086
Failure Class:	COMR003 RADIO COMMUNICATIONS SYSTEMS	**GL Account:**	WMATA-02-33540-50499280-042-**********-*****-OPR**		
Problem Code:	3541 NO TX AUDIO	**Supervisor:**		**Target Start:**	
Requested By:	55385	**Requestor Phone:**	[redacted]	**Target Comp:**	
Chain Mark Start:		**Chain Mark End:**		**Scheduled Start:**	
Create-Mileage:	0.0	**Complete-Mileage:**	0.0		

Task IDs

Task ID	
10	RADIO CHECKS

TECHS 317 AND 321 PERFORMED RADIO CHECKS ON TRACK 2 FROM C05 TO K04.ALL RADIO CHECKS WERE LOUD AND CLEAR.

Component: **Work Accomp:** **Reason:** **Status:** CLOSE **Position:** **Warranty?:** N

Actual Labor

Task ID	Labor	Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10	[redacted]	06/02/2023	06/02/2023	17:00	20:00	Y	03:00	00:00	$139.80
10	[redacted]	06/02/2023	06/02/2023	17:00	20:00	Y	03:00	00:00	$138.42
						Total Actual Hour/Labor:	06:00	00:00	$278.22

Failure Reporting

Cause		Remedy		Supervisor	Remark Date
2500	NO PROBLEM FOUND	3191	TESTED - NO TROUBLE FOUND		06/02/2023
Remarks:	RADIO CHECKS LOUD AND CLEAR				

Figure 18 - Comprehensive Radio check from Rosslyn to Ballston Station, track 2 Work Order.

Appendix D – ROCC Lessons Learned

ROCC Rail Operations Control Center

Incident Date: April 15, 2023

Lessons Learned

Trouble shooting procedures/Red Signal Overrun

Incident Summary

On April 15, 2023 Train 601 7K series train Track 2 Rosslyn reported that they were experiencing a door problem and was unable to operate the doors from the lead car. Train 601 performed a fifth car door operation to offload the train. Ops 2 Button RTC called OPS 4 Button RTC and stated that the train was out of service and requested the train be stored in West Falls Church Yard.

Upon arrival in the lead car the train operator reported that they were unable to get a brakes off and the train began to experience a Train Control Network Malfunction. After several troubleshooting methods that yielded no results that would enable the train to move. At 4:15pm CMNT on the scene assisting with the incident train requested to activate Power Knockout to no avail. At 4:17pm CMNT cut out ATP to no avail. At 4:19pm CMNT activated VMDS to no avail. CMNT then recycled the battery circuit breaker and performed a hard reset for the train.

At 4:25pm the disabled train was able to get a brakes release. CMNT on the scene again cut out ATP. The Radio RTC instructed that all trains holding close and continue. With AIM indication displaying that ATP was cut out, the incident train began to move no safety feature with speeds up to 38 MPH. There was no effort to stop the train and ensure that the train moved under an absolute block with speeds no greater than 15MPH.

At 4:29pm OPS 4 Radio RTC began to attempt to contact Train 701 with the intention to have the Operator relieved on OPS 4 and received no response; at 4:30pm OPS 4 Button RTC cancelled K04-08 signal to display a red aspect in an attempt to get Train 601 to contact them. At 4:31pm Train 701 overran K04-08 signal red rendering the Ballston interlocking inoperable pending ATC personnel's inspection of the interlocking. There were no injuries or damage as a result of this event.

ROCC Contributing Factors

Ops 2 Radio RTC did not attempt to stop the train and verify if the train had ATP cut out despite AIM indication showing that ATP was cut out on the train.

OPS 2 Radio RTC did not advise the incident train that their ID changed to 701 which contributed to the incident train not responding to OPS 4 when they attempted to contact the Operator by Train ID 701. (The Operator responded when they were contacted as ID 601)

OPS 2 RTC's did not move incident train under an absolute/ permissive block despite AIM indication showing that ATP was cut out on the train.

Ops 2 Button RTC did not update OPS 4 RTC's that the train was moving with ATP indication shown on the train.

Ops 4 Button cancelled B04-08 signal with positive radio communication that the operator acknowledged they were in approach to a red signal.

Incident Analysis

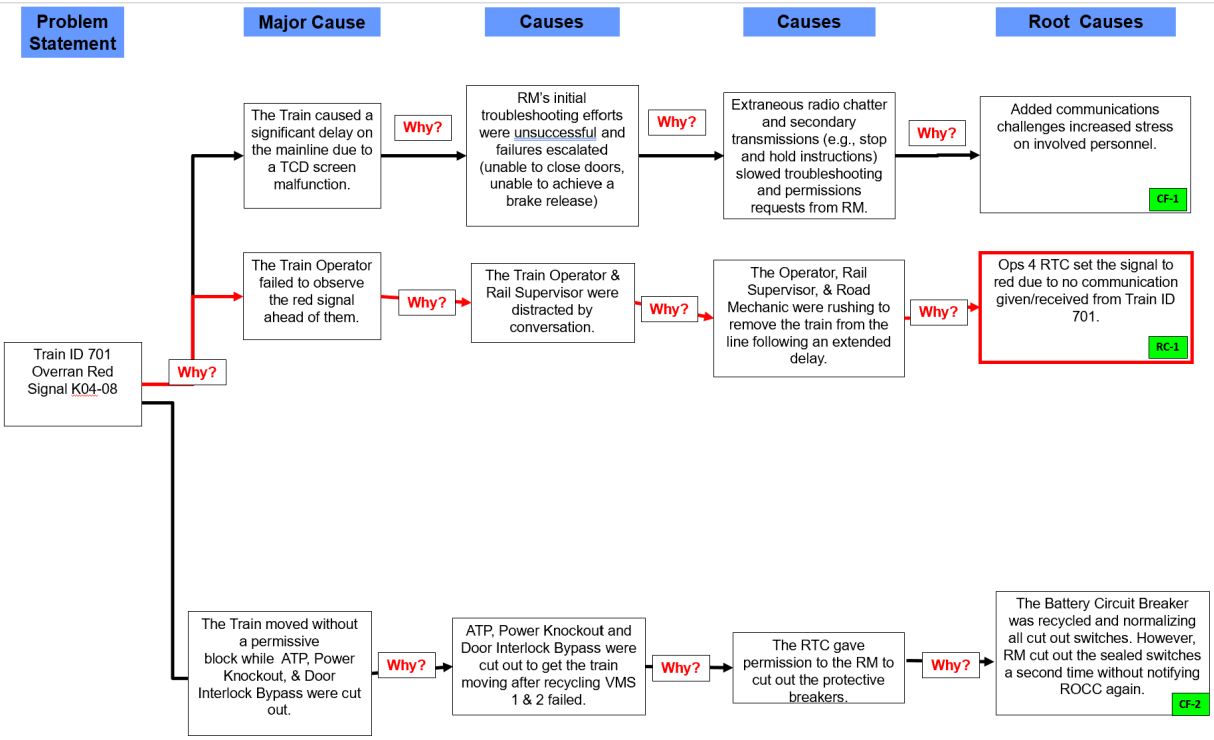
- *Based on the 7000-series Troubleshooting Procedures Checklist, steps were not followed in sequence for the fault.*
- *Train ID 701 was operated with ATP cut out without a permissive or absolute block and reaching speeds that exceeded 15 mph (up to 38 mph).*
- *MSRPH OR. 3.24 - Use of Mode 3 shall be accomplished only after receiving specific authorization from ROCC or the Interlocking Operator to "CUT OUT ATP". Speed shall be restricted to 15 mph unless otherwise authorized by ROCC.*
- *MSRPH OR 3.27 - After a Class I vehicle has been operated in Mode 3, or when the ATP C/O switch has been moved to the CUT-OUT position for any reason, the train must be moved under a permissive or absolute block not to exceed 15 mph or less, or as directed by ROCC. The train operator must be prepared to stop within half the range of vision, short of any train, obstruction, broken rail or improperly aligned switch.*
- *3.67.1 Rail Operations Control Center Supervisors or Rail Transportation Supervisors shall advise Train Operators when they are approaching red signals that are positioned just beyond the station platforms.*
- *MSRPH OR 3.29 - When in Mode 3, a Class I vehicle shall be operated using absolute block procedures as defined in SOP # 15 and SOP # 4.6 through 4.9 (related rules 3.1 and 3.30)*

ROCC Procedures Manual:

- *6.10.4 RTCs shall carry out safe and efficient movement of services on their respective Ops desk and coordinate with controllers on other desks to support systemwide operations.*
- *6.10.6 RTCs shall coordinate all train and equipment movement on the rail system. The Radio and Button RTCs shall coordinate to plan and implement strategies to maintain train movement during normal, emergency, and testing operations.*
- *6.10.16.1 When vehicles are not under the protection of the ATC system or in the printed schedule, RTCs shall follow the procedures in MSRPH SOP #15 Absolute Block / Permissive Block.*

Figure 19 - ROCC Lessons Learned

Appendix E – Why-Tree Analysis



Root Cause Analysis