

WMSC Commissioner Brief: W-0179 - Collision - Forest Glen Station - May 7, 2022

Prepared for Washington Metrorail Safety Commission meeting on September 20, 2022

Safety event summary:

Roadway maintenance machines (RMMs) collided in Forest Glen Station during work zone setup activities at approximately 5:05 a.m. on Saturday, May 7, 2022. Several different work crews were in the area as part of a weekend shutdown. This included a Wayside Work Planning (WWPL) Supervisor, and a separate Roadway Worker in Charge (RWIC) responsible for work zone setup, vehicle movement and other roadway worker protection.

Prime Mover 26, coupled to Flat Car 527 and Flat Car 540, was stopped approximately halfway down the station platform on Track 2. The moving consist was made up of Prime Mover 40 pushing Flat Car 531. On board were an Equipment Operator, Flagman, and members of an Automatic Train Control Maintenance (ATCM) work crew that the Equipment Operator and Flagman were bringing back to the station. The Flagman was inside a booth at the end of the flat car. The booth has an emergency brake valve. There is also an emergency brake valve at the front end of the flat car. The ATCM crew members were standing on the deck of the prime mover. There is no recorded communication regarding the move between the RWIC and the Equipment Operator or Flagman.

As the consist entered the station. the Flagman and Equipment Operator did not perform any safety stops that are required by Metrorail procedure. The Flagman and the Equipment Operator also stated they did not communicate via radio as required by Metrorail rules and procedures. The vehicles continued moving until colliding with Prime Mover 26.

When the vehicles collided, the ATCM personnel standing on Prime Mover 40 were thrown into each other, into parts of the vehicle, and onto the ground by the force of the collision and sudden stop. Two ATCM personnel reported injuries.

Contrary to Metrorail policy, after this collision, the Equipment Operator on Prime Mover 40 moved the unit backward several feet before notifying anyone of the collision. Changes made to the accident scene after the collision limited the availability of specific information, such as whether emergency brakes were applied in the final moments before the collision. Metrorail's RMMs generally do not have event recorders or onboard cameras that collect this information. The Equipment Operator informed the RWIC of the collision.

The RWIC then also acted contrary to Metrorail procedure and directed the Equipment Operator approximately 7 minutes after the collision to further violate the accident investigation procedure by moving Prime Mover 40 another 10 feet before chocking and securing the unit.

The RWIC notified the WWPL Supervisor of the collision. The Supervisor independently collected witness statements and only later, at 6:36 a.m., contacted the Maintenance Operations Center (MOC). The MOC is a desk within the Rail Operations Control Center (ROCC) but is not the proper way to report accidents and incidents, which, in any event, are to be reported immediately. The MOC transferred the call to a ROCC Operations Manager. The RWIC and WWPL Supervisor stated they were not familiar with incident reporting procedures. This contributed to the delay in reporting the collision to the ROCC operations team and other responsible personnel.



This lack of familiarity with incident response procedures also meant that individuals involved in the collision were not immediately taken for post-event drug and alcohol testing. The ROCC Operations Manager informed the WWPL Supervisor during their call more than 1.5 hours after the event that the personnel needed to be taken for testing.

Work schedule data indicates that the Equipment Operator and Flagman were at risk of fatigue-related impairment. The Equipment Operator and Flagman were each working their eighth consecutive night of work.

The investigation indicates that Metrorail is not recording all radio channels used for safety-critical communications. The work crews were using talk around channels rather than operations channels for their work as part of the weekend shutdown.

Metrorail did not report this event within the required two hours to the WMSC or the Federal Transit Administration (FTA).

Probable Cause:

The probable cause of this event was Metrorail's inadequate procedures for non-lead-end operations and work vehicle storage. Contributing to this event was insufficient communication, and Metrorail's culture that accepts noncompliance with written operational rules, procedures and manuals.

Corrective Actions:

Metrorail is evaluating and updating procedures related to vehicle movement where the operator is not at the lead end.

Metrorail has committed to installing data and video recorders on RMMs over the next six years.

Metrorail redistributed safety bulletin on incident reporting and post incident testing (WWPL), and a lessons learned document related to safety stop and communication requirements (Track and Structures).

WMSC staff observations:

Personnel involved in this event had a risk of fatigue impacting their effectiveness, however the available information is insufficient to definitively state whether fatigue was a contributing factor to this collision. CAP C-0008-B related to an effective fatigue policy remains open.

Metrorail Corrective Action Plan (CAP) C-0070 regarding <u>training on and compliance with investigation procedures</u> is open, with a scheduled completion date for all actionable items in 2023.

Metrorail should maximize its recording capabilities, and take advantage of those recordings for operational oversight, to ensure continuous safety improvement.

Metrorail safety rules require all vehicle movement in work zones to be coordinated with and directed by the RWIC. It is important to the safety of roadway workers and others that movement is controlled as specified by Metrorail rules and procedures.

The WMSC held conversations with Metrorail regarding Metrorail's failure to report this event within two hours as required.



Washington Metro Area Transit Authority Department of Safety and Environmental Management (SAFE) FINAL REPORT OF INVESTIGATION A&I E22283

Date of Event:	May 7, 2022
Type of Event:	Collision
Incident Time:	05:05 hours
Location:	Forest Glen Station, Track 2
Time and How received by SAFE:	06:40 hours MAC
WMSC Notification Time:	07:51 hours
Responding Safety Officers:	WMATA SAFE: Yes
	WMSC: No
	Other: N/A
Rail Vehicle:	PM40xF531; PM26xF527xF540
Injuries:	Two minor injuries
Damage:	None
Emergency Responders:	None
SMS I/A Number	20220508#100160

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Forest Glen Station – Collision

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Abbreviations and Acronyms

ARS	Audio Recording System
АТСМ	Automatic Train Control Maintenance
САР	Corrective Action Plan
ССТV	Closed-Circuit Television
СТЕМ	Car Track Equipment Maintenance
FC	Flat Car
MOC	Maintenance Operations Center
MSRPH	Metrorail Safety Rules and Procedures Handbook
NOAA	National Oceanic and Atmospheric Administration
РМ	Prime Mover
RTRA	Office of Rail Transportation
ROCC	Rail Operations Control Center
RWIC	Roadway Worker in Charge
SAFE	Department of Safety
SMS	Safety Measurement System
WMATA	Washington Metropolitan Area Transit Authority
WMSC	Washington Metrorail Safety Commission
WWPL	Office of Wayside Work Planning

Executive Summary

In the early morning hours of Saturday, May 7, 2022, several different work crews were operating in the area of Forest Glen Station, preparing the work area for the weekend Red Line track work shutdown. There was a Wayside Work Planning (WWPL) Supervisor who served as the on-site supervisor while the Roadway Worker In Charge (RWIC) served as the work site lead by coordinating the work zone set ups, unit movements, etc. At approximately 05:05 hours, Closed Circuit Television (CCTV) captured Prime Mover (PM) 40 pushing Flat Car (FC) 531 back into Forest Glen Station on Track 2. PM 40 was returning to Forest Glen Station after picking up an Automatic Train Control Maintenance (ATCM) work crew. As they entered the station, the Flagman was inside the booth at the end of the flatcar, the ATCM crew were standing on the deck of PM 40, and the Equipment Operator was operating from inside the cab.

During the approach to PM 26, which was positioned approximately halfway onto the platform, the Equipment Operator failed to conduct any safety stops. The coupler of FC 531 struck the coupler of PM 26 causing the PM, FC 527, and FC 540, coupled to PM 26, to shift forward and push against the wheel chocks. The force of the collision caused an ATCM crew member to fall into another crew member and then onto the deck of PM 40.

After the collision, the PM 40 Equipment Operator reversed the unit by several feet prior to notifying the RWIC or WWPL Supervisor. The Equipment Operator reported that they were attempting to relieve the pressure off the knuckles of both units. The Equipment Operator acknowledged they should have stopped PM 40 when they noticed the Flagman was not communicating the safety stops. There were two minor injuries reported and no significant damage as a result of this incident. Neither injured party required medical treatment after this event occurred.

The root cause of this event were multiple human factors errors, including a lack of communication between the Equipment Operator and Flagman and a failure to act by the Flagman and Equipment Operator when safety stops did not occur. Inadequate procedures relating to non-lead-end operations were identified as contributing factors. While there are established procedures for when to conduct safety stops, non-lead-end operations and minimum storage distances for Class II vehicles are not clearly described and understood. Fatigue risk for this event was determined to be moderate due to the time of day and work schedules; however, parties involved reported sufficient sleep and had enough time off preceding the event to achieve adequate rest.

Incident Site

Forest Glen Station, Track 2

Field Sketch/Schematics



Figure 1: Shows where Flat 531 made contact to PM26 on track 2 at Forest Glen Station platform.

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 two (2) individuals as part of this investigation, including the:
 - Equipment Operator
 - Flagman
- Informal Interviews Collected through conversations with individuals during the investigation to provide background and supporting information.
 - RWIC
 - WWPL Supervisor
- Documentation Review A collection of relevant work history information and process documentation contained in Metro systems of record. These records include:
 - Employee Training Procedures & Records
 - Metrorail Safety Rules and Procedures Handbook (MSRPH)
 - National Oceanic and Atmospheric Administration (NOAA) data
 - Certifications

- System Data Recording Review A collection of information contained in Metro Data Recording Systems. This data includes:
 - Audio Recording System (ARS) playback include Ops. 1 & 10 Radio, Phone-12081 & 12065
 - Closed-Circuit Television (CCTV)

Investigation

On Saturday, May 7, 2022, at approximately 03:55 hours, there were several different work crews at Forest Glen Station preparing the work area for the weekend Red Line track work shutdown. There was a WWPL Supervisor who served as the on-site supervisor while the RWIC served as the work site lead by coordinating the work zone set ups, unit movements, etc. At approximately 05:05 hours, CCTV captured PM 40 pushing FC 531 back into Forest Glen Station. PM 40 was returning to Forest Glen Station after picking up an ATCM work crew. The ATCM work crew members were outside the operator's cab, standing on the deck of PM 40. As they were entering the station, the Flagman was inside the booth and failed to announce the closing distance or take action to stop the unit due to the lack of safety stops. As FC 531 got closer to PM 26, the Flagman stated they dropped their radio, which prevented them from instructing the operator to stop. When FC 531 was 10 feet or less from PM 26, the Flagman reportedly attempted to dump the emergency brake valve located in the Flagman booth (See Appendix A), however contact was made. The force of the contact caused one of the ATCM work crew members to fall backwards landing on the deck of PM 40. Other crew members were visibly jostled by the force of the contact. There were minor injuries reported, but none required medical assistance at the time of the event. Car Track Equipment Maintenance (CTEM) mechanics responded to the scene and observed no damage to the equipment. They were unable to determine if the emergency valve was dumped because the air pressure was recharged prior to the mechanics arrival.

Immediately after the collision, the Equipment Operator reversed PM 40 several feet without authorization from the RWIC or ROCC. During the SAFE interview, the Equipment Operator stated they were attempting to relieve the pressure off the knuckles of both units. The Equipment Operator acknowledged they should have stopped PM 40 when they noticed the Flagman was not communicating the safety stops.

Following the collision, the Equipment Operator was observed on CCTV conversing with the ATCM work crew and performing a visual inspection of the involved units. The Equipment Operator verbally informed the RWIC about the collision. There was no recorded audio of the Equipment Operator talking to the RWIC or Flagman during this event. The RWIC was unaware that PM 40 was moved prior to their authorization. Approximately seven minutes after the collision, the Equipment Operator was instructed by the RWIC to move the PM, chock the wheels, and secure the unit. PM 40 reversed away from PM 26 by approximately ten feet. The event was reported by the RWIC to the WWPL Supervisor, who in turn, collected witness statements and made the initial notification to the Maintenance Operations Center (MOC) desk at approximately 06:36 hours. Both the RWIC and WWPL Supervisor were unfamiliar with WMATA's Accident investigation procedures which contributed to the delay in reporting the collision to the ROCC.

CTEM and SAFE personnel responded and inspected the units and scene. No damage was discovered to any unit during the initial and post-incident inspections.

Chronological Event Timeline

Time	Description
03:55 hours	RTC: Instructed RWIC to hot stick area and place shunts. [Ops. 1]
04:07 hours	RWIC: Checked with RTC to see if they saw good shunts. [Ops. 1]
04:10 hours	RTC: Gave RWIC permission to go to work. [Ops. 1]
04:13 hours	RWIC: Attempted to contact PM 40 but no response. [Ops. 1]
04:15 hours	RTC: Advised the RWIC to attempt to contact PM 40 on Ops. 10. [Ops. 1]
04:16 hours	No relevant communication found. During interviews, it was said the work crews
to 06:35	were using Ops. 1 for communication but there is no audio of their
hours	communication.
06:36 hours	<u>WWPL Supervisor</u> : Contacted MOC Desk to report that two units' made contact
	and they were not sure what to do. They completed the incident and witness
	forms but were not sure of the next step. The MOC Desk transferred the WWPO
	Supervisor to a ROCC Operations Manager. [Phone-12081]
06:37 hours	<u>WWPL Supervisor</u> : Informed ROCC Operations Manager of the situation of the
	PMs bumping knuckles and jolting personnel on board PM 40. They advised
	the ROCC Operations Manager that they did not know what the next steps
	were. ROCC Operations Manager advised the WWPL Supervisor that the
	employees needed to be transported for post incident testing and the incident
	logged as a collision. [Phone-12065]
06:47 hours	<u>ROCC Operation Manager:</u> Contacted the WWPL Supervisor to obtain their
	contact information, and description of what happened. Also, clarified the post
	incident testing procedure. Informed the WWPL Supervisor that personnel were
	en route to the scene and to not move any units. [Phone- 12065]

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

**Note: Times above may vary from other system's timelines based on clock settings.

Vehicle Program Services (CENV)

CENV performed a post-incident inspection and developed an incident report for the collision event. CENV'S report stated there was no damage as a result of the collision. Both CENV and CTEM could not identify deficiencies with any of the units that would have contributed to this incident. Data and video are not recorded on incident units to determine operational activity prior to contact. (See Appendix E)

Closed-Circuit Television (CCTV)



Figure 2: At approximately 05:07:45 hours, CCTV shows PM40 pushing FC 531 into Forest Glen Station prior to contact.



Figure 3: At approximately 05:07:51, CCTV shows when FC 531 and PM 26 made contact.



Figure 4: At approximately 05:07:51, CCTV shows when one of the crew members on-board PM 40 fell from the force of the collision.



Figure 5: At approximately 05:08:27 hours, CCTV shows the first time PM 40 was moved a few feet after contact was made.



Figure 6: At approximately 05:16 hours, CCTV shows the second time PM 40 was moved several feet after contact was made without authorization.

Interview Findings

There were several findings discovered during the two interviews. During the interview with the Flagman, it was discovered that the Flagman was inside the booth on FC 531, however they acknowledged that they should have been outside the booth during the close-in process. The Flagman and Equipment Operator admittedly failed to conduct safety stops as they entered Forest Glen Station. The Flagman mentioned they dropped their radio as PM 40 and FC 531 got closer to PM 26. When the Flagman realized they were too close, they reportedly attempted to dump the air pressure. The Flagman stated they were communicating on Ops 1, however, there were no transmissions between the Flagman and Equipment Operator recovered. The Equipment Operator stated they did not think to stop the PM even though the Flagman was not calling out stopping distances. The Equipment Operator tried to judge the distance themselves. The Equipment Operator admitted to moving the equipment after the collision without authorization. The Equipment Operator stated they moved PM 40 because they were trying to relieve the pressure on the knuckles of the two units. The Equipment Operator stated they immediately reported the incident to the RWIC at the location. The RWIC was on the platform at the time of the incident so the communication between the Equipment Operator and RWIC was verbal and not recorded via radio channels.

Weather

On May 7, 2022, at the time of the incident, NOAA recorded the temperature as 50° F. This incident occurred at an underground station. Weather was not a contributing factor in this event (Weather source: NOAA) – Location: Silver Spring, MD.)

Human Factors

<u>Fatigue</u>

Signs and Symptoms of Fatigue

Equipment Operator

Conditions at the time of the incident were evaluated to distinguish whether evidence of fatigue was present. Video of the person involved was not available to ascertain whether evidence of fatigue was present. The Equipment Operator reported feeling fully alert at the time of the incident. The Equipment Operator reported experiencing no symptoms of fatigue in the time leading up to the incident.

<u>Flagman</u>

Conditions at the time of the incident were evaluated to distinguish whether evidence of fatigue was present. Video of the person involved was not available to ascertain whether evidence of fatigue was present. The Flagman reported feeling fully alert at the time of the incident. The Flagman reported experiencing no symptoms of fatigue in the time leading up to the incident.

Fatigue Risk

Equipment Operator

Incident data was evaluated for fatigue risk factors. Risk factors for fatigue were identified. The incident time of day (5:05 hours) suggests an increased risk of fatigue-related impairment. The Equipment Operator worked overnight shifts, including one (1) 14-hour shift (19:55 – 10:01 hours), in the days leading up to the incident. The incident occurred on the eighth consecutive night of work. The Equipment Operator reported a total of 8.5 hours of sleep in the 24 hours preceding the incident and was awake for 12.1 hours at the time of the incident. The off-duty period preceding the incident was 14 hours long, which provided the opportunity for 7-9 hours of sleep. The Equipment Operator reported usual workday sleep durations of 8 hours and no issues with sleep.

A biomathematical fatigue modelling application (SAFTE-FAST WebSFC) was used to further evaluate fatigue risk factors that may have been present in the Equipment Operator's schedule. The analysis was based on the Equipment Operator's work schedule, reported sleep from the day before the incident, and reported habitual sleep durations. Estimated performance effectiveness at the time of the incident was 77.4%. Specifically, the analysis identified the incident time of day and the circadian effects of night work as factors contributing to an increased risk of fatigue at the time of the incident.



Figure 7: Modeling analysis output shows estimated performance effectiveness during the incident work shift and for the week leading up to the work shift, based on the employee work and reported sleep schedule. Estimates were based on the Equipment Operator's work schedule, reported sleep from the day preceding the incident, and reported habitual sleep durations (8 hours a day). Bold portions of the modeled curve show work (in black) and sleep times (in blue). Effectiveness is shown on the vertical axis, with colored fields in the chart background signifying ranges of effectiveness scores including high effectiveness (>90%) in green, and low effectiveness (<65%) in red. Time is shown on the horizontal axis.

<u>Flagman</u>

Incident data was evaluated for fatigue risk factors. Risk factors for fatigue were identified. The incident time of day (5:05 hours) suggests an increased risk of fatigue-related impairment. The Flagman worked overnight shifts, including two (2) 14-hour shifts (20:00 - 10:00 and 16:00 - 06:00 hours), in the days leading up to the incident. The incident occurred on the eighth consecutive night of work. The Flagman reported a total of 7 hours of sleep in the 24 hours preceding the incident and was awake for 13.1 hours at the time of the incident. The off-duty period preceding the incident was 14 hours long, which provided the opportunity for 7-9 hours of sleep. The Flagman reported usual workday sleep durations of 8 hours and no issues with sleep.

A biomathematical fatigue modelling application (SAFTE-FAST WebSFC) was used to further evaluate fatigue risk factors that may have been present in the Flagman's schedule. The analysis was based on the Flagman's work schedule, reported sleep from the day before the incident, and reported habitual sleep durations. Estimated performance effectiveness at the time of the incident was 78.5%. Specifically, the analysis identified the incident time of day and the circadian effects of night work as factors contributing to an increased risk of fatigue at the time of the incident.



Figure 8: Modeling analysis output shows estimated performance effectiveness during the incident work shift and for the week leading up to the work shift, based on the employee work and reported sleep schedule. Estimates were based on the Flagman's work schedule, reported sleep from the day preceding the incident, and reported habitual sleep durations (8 hours a day). Bold portions of the modeled curve show work (in black) and sleep times (in blue). Effectiveness is shown on the vertical axis, with colored fields in the chart background signifying ranges of effectiveness scores including high effectiveness (>90%) in green, and low effectiveness (<65%) in red. Time is shown on the horizontal axis.

Post-Incident Toxicology Testing

WMATA's Drug and Alcohol Program determined that the Equipment Operator and Flagman tested in relation to this event were not in violation of the Drug and Alcohol Policy and Testing Program 7.7.3/6.

Metrorail Safety Rules and Procedures Handbook (MSRPH)

- 3.111 All Class 2 vehicles operating on the mainline shall be operated by a qualified operator or under the guidance of a qualified operator acting as pilot.
- 3.112 When flat cars are coupled to a diesel unit, the vehicle flag person shall:
 - Place two white lights on the lead flat car if they are being pushed;
 - Place two red lights on the rear flat car if they are being pulled;
 - Ride the head end of the lead flat car to advise the operator of interlocking signal aspects and track conditions when being pushed;
 - Hold brake dump valve so that brakes can be applied in an emergency; and
 - \circ $\,$ Monitor tools and materials loaded onto the flat car.
- 3.89 Safety stops shall be made as prescribed in Rule 3.89 when approaching another rail vehicle, bumping post, or obstruction.
- 3.89 Safety stops, when required, must be made three (3) car lengths, then two (2) car lengths, then fifty (50) feet, then ten (10) feet then proceed at a speed not to exceed three

(3) mph until final stop is made. Speeds into shop are not to exceed three (3) mph. (Refer to rule 3.131). (Related Rule 3.88)

3.96 – Whenever a Class I or Class II rail vehicle is operated from other than the lead car/end or from either end of a flat car (whether pushing or pulling), a qualified employee shall be assigned as a flag person. Positive communications shall be established between the operator and the vehicle flag person. The Operator shall confirm that the flag person clearly understands each authorized move before proceeding. If communication is lost, the operator shall bring the vehicle to a stop.

Immediate Mitigation to Prevent Recurrence

- The Equipment Operator and Flagman were removed from service for post-incident testing.
- Involved vehicles were inspected for damage.

Findings

- PM 40 was initially at Forest Glen Station before it left to pick up a ATCM work crew.
- PM 26, coupled with FC 527 and FC 540, were chocked and secured on the platform of Forest Glen with no personnel on board.
- The Flagman was inside the Flagman's booth on FC 531 as PM 40 entered Forest Glen Station. An emergency brake valve is located in the booth and at the front end of the Flat Car
- No safety stops were performed in approach to PM 26.
- FC 531 and PM 26 did not couple when contact was made.
- PM 40 was moved twice after contact was made to PM 26: once by the Equipment Operator immediately after the collision; and a second time under orders from the RWIC.
- The RWIC was unaware PM 40 was moved the first time but authorized the second move.
- The RWIC and WWPL Supervisor reported being unfamiliar with event reporting procedures. The RWIC and WWPL Supervisor gathered statements from involved personnel and began initial fact finding activities, which led to a delay in reporting the event of over an hour.
- There were no damages to FC 531 or PM 26.
- As the scene was not preserved, CTEM mechanics were unable to verify if the emergency brake valve was dumped at the time of the collision.
- Post-incident inspection and analysis identified no deficiencies with the rail vehicles involved in the collision.
- The work crews were not using recorded radio channels (talk-around channels) during this event.
- The Equipment Operator and Vehicle Flag Person were determined to have moderate risk of fatigue impairment at the time of the event.

Probable Cause Statement

The root cause of this event were multiple human factors errors, including a lack of communication between the Equipment Operator and Flagman and a failure to act by the Flagman and Equipment Operator when safety stops did not occur. Inadequate procedures relating to non-lead-end operations were identified as contributing factors. While there are established procedures for when to conduct safety stops, non-lead-end operations and minimum storage distances for Class II vehicles are not clearly described and understood. Fatigue risk for this event was determined to be moderate due to the time of day and work schedules; however parties involved reported sufficient sleep and had enough time off preceding the event to achieve adequate rest.

Corrective Action Code	Description	Responsible Party	Estimated Completion Date
100160_SAFECAPS _TRST_001	Distribute Lessons Learned following event that highlights safety stop and preserving an accident scene by not moving involved units.	TRST	Completed
100160_SAFECAPS _WWPL_002	Re-issue safety bulletins on incident reporting requirements and post incident testing.	WWPL	Completed
100160_SAFECAPS _SAFESRC_003	Evaluate and update procedures related to Class I & II vehicle moves from non-lead end.	SAFE Office of Operating Practices	12/31/2022
95911_SAFECAPS_ CMNT_004*	Install data recorders and video recorders to record events deemed appropriate by CENV., vehicle speed, emergency stop, and ignition status. NOTE: There are 30 Class 2 configurations. The expanded list for individual configurations will vary and is not fully developed.	CTEM	05/20/2028

SAFE Recommendations/Corrective Actions

*Note: Recommended Corrective Action 95911_SAFECAPS_CMNT_004 is copied from Event E21476 for reference

Appendix A – Interview Summary

*The below transcript is a summary of the SAFE interview conducted with the Equipment Operator and the Flagman. It reflects statements made by them and may conflict with other systems of record.

Equipment Operator

The Equipment Operator is a WMATA employee with three (3) years of service with four (4) months as an Equipment Operator D. The Equipment Operator previously worked as a Track Repairman. The Equipment Operator is RWP Level 4 certified and will have to recertify in January 2023. The Equipment Operator last certified as an equipment operator in January 2022. The Equipment Operator mentioned feeling fully alert right before the incident. The Equipment Operator stated they loaded the units with the material that they were going to need for the weekend because the unit would be at the location all weekend for the singe tracking work. PM 40 and their crew were piggybacking with a crew that was already at Forest Glen Station. The Equipment Operator explained the process for entering the station and stated they should have performed safety stops. The safety stops were not conducted as they entered the station. They were communicating on Ops 1. The Equipment Operator stated they did not have eyes on the Flagman and never communicated with them as they were entering. The Equipment Operator mentioned that the Flagman said they dropped their radio and that is why they were unable to inform them of the distance. The Equipment Operator admitted that they did not think to stop the unit after not performing safety stops or communications form the Flagman. The Equipment Operator stated they were pushing Flat Car 531 into Forest Glen Station when it made contact with PM 26. The Equipment Operator stated it was their decision to move PM 40 after making contact, but it was to relieve the pressure on the knuckle. The Equipment Operator engaged the service brake and parking brake, secured the unit, and got off to make sure everyone was okay. The Equipment Operator was aware that PM 26 was on the platform of Forest Glen Station because they had been there earlier. There was no damage to any units as a result of the collision.

<u>Flagman</u>

The Flagman is a WMATA employee with five (5) years of service all as a Track Repairman. The Flagman is RWP Level 2 certified and will have to recertify in August 2022. The Flagman last certified as a Track Repairman in August 2021. The Flagman mentioned feeling fully alert right before the incident. The Flagman mentioned there were no personal commitments that interfered with their chance of getting good rest. The Flagman stated they completed a RJSB and they were assigned as the Flagman for the night. The Flagman stated they should have been outside the booth conducting safety stops as the PM entered the station. The Flagman stated they were in the booth at the time and did not perform the safety stops. As PM 40 was getting closer to the other unit, the Flagman attempted to tell the Operator to stop but they dropped their radio. The Flagman stated they were 10 feet or less when they noticed they were too close to PM 26 and dumped the air pressure, but contact was already made.

Appendix B – Emergency Dump Valve



Figure 9: Shows the emergency dump valve located in the Flagman booth on a flat car.

Appendix C – Post-Incident Inspection Work Orders

M		Washington Met Maintenance ar W	ropolitan Area Transit Authority nd Material Management System York Order Details	Page 1 of 2 MX76PROI
Work Orde Type: CM	ler #: 17047067 I			Status: CLOSE 05/10/2022 10:34
Jot	Work Description: b Plan Description:	Post Damage Inspection (Incident 86	01212)	
			Work Information	
	Asset: MPM26	PM26, PRIME MOVER, HARSCO, 354C, S/ N 6190285, 4	Owning Office: CTEM	Parent:
	Asset Tag: MPM26		Maintenance Office: CTEM-ALEX-HVYR	Create Date: 05/10/2022 10:13
	Asset S/N: 6190285		Labor Group: CTEM-GBLT-HVY	Actual Start: 05/10/2022 10:34
	Location: 1213	C99, ALEXANDRIA YARD	Crew:	Actual Comp: 05/10/2022 10:34
Wor	rk Location: 1193	B09, FOREST GLEN	Lead:	Item: CTEM49200006
Fai	ailure Class: CTEM001	GENERAL	GL Account: WMATA-02-33380-50499070	-041-**************-0PR**
Pro	oblem Code: 1025	ACCIDENT/COLLISION/DERAIL	Supervisor:	Target Start:
Rec	quested By:		Requestor Phone:	Target Comp:
Chain	Mark Start:		Chain Mark End:	Scheduled Start:
Crea	ate-Mileage: 0.0		Complete-Mileage: 0.0	
Task IDs				
Task ID				
10	Perform Post Incident I	nspection		
	Performed Post Incident Ir No damage was found du Attached is the Post Incide All Labor was captured on CENV: A3: Collison (Mainline)	ispection: 5/7/2022 at Forest Glen Station ing the inspection. and Inspection Form 50.993 the Weekend Support Work Order: 16993282 also inspected unit at Gienmont 5/8/2022 as part of his inv	estigation.	
	Incident Level: A3 Time: 05-07-2022 07:10 Location: Forest Glen Track Number: 2			
	Train ID: PM 40, PM 26 (C Object: WWPO Superviso Personnel: TRST on scen Actions: TRST supervisor Impact: Red Line None	Collision was with PN26 and F531) informed ROCC at approximately 0640 that PM 40 e responded and transported the Prime Mover Operators for) made contact with PM 26 in the work zone/area. No injuries or dam r post-incident testing.	ages reported.
Component	Train ID: PAI 40, PM 26 (C Object: WWPO Superviso Personnel: TRST on scene Actions: TRST supervisor Impact: Red Line None 	Ollision was with PM26 and F531) effect of the Prime Mover Operators for e responded and transported the Prime Mover Operators for ION; PRIME MOVER Work Accom) made contact with PM 26 in the work zone/area. No injuries or dam r post-incident testing. pp: INSPECTED Reason: INSPECTION	ages reported. Status: CLOSE Position: Warranty?: N
Component: Failure Report	Train ID: Phi 40, PM 26 (C Object: WWPO Superviso Personnel: TRST on scen Actions: TRST supervisor Impact: Red Line None	Collision was with PM26 and F531) and F531) and transported the Prime Mover Operators for a provide the Prime Mover Operators for TION; PRIME MOVER) made contact with PM 26 in the work zone/area. No injuries or dam r post-incident testing. ap: INSPECTED Reason: INSPECTION	ages reported. Status: CLOSE Position: Warranty?: N
Component: Failure Repor	Train ID: PAI 40, PM 26 (C Object: WWPO Superviso Personnel: TRST on scen Actions: TRST supervisor Impact: Red Line None 	Collision was with PM26 and F531) e e responded and transported the Prime Mover Operators for TION; PRIME MOVER Work Accom Remedy EUICI E INN/CI VEMENT 3102 TEST) made contact with PM 26 in the work zone/area. No injuries or dam r post-incident testing. ap: INSPECTED Reason: INSPECTION Supervisor ED / INSPECTED	ages reported. Status: CLOSE Position: Warranty?: N Remark Date

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Figure 10: PM26 Work Order - Page 1 of 1

Work Order #: 17053637	Washing Mainter	ton Metrop nance and N Work	oolitan Area Material Mar Order Det	a Transit A hagement S ails	uthority System		Stat	Page 1	of 2 MX76PROD	
туре: См							05/1	9/2022 05:1	2	
Work Description	Post Demogra Inspection //	noidont 960121	2)							
Job Plan Description	Post Damage inspection (incident 600121	2)							
Incident Level: A3 Time: 05-07-2022 07:10 Location: Forest Glen Track Number: 2 Train ID: PM 40, PM 26 (Collisii F527 was coupled to F540 whit Object: WWPO Supervisor a Personnel: TRST on scene Actions: TRST supervisor resp Impact: Red Line None Inspection genot 50 903 is atta	on was with PM26 and F531) th was coupled to PM26 informed ROCC at approxim- ronded and transported the Pri- sched to this WO	nately 0640 that F ime Mover Opera	PM 40 made conta tors for post-incid	ect with PM 26 in dent testing.	the work zone	e/area. No injuries	or damage	s reported.		
inspection report 50.995 is alla	iched to this WO.		Work Informat	ion						
Assat: ME527	CTEM ELAT CAR SIN E527		Owning Offi	A TRST.TRAK.SI			Pa	ent:		
Asset Tag: ME527	CTEM, FEAT CAR, ON FOLT		Maintenance Offi	e: CTEM-GBLT-H	VYR		Create D	ate: 05/13/202	2 13:18	
Assat \$/N- F527			Labor Grou	ID: CTEM-GBI T-H	VY.		Actual S	Actual Start: 05/14/2022 21:59		
Location: 1437	E99 GREENBELT YARD		Cabor Gro	w.			Actual Comp: 05/19/2022 05:11			
Work Location: 1197	B98 GLENMONT YARD		Le	d:			Hem: CTEM49200003			
Failure Class: CTEM001	GENERAL		GL Accou	nt: WMATA-02-333	80-50499070-04	·	PR**			
Problem Code: 1025	ACCIDENT/COLLISION/DERAIL		Supervis				Target S	tart		
Requested By:			Requestor Pho				Tarnet Co	mo.		
Chain Mark Start			Chain Mark E	vd:			cheduled S	tart		
Create-Mileage: 0.0			Complete-Milea	ae: 0.0						
Task IDs										
Task ID										
10 Perform Post Incident I	nspection									
Component: 000-400-AE0 CTEM_F	LAT CAR_ FLEET	Work Accomp: IN	SPECTED	Reason: INC	IDENT//ACCIDE	NT Status: CLOSE	Position:	War	ranty?: N	
Actual Labor	-									
Task ID Labor		Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost	
10		05/13/2022	05/13/2022	12:00	13:00	Y	01:00	00:00	\$37.36	
10		05/13/2022	05/13/2022	12:00	13:00	Y	01:00	00:00	\$42.59	
					Total	Actual Hour/Labor:	02:00	00:00	\$79.95	

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05/19/2022 05:12

Figure 11: FC527 Work Order - Page 1 of 2



Washington Metropolitan Area Transit Authority

Maintenance and Material Management System

Work Order Details



Page 2 of 2 MX76PROD

Status: CLOSE 05/19/2022 05:12

Work Description: Post Damage Inspection (Incident 8601212)

Job Plan Description:			
Failure Reporting			
Cause	Remedy	Supervisor	Remark Date
			05/19/2022
Remarks: Performed Post Incident Ins	pection of Flatcar		

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Figure 12: FC527 Work Order - Page 2 of 2

05/19/2022 05:12

work Order #: 17053542 Type: CM	Washing Mainter	ton Metrop nance and N Work	oolitan Area //aterial Mana (Order Deta	Transit A agement S ils	uthority System		Stat 05/1	Page 1 us: CLOSE 9/2022 05:1	of 2 MX76PROD	
Work Description	: Post Damage Inspection (I	ncident 860121	2)							
Job Plan Description Incident Level: A3 Time: 05-07-2022 07:10 Location: Forest Glen Track Number: 2 Train ID: PM 40, PM 26 (Collisi F540 was coupled to PM26 Object: WWPO Supervisor # Personnel: TRST on scene Actions: TRST supervisor resp Impact: Red Line None	: on was with PM26 and F531) informed ROCC at approxim bonded and transported the Pri	nately 0640 that F ime Mover Opera	PM 40 made contac tors for post-incide	t with PM 26 in ent testing.	the work zone	≥∕area. No injuries	or damage	s reported.		
Post Inspection Form 50.993 is	s attached to this WO		Work Informatio							
Accet: MEE40	CTEM ELAT CAR SIN EE40		Owning Office				Bor	onti		
Asset Tag: ME540	CTEW, TEAT CAR, SHAT 540		Maintenance Office	CTEM-NCAR-H			Croate Date: 05/13/2022 12:03			
Asset Full: E540			Labor Group	CTEM GRIT			Actual St	Create Date: 05/13/2022 12:03		
Asset S/N. 1 340			Labor Group	. CTEW-GDET-IT	vi		Actual Start: 05/14/2022 22:00			
Location: 1230	D99, NEW CARROLLION TARD		Crew				Actual Comp: 05/19/2022 05:16			
Ecilure Class: CTEM001	GENERAL		CL Account	. MAAATA 02 223	200 50400070 04	4 *********************************		ent. CTEIVI492	200003	
Problem Code: 1025			Supervisor	. WWATA-02-333	560-50455070-04		Target St	tart.		
Problem Code: 1025	ACCIDENT/COLLISION/DERAIL		Supervisor				Target S	uart.		
Chain Mark Start:			Chain Mark End				cheduled S	tart:		
Create-Mileage: 0.0			Complete-Mileage				cileutieu S	tart.		
Task IDs			Complete-Mileage	. 0.0						
Task ID										
10 Perform Post Incident	Inspection									
Component: 000-400-AE0 CTEM_F	LAT CAR_ FLEET	Work Accomp: IN	SPECTED	Reason: INC	IDENT//ACCIDE	NT Status: CLOSE	Position:	War	ranty?: N	
Task ID Labor		Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost	
10		05/13/2022	05/13/2022	13:00	14:00	Y	01:00	00:00	\$37.36	
10		05/13/2022	05/13/2022	13:00	14:00	Y	01:00	00:00	\$42.59	
					Total	Actual Hour/Labor:	02:00	00:00	\$79.95	
·					Total	Actual froundation	52.00		\$10.00	

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05/19/2022 05:17

Figure 13: FC540 Work Order - Page 1 of 2



Washington Metropolitan Area Transit Authority

Maintenance and Material Management System

Work Order Details



Status: CLOSE 05/19/2022 05:16

Work Description: Post Damage Inspection (Incident 8601212)

Job Plan Description:			
Failure Reporting			
Cause	Remedy	Supervisor	Remark Date
			05/19/2022
Remarks: Performed Post Incident Ins	pection of Flatcar		

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Figure 14: FC540 Work Order - Page 2 of 2

05/19/2022 05:17

Work Order #: 17053146 Type: CM	Washington Metr Maintenance and Wo	opolitan Area T d Material Mana ork Order Detai	Fransit Authority gement System Is	S	Page 1 of 1 MX76PROD Status: CLOSE J5/13/2022 10:05		
	110						
Work Description	: Post Incident Inspection (Incident 860	1212)					
Job Plan Description							
Incident Level: A3 Time: 05-07-2022 07:10 Location: Forest Glen Track Number: 2 Train ID: PM 40, PM 26 (Collisi Object: WWPO Supervisor 4 Personnel: TRST on scene Actions: TRST supervisor resp Impact: Red Line None	on was with PM26 and F531) informed ROCC at approximately 0640 th wonded and transported the Prime Mover Op	at PM 40 made contact erators for post-inciden	with PM 26 in the work zone/ar t testing.	ea. No injuries or dam	ages reported.		
		Work Information	1				
Asset: MPM40	PM40, PRIME MOVER, HARSCO, 354C, S/ N 6100781, 4	Owning Office:	CTEM		Parent:		
Asset Tag: MPM40		Maintenance Office:	CTEM-GBLT-HVYR	Crea	te Date: 05/13/2022 07:23		
Asset S/N: 6100781		Labor Group:	CTEM-NCAR-HVY	Actu	al Start: 05/13/2022 08:24		
Location: 1437	E99, GREENBELT YARD	Crew:	Crew: Actual				
Work Location: 1743	B99, BRENTWOOD YARD, STORAGE AREA	Lead:			Item: CTEM49200006		
Failure Class: CTEM001	GENERAL	GL Account:	WMATA-02-33380-50499070-041-**	*******OPR**			
Problem Code: 1025	ACCIDENT/COLLISION/DERAIL	Supervisor:		Targ	et Start:		
Requested By:		Requestor Phone	t Comp:				
Chain Mark Start:		Chain Mark End:		Schedul	ed Start:		
Create-Mileage: 0.0		Complete-Mileage:	0.0				
Task IDs							
Task ID							
10 Check over for Damag	e from collision						
Performed post incident in	spection and recorded findings on Form 50.993. Attached fo	rm to this work order.					
Inspection performed by:	and						
No damage found. All svs	tems operate normally.						
Component: 000-400-ABZ INSPEC	TION; PRIME MOVER Work Accomp	: INSPECTED	Reason: INCIDENT//ACCIDENT	Status: CLOSE Positi	on: Warranty?: N		
Failure Reporting	· · · · · · · ·						
Cause	Remedy		Supervisor		Remark Date		
· · · · · · · · · · · · · · · · · · ·							
Remarks:							
WT_plust_woprint.rptdesign					05/13/2022 10:07		

Figure 15: PM40 Work Order - Page 1 of 1



Washington Metropolitan Area Transit Authority

Maintenance and Material Management System

Page 1 of 1 MX76PROD

Work Order Details



Status: CLOSE 05/10/2022 10:35

Work Description: Post Damage Inspection (Incident 8601212) Job Plan Description:

-					Mark Informe	tion					
	Asset: ME531	CTEM FLAT CAR S/N E531	i .		Owning Off	ice: IRPG-PDFC			Par	ent:	
	Asset Tag: ME531				Maintenance Off	ice: CTEM-NCAR-H	VYR		Create D	ate: 05/09/202	22 07:23
	Asset S/N: F531				Labor Gro	UD: CTEM-NCAR-H	VY		Actual S	tart: 05/09/202	22 07:28
	Location: 1230	D99, NEW CARROLLTON Y	ARD		Ci	rew:			Actual Co	mp: 05/10/202	22 10:35
Wor	k Location: 1743	B99, BRENTWOOD YARD, S	STORAGE A	REA	L	ead:			It	em: CTEM492	200003
Fa	ilure Class: CTEM001	GENERAL			GL Acco	unt: WMATA-02-333	80-50499070-041-	······_····	PR**		
Pro	blem Code: 1025	ACCIDENT/COLLISION/DEF	RAIL		Supervi	sor:			Target St	tart:	
Red	quested By:				Requestor Pho	one:			Target Co	mp:	
Chain	Mark Start:				Chain Mark E	End:		5	Scheduled St	tart:	
Crea	ate-Mileage: 0.0				Complete-Miles	age: 0.0					
Task IDs											
Task ID											
10	Check over for damage	e from collision									
	Inspectors: /	5/9/2022									
	Performed Post Incident Ir No damage found. 50.993 Inspection form is a	nspection. attached to this work order									
Component	: 000-400-AEZ INSPEC	TION; FLAT CAR	Work	Accomp: If	NSPECTED	Reason: INC	IDENT//ACCIDENT	Status: CLOSE	Position:	War	rranty?: N
Actual Labor	1										
Task ID	Labor			Start Date	End Date	Start Time	End Time	Approved?	Regular Hours	Premium Hours	Line Cost
10				05/09/2022	05/09/2022	06:00	10:00	Y	04:00	00:00	\$167.03
10				05/09/2022	05/09/2022	06:00	10:00	Y	04:00	00:00	\$167.86
							Total A	ctual Hour/Labor:	08:00	00:00	\$334.89
Failure Repo	rting										
Cause			Remedy				Supervisor			Rem	ark Date
1023	ACCIDENT OTHER V	EHICLE INVOLVEMENT	3192	TESTED /	INSPECTED					05/10	0/2022
Remarks											
	; Performed Post Incident I	nspection									
	; Performed Post Incident I	nspection									

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05/10/2022 10:36

Figure 16: FC531 Work Order - Page 1 of 1

Appendix D – WWPL Written Summary

TO BE COMPLETED AND Witness or Employee Statement Form M Washington Metropolitan Area Transit Authority DISTRIBUTED WITHIN 24 HOURS Incident Information Date/Time Reported Location Incident Time Date BOJ PLATFORM PMYO 5/7/2022 65:15 05:20 Incident ID# (from OCC) - Completed by Supervisor SMS Incidents/Accidents Report# Completed by Supervisor nvolved Person or Witness (Non-WMATA Involved Person or Witness) Na Phone Number E-Mail Ad What happened prior to the incident/accident? Par 40 WAS TRANSPORTS ATE Personnel Back to BO 9 PHEADERN - PM 40 PUSKy FIATS CHR - BUMP PM 26 KNUCKLE AND SOME ATE Personnel Felt Suffle Impact - going Loss than 5 mpH NU MCDICA (Hearton Requested and NO DAMAGE to Many UNITS Describe the incident/accident SAME AS ABOVE What happened after the incident/accident? Pm 40 checked up unit and All Ressonved wase terring for the Dry (Shift Che Je) RUIC Morgan 6104 Reported Incident TO Me (Tim the Cariousis) se indicate the area of the injury by placing an X on the corresponding body parts below. To specify which side of the body volved, please use "L" for left and "R" for right. DIvjuries Date: 5-7-22 Employees Turn Over to Complete

Appendix E – CENV: Incident Report

Executive Summary

At approximately 0640 hours on the morning of May 7, 2022, at B09 Forest Glen station, Track 2, PM40/F531 consist traveling outbound, in the reverse direction, contacted stationary PM26 consist (Figure 1 and Figure 2). No injuries were reported from the incident. After a successful rolling brake test was performed on PM40 and PM26, work resumed at the Forest Glen work zone. PM40 and PM26 do not have data or video recorders.



Figure 1 – PM40 prior to contact



Figure 2 - PM26 prior to contact

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Figure 17: Shows the executive summary of the CENV incident report.

Introduction

PM26 and PM40 are two of the twenty-two 354c Prime Movers manufactured by Harsco Rail. The Prime Movers are utilized by Track and Structures for transportation of materials and personnel and preventive maintenance of track and structures throughout the Metrorail system. Prime Movers are limited to transporting two units of trailing stock. Located inside the cab are the main console and operators' seat where all general functions of the prime mover can be controlled and monitored. The Harsco Prime Mover cab is equipped with travel benches to seat eight personnel. The vehicle also has a remote operator's station (ROS) located at the B end. Operation at the ROS is limited to work activities such as creep travel and crane operation. Emergency shutdown and emergency brake dump valve are present at the ROS.

F531 is a standard WMATA flatcar with a flagman's booth at the B-end. The flagman's booth has directional lighting a horn, and an emergency brake dump valve.

Findings of Investigation

At approximately 0640 hours on the morning of May 7, 2022, ROCC was notified of an Unusual Occurrence where PM40 coupled with F531 contacted PM26 at Forest Glen Station Work Area (Attachment 1). A successful brake test was performed on PM40 and PM26. Work resumed at the Forest Glen work zone. CTEM arrived on the scene and inspected both PM26 and F531 knuckles. No damage resulted from the contact (Attachment 2). Post-incident, PM40/F531 transported to Brentwood yard (B99), and PM26 transported to Glenmont yard (B98).

CTEM performed additional functionality tests on PM40 and F531 the following day. No deficiencies were noted (Attachment 3 and Attachment 4).

CENV personnel inspected both consists on May 9, 2022 and concurs with CTEM reporting (Figure 3 & Figure 4). Neither PM40 nor PM26 is equipped with data or video recorders. No further analysis can be performed.

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Figure 3 – F531 B-end coupler



Figure 4 - PM26 A-end coupler

Figure 18: Shows the introduction and findings from the CENV report.

Conclusion

No damage resulted from this incident. Both CENV and CTEM could not identify deficiencies with any of the units that would have contributed to this incident. Data and video are not recorded on incident units to determine operational activity prior to contact.

Recommendations

- Install data recorders on-board Prime Movers.
- Install multi-camera video recorders on-board Prime Movers.

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Figure 19: Shows the conclusion and recommendation from the CENV report.

Appendix F – Root Cause Analysis



Root Cause Analysis