Washington Metropolitan Area Transit Authority
Board Action/Information Summary

Action ● Information	MEAD Number:	Resolution: Yes ● No

TITLE
Briefing on Red Signal Overruns

PRESENTATION SUMMARY
The Department of Safety & Environmental Management (SAFE) will brief the Board on the red signal overruns and actions to mitigate the potential hazard.

PURPOSE
The Board Safety Committee will receive an briefing on red signal overruns, corrective actions, both current and pending, based on analysis conducted. Further, the committee presentation provides transparency to our stakeholders, employees and public in the Washington metropolitan area community.

DESCRIPTION
WMATA continues to work and is committed to identifying and mitigating hazards that pose a safety issue to our employees and customers. Red signal overruns are a lapse in safety that violate one of Metro's cardinal rules and pose potential for serious injury and property damage.

Key Highlights:

- The number of red signal overruns violations has fluctuated with 17 in 2012 to a low of 11 in 2013. As of this report, there have been eight red signal overruns.

- WMATA is required to report each instance to its oversight agency and conduct an investigation. In 2015, WMATA received the Attitcus report, *Investigation of WMATA Red Signal Violation Incidents* as well as various recommendations from oversight agency. Implementation of recommendations is currently ongoing.

- On July 14, 2016, our oversight agency, Federal Transit Administration Washington Metropolitan Area Transit Authority Safety Oversight (FWSO), issued preliminary report on Red Signal Overruns for comment. Final report expected before the end of July 2016.

Background and History:

Red signal violations are a serious safety lapse that violates WMATA's cardinal rule that:

> "Rail vehicles shall not be operated past or closer than a point 10 feet in approach of an interlocking signal or lamp displaying a red aspect, a red glad, or a dark interlocking signal except a t a bump post or entering a pocket track, or unless authorized by ROCC or the interlocking operator and the move is consistent with customer safety as specified in Rule 3.1."

Red signal violations are primarily caused by human factor related errors such as inattention and distraction, inexperience or unclear communications between operator and controller.

The number of red signal violations has fluctuated year over year averaging approximately 14 a year. As of this report, there have been eight red signal overruns. The occurrences happen as frequently on the mainline as in the yards.

Calendar Year	Red Signal Violations
2012	17
2013	11
2014	14
2015	16
2016	8
TOTAL	66

Discussion:

Preventing red signal overruns continues to be a challenge. Historically, WMATA has offered re-training, notices to operators, safety blitzes and stand-downs and even installed new signs on operator consoles and additional signs in areas to identify upcoming signals. Yet the number of red signal overruns has not statistically decreased. In response to this, a study was commissioned and a number of recommendations were identified in the Attitcus report received in early 2015. These recommendations and others received as part of our oversight agency's inspection and audits are currently being implemented with the expectation that all of the corrective actions will be completed by first quarter of 2017. The current preliminary report on the same subject will be reviewed and additional corrective actions required will be developed from their recommendations.

Funding Impact:

No additional funding is necessary at this time.

Timeline:

Previous Actions	• Investigate each red signal overrun • Implemented corrective actions
Anticipated actions after presentation	• Continue to implement all corrective actions • Review and develop additional corrective actions • Update Board Committee quarterly on status

Recommendation:

To inform the Board's Safety Committee of the status of red signal overruns and steps taken to address the issue.

This page intentionally left blank.

Washington Metropolitan Area Transit Authority

Update on Red Signal Violations

Safety Committee
July 28, 2016

Red Signal Violation

- Vehicle passing a signal displaying a red aspect without authorization
- It is a breach of safety defenses
- It can lead to catastrophic damage to property or serious personal injury

Background

- Since 2012, over 60 “red signal violations’’
- Overruns reported to Oversight
- Investigations performed
- Commissioned Attitcus Report
- Corrective actions ongoing

Occurrences of Red Signal Violation

- Mainline and yard
- All hours, time of day/week
- Train and track equipment
- Operates under restrictive train speed, <12mph
- Human error contributing factor

YEAR	NUMBER
2012	17
2013	11
2014	14
2015	16
2016	8
TOTAL	**66**

Corrective Actions

Ongoing Actions

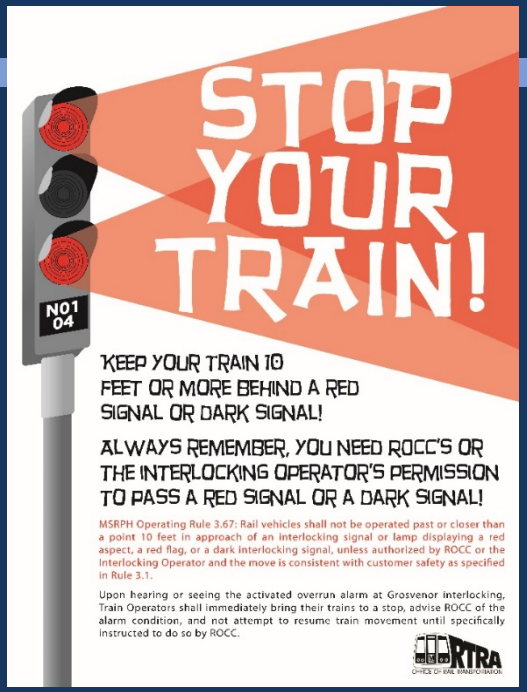
- Re-training efforts
- Notices
- Safety blitzes
- Procedural changes
- New physical signage
- Disciplinary action

Pending Actions

- Schedule Adjustment
- Radio Training
- Yard Schematics
- Console Stickers
- Signal Recognition Aid
- Compliance Testing

Next Steps

- Continue to implement all corrective actions
- Review and develop additional corrective actions to address latest report
- Identify technology solutions
- Update Committee quarterly on status



ATTICUS
CONSULTING GROUP LLC

Investigation and Analysis of

WMATA 2014 Red Signal Violation Incidents

Preliminary Report

April 29, 2015

Prepared for: Mr. Rob Troup,

Deputy General Manager of Operations

Washington Metropolitan Area Transit Authority

"Human factors are the leading cause of train accidents and incidents in the United States. Human factors go well beyond the operator who operates on-track or on-road equipment. They include local and senior management support and oversight, operating practices and procedures, technologies and facilities, and the work culture-in short, the socio-technical environment in which public transportation employees work."[1]

BACKGROUND

At the Association of American Public Transit Association (APTA) CEO Conference held in Washington, DC, February 10, 2014, Randall Jamieson and Dr. Daniel Smilek of the Atticus Consulting Group LLC (Atticus) made a presentation titled, 'How to Identify and Prevent Human Attention-related Errors and Accidents in Public Transit Operations'. Following their presentation, Mr. Rob Troup, Deputy General Manager of Operations of the Washington Metropolitan Area Transit Authority (WMATA) approached Mr. Jamieson and Dr. Smilek indicating that WMATA had experienced four (4) recent red signal violations in its rail operation and that he was very interested in learning more about Atticus' approach to identifying and preventing major rule violations such the red signal violations they were experiencing. Mr. Troup advised that although WMATA had recently undertaken work with regards to situational awareness, he was interested in Atticus making a presentation(s) to his operations team and discussing the possibility of incorporating Atticus' human attention performance training into WMATA rail operations training curriculum. Following a series of telephone conversations and email exchanges between Mr. Troup, Linda Stoffregen, Director of Operations Management Services and Atticus and subsequent requests for proposals to provide information sessions and attention performance training, Atticus was given the notice to proceed to undertake a study, using interviews and existing data, to analyze the potential causes of the four (4) red signal violations and to make recommendations as to what the Authority might do in the future to proactively prevent these rule violations from reoccurring.

SCOPE OF WORK[2]

The portion of the scope of work as outlined by WMATA for which this submission refers, required that Atticus, 1) investigate a total of four (4) recent red signal violations that occurred in WMATA train operations, 2) analyze the potential cause(s) of those violations and, 3) make recommendations as to what the Authority might do to proactively prevent these kinds of rule violations in the future. Following is the scope of work presented to

[1] Federal Railroad Administration, May 2007

[2] The complete Scope of Services document is attached in Appendices #

Atticus by WMATA regarding its investigation and analysis of WMATA's red signal violations.

> Red Signal Violations
>
> a) Scope of Services:
>
> There have been four (4) recent red signal violations on the WMATA property, the consultant shall perform a study, using interviews and existing data, to analyze the potential causes of the violations and make recommendations as to what the Authority may do in the future to proactively prevent these rule violations, including appropriate disciplinary measures. It is expected that the consultant will be provided copies of the incident reports and will conduct interviews. On-site visit is expected to be no more than three (3) working days.
>
> b. Deliverables:
>
> i. Investigation and analysis of red signal violation
> ii. Preliminary written report on findings and conclusions
> iii. Final written report on findings and conclusions
> iv. Presentation to senior management staff on findings and recommended actions

Notwithstanding the limits of the above noted scope of work as outlined by WMATA, due to the critical nature of this type of major rule violation and in the interest of providing added value to WMATA, Atticus undertook to conduct a comprehensive investigation and analysis all of WMATA's red signal violations incidents that occurred in WMATA train operations during 2014. It should be noted that there will be no additional cost to WMATA for this additional work.[3]

METHODOLOGY

Following the notice to proceed and consistent with the Scope of Services between WMATA and Atticus, Randall Jamieson and Dr. Daniel Smilek of the Atticus Consulting Group LLC (Atticus) provided Mr. Rob Troup, WMATA Deputy General Manager of Operations and his senior management staff with an on-site presentation titled "Identifying and Preventing Human Attention-related Errors and Rule Violations in WMATA Rail Operations" on December 3, 2014. Following that presentation Mr. Jamieson and Dr. Smilek undertook a series of on-site interviews with senior WMATA operations and safety management staff and the Tri-State Oversight Committee (TOC) Chairperson, Klara Baryshev. In addition, between December 3, 2014 and December 5, 2014 Mr. Jamieson and Dr. Smilek commenced a series of in-depth interrogative interviews, follow-up interviews, webinar presentations and limited attention performance training with numerous WMATA corporate and field operations, safety and training officers, train operators, interlocking operators, terminal

[3] The RTRA Red Signal Overruns list of red signal violation incidents that Atticus was supplied by WMATA indicated that a total of eleven (11) red signal violations occurred during 2014 including an incident that was alleged to have occurred on October 12, 2014. However, during the course of its investigation Atticus revealed that although this incident had been identified at the time that it occurred, investigated by WMATA management and corrective disciplinary action had been taken against the train operator in question, on further forensic investigation by the Superintendent responsible for the territory involved, it was determined that the initial interpretation of the TWC Report by ATC's engineer was incorrect and that the train operator did in fact have a permissive signal, as she had claimed throughout the investigation. Therefore it was ultimately concluded by WMATA train operations management that this alleged violation of Metro Rail Rule 3.67 in fact did not occur.

and station supervisors, members of the TOC and the president and board members of the Amalgamated Transit Union ATU Local 689. A list of the work related activities and approximate time spent by Atticus conducting its investigation and analysis of WMATA's 2014 red signal violation incidents is outlined in Table No. 1 below.

WMATA Red Signal Violations Investigation and Analysis Work Related Activities Undertaken by Atticus	**Time Spent**
On-site senior WMATA management interviews	2.5 days
In-field train riding and facility observations	1.5 days
WMATA documentation requisitioning and review	5 days
On-site meeting and webinar presentation to the TOC	.25 days
Administration and coordination of telephonic interviews	3 days
Telephonic interviews with WMATA corporate and field safety, operations, training, QC and ROCC managers	3 days
Telephonic interviews with train operators, interlocking operators and terminal supervisors	12 days
Telephonic interviews with exemplary employees[4]	1 day
Telephonic interviews and presentation to the Amalgamated Transit Union, ATU Local 689 President and Board Members	2 days
Preliminary Report preparation (ppt. presentation)	4 days
Preliminary Report preparation (Word document)	3 days
Final Report preparation	TBD
Final Report Presentation	TBD

Table No. 1

Following is a comprehensive report of the investigation and analysis of each of WMATA's 2014 red signal violation incidents. Each incident is broken down with first a report of the Findings and Conclusions reached by WMATA field operations and corporate safety officers during their investigation of each of the red signal violation incidents that occurred during 2014, followed by the Corrective Action(s) recommended by WMATA corporate safety officers following the completion of their investigation of each of these incidents. A summation of Atticus' Investigation and Conclusions reached during its investigation and analysis of each of these incidents as well as the root cause, contributory cause(s) and systemic cause(s) identified by Atticus are also documented in sequential order by date of occurrence for each of the red signal violation incidents that occurred during 2014. A summary of conclusions and recommendations proposed by Atticus is located on pages 11-13 of this report. A discussion of Atticus' overall findings and thoughts regarding each of the red signal violation incidents will be provided in Atticus' Final Report.

[4] In addition to conducting in-depth interviews with eleven train operators who were involved in a red signal violation during 2014, several comprehensive interviews and follow-up interviews were conducted with a number of WMATA train operators who had clear disciplinary and safety records, are commonly regarded as being exemplary employees and who were amenable to participating in the interview process with Atticus investigators.

WMATA 2014 RED SIGNAL VIOLATION INCIDENTS BY LOCATION

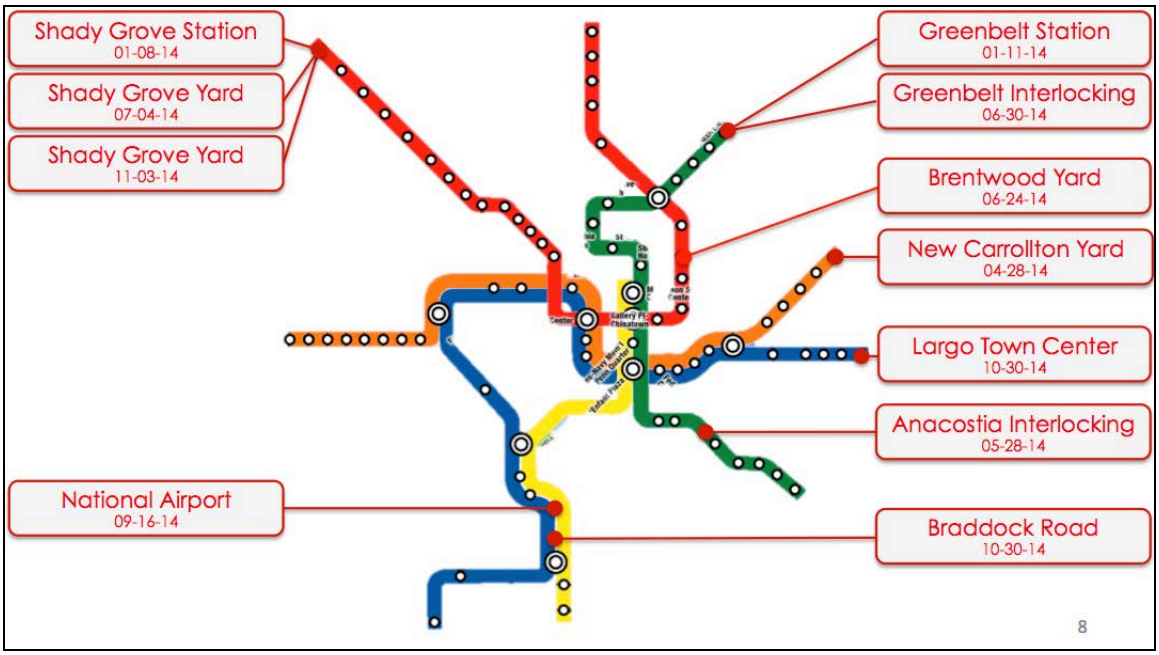


Figure No. 1

Analysis of WMATA 2014 red signal violation incidents by location indicates that while there was a fairly broad and random distribution of these incidents, there was a noticeable concentration of incidents with trains departing yards or initial terminals. The most notable yard was the Shady Grove yard. However, Greenbelt station, Brentwood yard, New Carrollton yard and Largo Town Center were locations where trains were originating a run or yarding at the facility.

WMATA 2014 RED SIGNAL VIOLATION INCIDENTS BY TIME OF YEAR

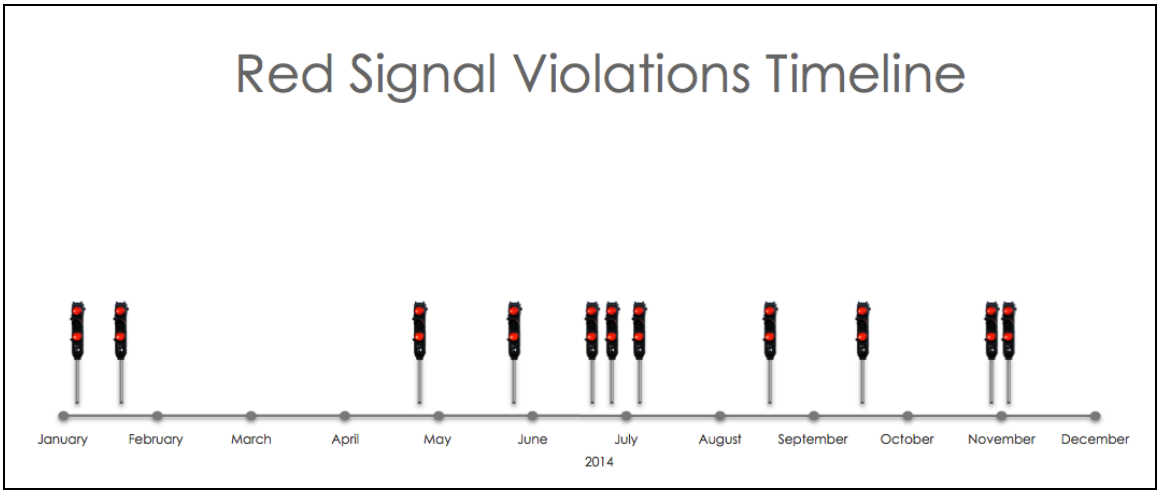


Figure No. 2

HUMAN FACTORS ANALYSIS AND CLASSIFICATION SYSTEM - RAILROAD (HFACS-RR: TAXONOMY)

"Human factors are the leading cause of train accidents and incidents in the United States. Human factors go well beyond the operator who operates on-track or on-road equipment. They include local and senior management support and oversight, operating practices and procedures, technologies and facilities, and the work culture-in short, the socio-technical environment in which public transportation employees work."[5]

For the purpose of its investigation and analysis of WMATA's 2014 red signal violation incidents, Atticus followed the following guidelines: 1) general principals of root cause investigation and analysis, 2) cognitive interviewing techniques, 3) past experience conducting root cause investigations and analysis of rail related major rule violations and accidents, and 4) the Human Factors Analysis and Classification System – Railroad (HFACS-RR: Taxonomy) as adapted by the Federal Railroad Administration.

The Human Factors Analysis and Classification System (HFACS) was originally developed at the Federal Aviation's Civil Aeromedical Institute by Scott Shappell and Douglas Wiegmann based on James Reason's "Swiss Cheese Model". Wiegmann and Shappell further refined HFACS in their book, A Human Error Approach to Aviation Accident Analysis (2003), in order to explore antecedents of human error. The original model has four levels of antecedent causation: unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational factors.

Wieggmann's & Shappell's HFACS was adapted for rail operations by the Federal Railroad Administration Office of Research and Development and renamed "The Human Factors Analysis and Classification System – Railroad (HFACS-RR: Taxonomy)". The HFACS-RR: Taxonomy was the organizing framework utilized by Atticus to categorize the root causes, contributory causes and systemic causes of WMATA's 2014 red signal violations. The HFACS-RR has been reproduced in Figure No. 3 below.

[5] Federal Railroad Administration, May 2007

The Human Factors Analysis and Classification System – Railroad[6]

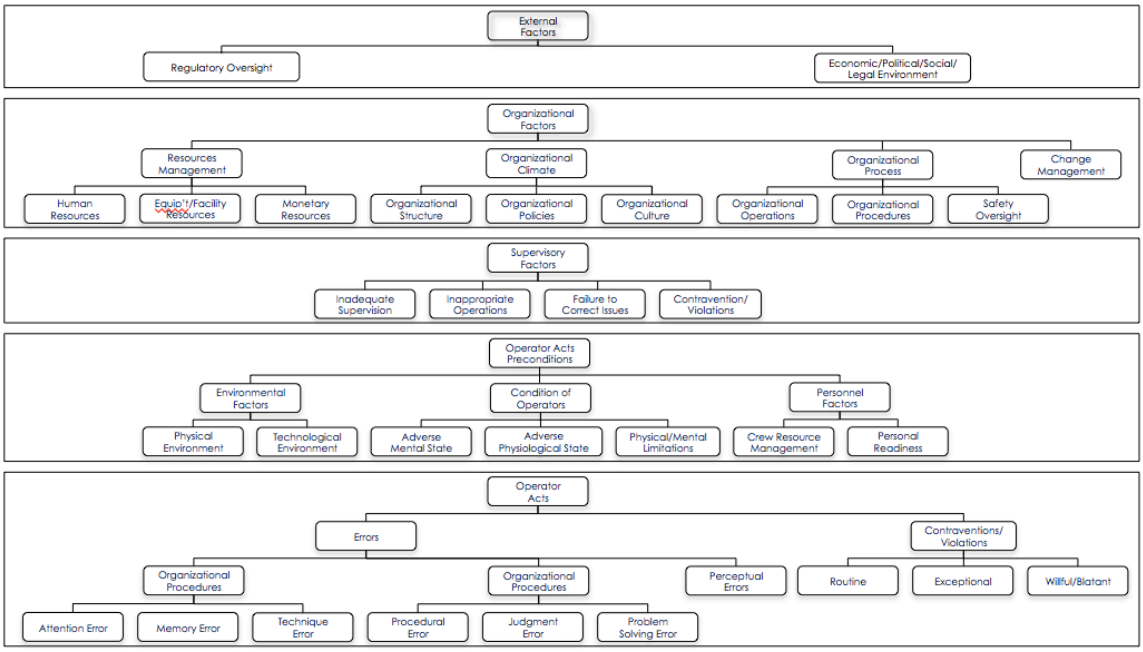


Figure No. 3

[6] The Human Factors Analysis and Classification System was originally developed by Wieggmann & Shappell, 2003). For the purpose of its Investigation and Analysis of WMATA's 2014 Red Signal Violation Incidents, a version of Wieggmann's & Shappell's HFACS that was adapted for rail operations by the Federal Railroad Administration Office of Research and Development was utilized.

COMPARISON OF WMATA' VS. ATTICUS' DETERMINATION OF THE ROOT CAUSES OF WMATA'S 2014 RED SIGNAL VIOLATION INCIDENTS

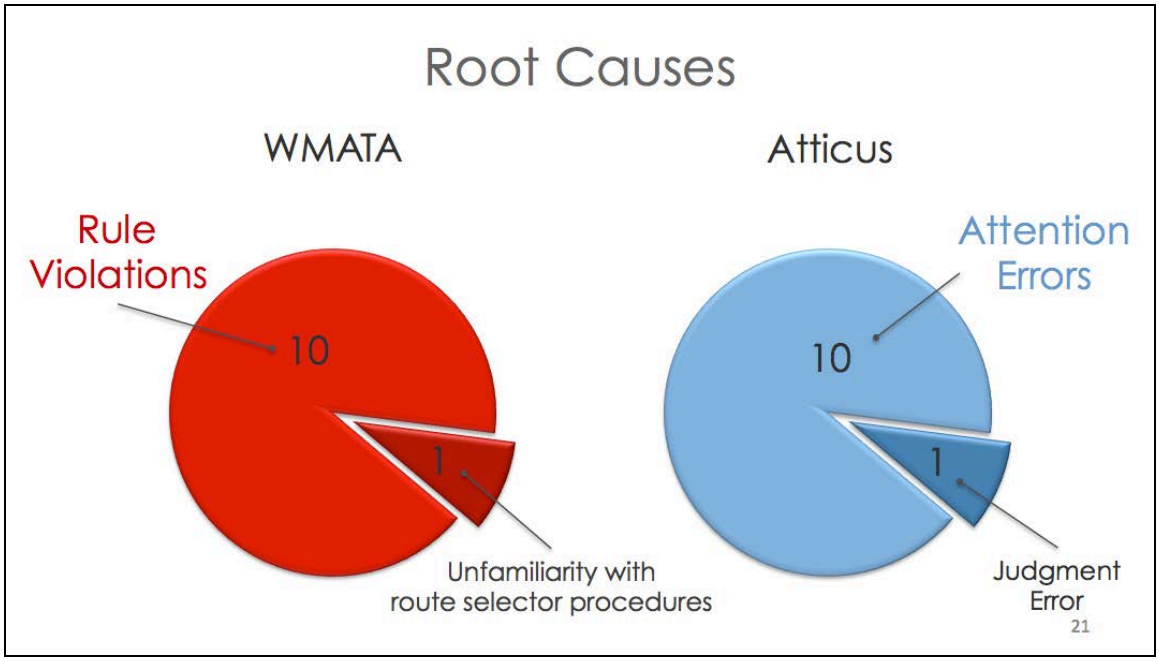


Figure No. 4

COMPARISON OF WMATA' VS. ATTICUS' DETERMINATION OF THE CONTRIBUTORY CAUSES OF WMATA'S 2014 RED SIGNAL VIOLATION INCIDENTS

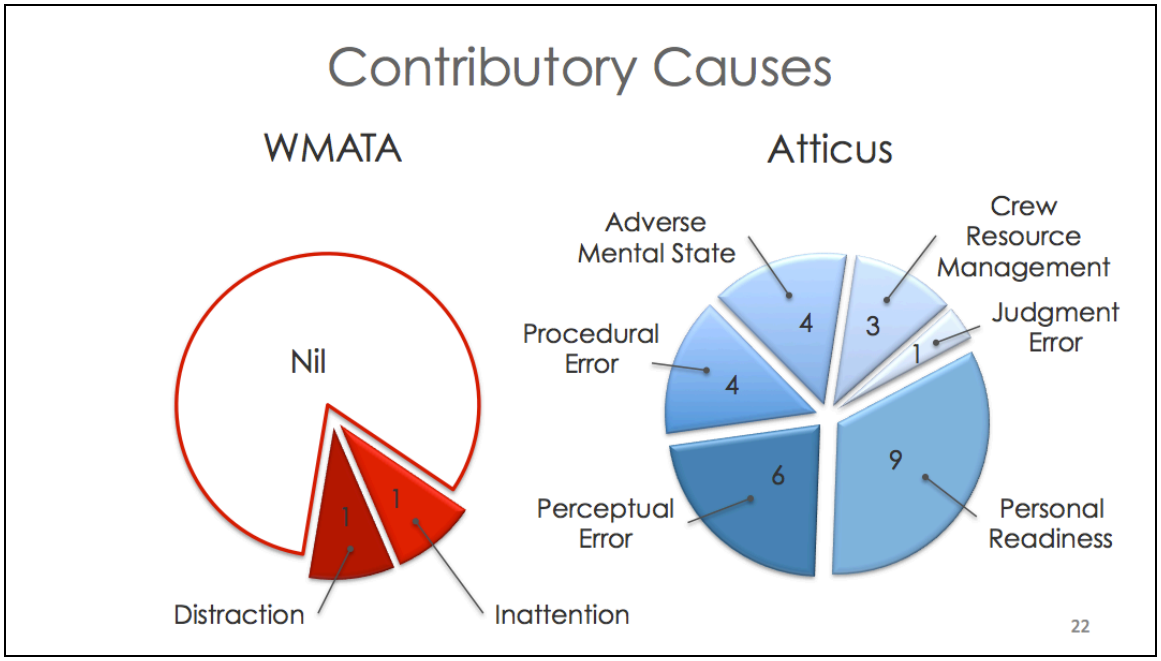


Figure No. 5

COMPARISON OF WMATA' VS. ATTICUS' DETERMINATION OF THE SYSTEMIC CAUSES OF WMATA 2014 RED SIGNAL VIOLATION INCIDENTS

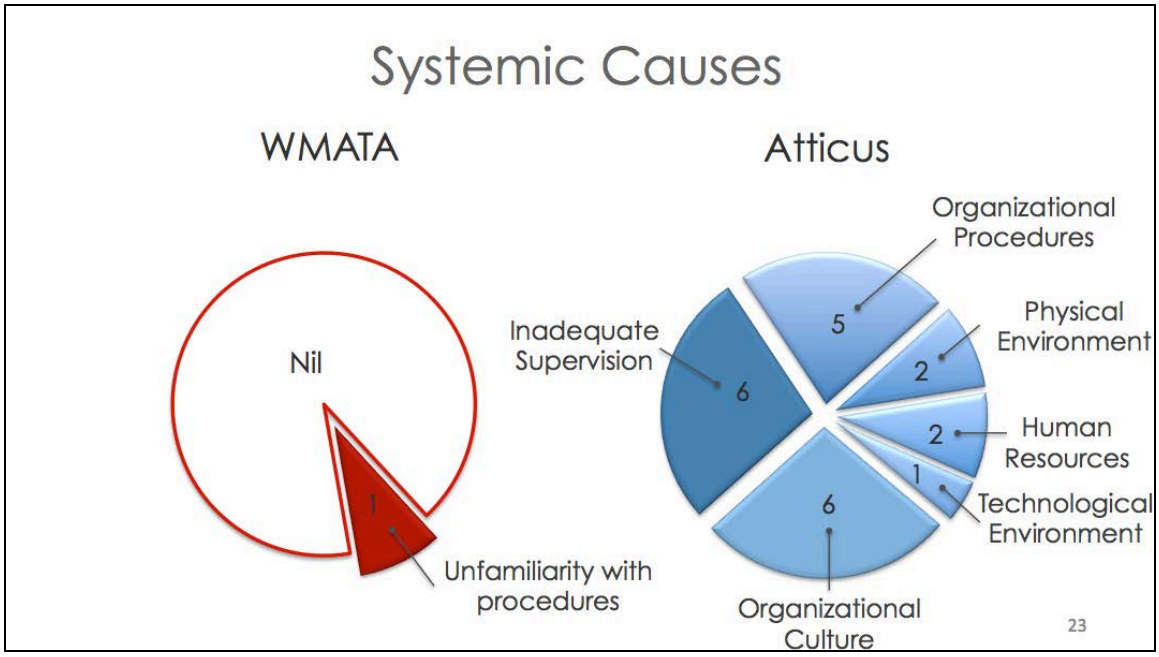


Figure No. 6

SUMMARY OF ATTICUS' CONCLUSIONS AND RECOMMENDATIONS

Category	Summary of Recommendations
1. Organizational Culture	1.1 WMATA leadership should consider relaxing the extent of its focus on on-time performance and the resultant unintended rushing by train operating employees to meet on-time performance expectations. Areas for consideration include train operating schedules, station dwell times, end-of-line turn-around times, employee break times and yard preparatory allowances.
2. Technological Environment	2.1 WMATA leadership should consider automating the announcement of routine, repetitive route information messaging to on-board passengers while en-route thereby removing this non-safety critical task and distraction to train operators when operating trains.
3. Organizational Procedures	3.1 WMATA leadership should consider revising its incident investigation reports and 'Lessons Learned' documents to include that they uniformly provide a clear delineation the root cause(s), contributory cause(s) and systemic cause(s) of incidents under investigation. 3.2 WMATA leadership should consider implementing a safety policy that prohibits contacting train operators while they are engaged, or about to engage, in train operations unless it is an operational or critical safety related matter. 3.3 WMATA leadership should consider tempering the tone of language directed towards employees in employee investigation reports consistent with appropriate and effective educational and behavioral change techniques. 3.4 WMATA leadership should consider revising its root cause investigation procedures for its train operations and safety managers to enhance their understanding of the causal role that human factors, particularly human attention-related errors, plays in rule violations and accident causation.
4. Inadequate Supervision	4.1 WMATA leadership should reinforce its radio communication protocols among train operators, terminal supervisors and interlocking operators to prevent on-going miscommunication among the parties.
5. Crew Resource Management	5.1 WMATA leadership should consider reinforcing the caliber of its crew resource management practices among train operators, interlocking operators, terminal supervisors and the ROCC.

SUMMARY OF ATTICUS' CONCLUSIONS AND RECOMMENDATIONS (cont'd)

Category	Summary of Recommendations
6. Procedural Errors	6.1 WMATA leadership should review it procedures for how trains are yarded/set-out at New Carrollton Yard. Currently there are discrepancies with regards to whether certain trains have or have not been previously provided interior/exterior inspections and when train are yarded whether trains have been yarded just clear or foul of the bond circuits of certain controlling signals.
7. Adverse Mental State	7.1 WMATA leadership should consider providing train operating employees with information and training to assist them in the managing their mental state and attention as required when engaged in train operations.
8. Perceptual Errors	8.1 WMATA leadership should consider providing train operating employees with training to assist them in identifying and managing their expectations and automatic, habitual responses to the routine and repetitive aspects of WMATA's train operations.
9. Personal Readiness	9.1 WMATA leadership should consider the immediate implementation and mandatory use of the "Point-of-Power job aid for train operators. 9.2 WMATA leadership should consider providing train operating employees with training to assist employees in managing their personal readiness in preparation for and during train operations.
10. Human Resources	10.1 WMATA leadership should assess its train operations FTE requirements in terms of its exposure to and potential for human error when train operating employees are routinely required to move up a train, make a "quick and safe turnaround" or consistently miss scheduled breaks. 10.2 WMATA leadership should consider shifting its approach towards train operating employees from one that focuses on their omni-present potential for failure (e.g. *"You are only as good as your last move"*) to one that encourages operational competency, professionalism and exemplary performance in their craft.

SUMMARY OF ATTICUS' CONCLUSIONS AND RECOMMENDATIONS (cont'd)

Category	Summary of Recommendations
11. Training	11.1 WMATA leadership should consider providing attention performance training for its train operators to educate them in the science of human attention and provide them with the skills and strategies necessary to consistently monitor, prioritize and focus their attention on safety critical tasks. 11.2 WMATA leadership should consider providing attention performance training for its operations, safety and training staff to educate them in the science of human attention and provide them with an understanding of how to manage conditions and situations in the work environment to reduce the potential negative impact on train operations and the safety performance of train operations employees. 11.3 WMATA leadership should consider revising its current yard familiarization training for train operators to include familiarization training at each of its terminals and yard locations. When necessary (e.g. following major infrastructure or operational changes, refresher training should also be considered.

POINT-OF-POWER JOB AID FOR TRAIN OPERATORS
ATTICUS CONSULTING GROUP LLC

During the investigation and analysis of WMATA's 2014 red signal violations one of the most significant and influential contributing factors in nine (9) of the eleven (11) red signal violation incidents is the rushing of train operators as they strive to achieve or maintain on-time train performance expectations combined with their automatic habitual behavior of going to a point-of-power automatically without full conscious awareness of their speed commands, signal indication nor switch position.

During the interviews conducted with the train operators who experienced a red signal violation during 2014 and exemplary operating employees who have maintained a clear disciplinary and safety record and who are regarded by their peers and superiors as being exemplary employees it became evident that in each of the red signal violation incidents, the train operator was on some level at-the-effect of what one WMATA train operator referred to as WMATA's "Rush-Rush" operating culture (A detailed account of WMATA's "Big Rush-Rush" operating culture can be found in Section# WMATA's Organizational, Operational and Safety Culture of this report).

During the interviews it became evident to Atticus, less so to the train operators, that WMATA's drive for on-time performance and the "Rush-Rush" operating culture that WMATA train operators find themselves operating in is, unbeknownst to them, causing them to unwittingly engage in Rush-Rush' operating behaviors themselves. Critically, WMATA train operators in their drive for on-time performance are at times failing to consciously attend to and verify speed commands, signal indications and alignment of switches as required by rule, prior to engaging the master controller and going to a point-of-power with their trains. Their rushing, albeit for the most part well intended, and resultant attention-related errors are causal in their failure to consistently and sequentially apply MSRPH Operating Rule 3.67, MSRPH Operating Rule 3.79, and MSRPH Operating Rule 1.79 and resultant red signal violation incidents under investigation.

Of particular concern are those routine, repetitive safety-critical tasks and routine and repetitive safety-critical task sequences that train operators must perform repeatedly throughout their work day and career that, when performed without full conscious awareness or in the proper sequence, are likely to result in a major rule violation or potentially catastrophic accident. It was also noted that train operators experience other attention-related errors such as station over-runs, opening and closing train door mistakes and line announcement errors that although on the surface appear to be not as egregious as a red signal violation, could also expose WMATA leadership to undesirable liability costs. At a minimum, such other attention errors and slips could be used as a proxy measure to identify the full potential of WMATA's liability due to attention-related errors in WMATA train operations.

Therefore, in an effort to facilitate an immediate and critical change in the operating behavior of WMATA train operators and in advance of any attention performance training that may be considered by WMATA for its employees particularly those in safety critical

positions, Atticus developed the "Point-of-Power" Checklist[7]. The purpose of the "Point-of-Power" Checklist is to provide WMATA train operators with an effective, practical and useable job aid that will be of immediate assistance to them, to be able to consistently and consciously focus their attention on the three key safety critical operating rules that train operators must follow prior to moving their train past an interlocking signal.

The definition of a checklist is as follows:

"A comprehensive list of important or relevant steps to be taken in a specific order"[8]

It should be noted that the Point-of-Power Checklist has been designed deceptively simple so that it does not present a source of distraction for train operators but rather to force train operators to alter their unsafe operating behavior such that they are forced to slow down their automatic physical response (e.g. train operators' natural tendency to automatically physically go to a point-of-power without full conscious awareness of their speed commands, signal indication and switch alignment) and to also forced them to slow down their cognitive response (e.g. train operators' natural tendency to automatically cognitively go to a point-of-power without full conscious awareness of their speed commands, signal indication and switch alignment) in order that they are forced to sequentially focus their attention on the three (3) safety critical steps that train operators have failed to follow in nine (9) of the eleven (11) red signal violation incidents under investigation. It should also be noted that although there were ten (10) red signal violation incidents recorded during 2014 where a train operator did not comply with MSRPH Operating Rules 3.67, Rule 3.76, and Rule 1.79 as a result of an attentional error, it is suggested that there were likely numerous other instances where train operators went to a point of power without conscious awareness of his/her speed commands, signal indication and switch alignment where they either caught their error in time and were able to stop their train before passing the signal or instances where they proceeded past an interlocking signal without complying with these safety-critical operating rules where but for chance, the interlocking signal happened to be a permissive signal.

Therefore the purpose of the "Point-of-Power Checklist", and the attention performance training recommended for train operators is intended to prevent <u>all</u> instances of attention-related errors, not just the ones that happen to result in a red signal violation. For this reason and the fact that the combination train operators' of rushing combined with their automatic habitual behavior of going to a point-of-power automatically without full conscious awareness of their speed commands, signal indication or switch position was a contributing factor in nine (9) of the eleven (11) red signal violation incidents that occurred in 2014 it is strongly recommended that WMATA leadership consider the immediate and mandatory use of the Point-of-Power Checklist by its train operators. An example of the Point-of-Power Checklist and its suggested placement on the control panel in the cab of its motive power are shown in Figure No. 2 and Figure No. 3. Atticus is happy to discuss the specific procedures it has developed and field tested for execution by WMATA train operators should WMATA leadership decide to proceed with this recommendation.

[7] The Point-of-Power Checklist was developed by Atticus Consulting Group LLC. It was field tested for use in WMATA train operations in by an experienced WMATA train operator during the week of March 30, 2014 and found to be effective in assisting the train operator focus his attention on the sequential compliance of MSRPH Operating Rules 3.67, Rule 3.79, and Rule 1.79.

[8] www.businessdictionary.com/defention/checklis

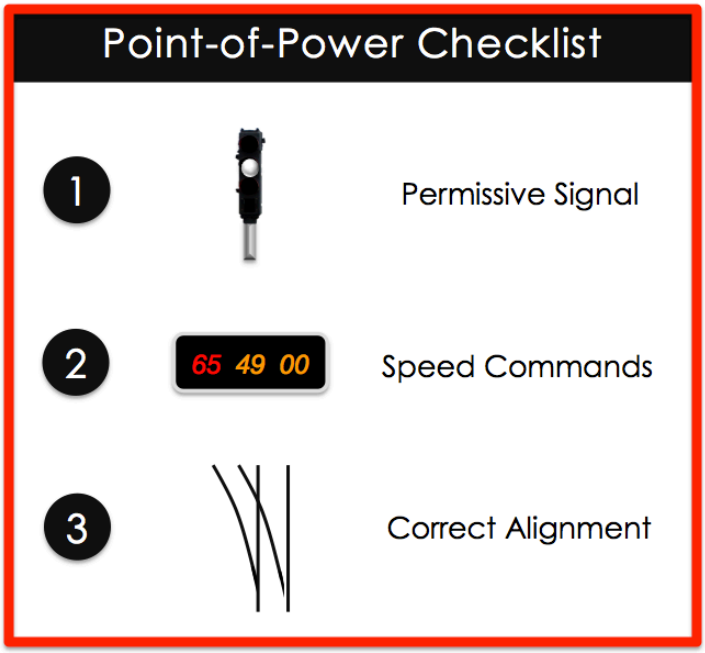


Figure No. 7

Recommended Placement of the Point-of-Power Checklist

Figure No. 8

INCIDENT INVESTIGATION AND ANALYSIS
ATTICUS CONSULTING GROUP LLC

Incident #1: SMS 130602 OCAT19393

Date: January 8, 2014

Location**:** Shady Grove Station: Signal A-15-06

WMATA Findings and Conclusions:

On Wednesday, January 8, 2014, Train Operator 1 was instructed to operate a train from Shady Grove station to White Flint station where she would be relieved. The train was berthed on the track 2 at Shady Grove station. Train Operator 1, who was unfamiliar with the train schedule, requested the leaving time from the Terminal Supervisor who responded that she was due to leave "now". Based on ROCC Playback information, SAFE concludes that Train Operator 1, overran A15-06 signal red. Train Operator 1 was not cognizant of her cab signal (speed readouts) and moved her train without speed commands, failing to adhere to Rule 3.22 which states in part: "Mode 2 - Level 2 is the normal operating mode in yards. On the mainline, vehicles shall not be operated in Mode 2-Level 2 unless specifically authorized by ROCC." Train Operator 1 failed to follow the procedure established for departing the Terminal area by checking her signal aspect, switch alignment, speed commands and finally verifying this information with the Terminal Supervisor. The Terminal Supervisor failed to insured that the proper lead was set in addition to proper communication being established before telling Train Operator 1 that she was due to leave "now".

A Lessons Learned Document "Communications Failure Leads to Red Signal Violation" Number: 2014-001 was issued January 27,2014. In this document SAFE concludes that the root cause of this incident was as follows: "The root cause of the incident were inattentiveness, improper communication, failing to follow established procedure for leaving terminals, and violation of cardinal operating rules: OR 3.1, OR 3.67, and 3.79.

WMATA Corrective Action(s):

1. Train operator suspended for 12 days
2. Discuss incident with Shady Grove Train Operators and develop Lessons Learned document with a focus on Terminal Communications.
3. Lessons Learned issued "Communication Failure Leads to Red Signal Violation"

Recommendations:

Ensure Terminal Supervisors and Operators comply with all operating rules, especially cardinal operating rules.

Discuss rules which pertain to red signals with operators as frequently as possible.

Ensure Terminal Supervisors and Operators follow established procedure for leaving terminal areas.

Inform Train Operators to "look before they leap" by performing a checklist verification. In addition to the formal disciplinary action taken with the train operator and issuance of the Lessons Learned document January 27, 2014 the following job aid was developed in the form of a sticker and placed on the train operators control panel.

Atticus Investigation and Conclusions:

In review of the circumstances leading up to this incident the train operator was scheduled to take her break however, due to a prior power outage, train service schedules were operating late and the operator was required to cancel her break period to operate a train from Shady Grove to White Flint station. The Operator was considered to be a relatively experienced train operator (2 years experience) and very familiar with the Shady Grove station. However, she was not familiar with the schedule of the train which she was requested to operate therefore she requested the leaving time of the train from Terminal Supervisor who responded stating she was "due out now".

During Atticus' interview of the train operator it became quite evident that the train operator relies heavily on her familiarity with the repetitive routine nature of her train operating requirements. Comments such as *"the more you do it the more you relax from thinking"*. In other words the more familiar she has become with operating WMATA trains the more she is likely to rely on her habitual, routine past experiences - in other words "operating on autopilot". It also became very clear that she operates under the felt-sense of urgency to be "on-time". Comments such as *"it was a quick turnaround", and "there is a big rush-rush culture at WMATA", and "everything is on-time, on-time, on-time, and I've got to be at the station on-time"* support this observation.

Looking at this issue from a macro view, due to the transparency of its operations in the face of significant public pressure and geo-political pressure unparalleled in any other transit operation in the country, WMATA's resultant "Rush-Rush" operational culture is an unwitting but significant contributory cause of its red signal violations and no doubt other less egregious operating errors.

The Operator also indicated that, in the instant case her "routine was broken" when she asked the terminal supervisor for the departure time of her train. She stated *"…most of the time when I'm talking to them (Terminal Supervisors/Interlocking Operators) I'm staring right at the signal"*. Although she indicated in her WMATA employee statement that she verified a lunar signal and proper switch alignment, in Atticus' interview of this individual she admitted that she *"assumed everything was set up for her and ready to go"* further supporting the likelihood that she relies heavily on the way things are usually.

She also acknowledged to Atticus that she was rushing and was not paying attention until she lost her speed commands and then noticed that she did not have the proper switch alignment. This supports the fact that the underlying root cause of this incident was an attention-related error on the part of the train operator exacerbated by the operator's unsafe operating behavior of rushing and reliance on and assumption of "everything is set up and ready to go" and not simply an unclear and misinterpreted communication between the operator and the terminal supervisor. In the instant case the train operator's operating behavior was likely informed by familiarity and routine and a sense of urgency to be on time and therefore not consciously attending to the safety critical tasks of verifying speed commands, signal indication and switch alignment.

Therefore being late in a "Big Rush-Rush operating culture" combined with the urgency of being "due out now" contributed to the unfolding of this Train Operator's most prevalent, automatic behavior which was to "go to a point-of-power" immediately after completing her train announcements, closing the train doors despite the then current operating requirement of first receiving a permissive indication at signal A15-06.

Root Cause:

Attention Error:
The Train Operator made her train announcements, closed the train doors and immediately went to a point-of-power, proceeding out of Shady Grove Station past signal A15-06, displaying stop, without conscious awareness of her speed commands, signal indication or switch alignment.

Contributory Cause(s):

Perceptual Error:
The Train Operator admitted to Atticus that she assumed that the Terminal Supervisor *"had everything set-up for her and ready to go"*. As such her perception of her situation was such that all she need to do was to complete her train announcements, close her train doors and depart Shady Grove station.

Crew Resource Management:
There was unclear, incomplete and misinterpreted communication between the Terminal Supervisor and the Train Operator.

Personal Readiness:
The Train Operator admitted to Atticus that she was rushing and not paying attention.

Systemic Cause(s):

Human Resources
Insufficient train operator resources resulted in the train operator being required to cancel her break, move up a train and then make a quick turnaround back to White Flint station.

Crew Resource Management ex Inadequate Supervision
The Terminal Supervisor did not ensure clear and complete communication between himself and the train operator and the train operator did not verify her understanding of the terminal supervisor's communication.

Organizational Culture
There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Incident #2: SMS 20140113OCAT25337

Date: January 13, 2014

Location: Greenbelt Station: Signal E-10-04

WMATA Findings and Conclusions:

Based on T/O's account of incident during interview with SAFE, RTRA Management and ROCC Playback information, SAFE concludes that T/O, overran signal E10-04 Signal and fouled Switch #3A in the normal position. T/O undeniably reported during interview with SAFE that he was rushing and made an assumption that Rail Supervisor instructed him to "close and go." T/O was not aware of his cab signal (speed readouts) and moved his train without verifying lunar signal and speed commands, failing to adhere to Rule 3.13.2 and 3.22.

WMATA Corrective Action(s):

1. Train Operator suspended for 12 days
2. RTRA supervision to discuss incident with Greenbelt Train Operators and Terminal Supervisors.
3. RTRA supervision to develop a directive instructing operators to keep doors open when a route has not been established.
4. RTRA supervision to discuss incident with Terminal Supervisors with an emphasis on clear communications.

Atticus Findings and Conclusions:

On arrival at Greenbelt station Train Operator walked the full length of the station platform to use the washroom. During that time the Terminal Supervisor repositioned the train and readied it for departure. On returning from the washroom the Terminal Supervisor told the Train Operator that ROCC had control of the interlocking. The Train Operator admitted to Atticus that he was excitable by nature and at the time he was not paying attention because he was rushing *"to get down the line"*. He stated that he knew it was time to go and that he rushed past the supervisor on station platform and did not register the conversation where the supervisor told him that ROCC had the board. He stated that he should have communicated with ROCC before departing. The Terminal Supervisor/Road Supervisor indicated that he (Train Operator) always seemed 'very jittery'…always worried about 'being on-time' and that he would try to calm him and other new operators down when train riding.

Root Cause:

<u>Attention Error</u>

The Train Operator rushed from the washroom facilities (approximately 15-steps to the train), made his train announcements, closed the train doors and immediately went to a point of power departing Greenbelt Station past signal A15-06, without conscious awareness of the signal indication, speed commands or switch alignment.

Contributory Cause(s):

Procedural Error
Dual task interference. The Train Operator stated "It's kind-of like simultaneous" referring to observing passengers on the platform, closing doors, watching door lights, closing the cab side window, making announcements and going to a point of power.

Adverse Mental State
The Train Operator admitted to Atticus that he was excitable by nature and particularly because he was a new train operator, and that he was rushing to "get down the line" because he knew he was late.

Personal Readiness
The Train Operator returned hastily from the washroom and then commenced a number pre-departure tasks (observing passengers on the platform, closing doors, watching door lights, closing the cab side window, making announcements). Consistent with the scientific literature there is a cognitive time lag when an individual is required to switch between various tasks. This cognitive time lag referred to as 'Task Switch Cost' is greatest when switching between different tasks such as in the case when Train Operators perform pre-departure tasks.

Systemic Cause(s):

Organizational Culture
There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Inadequate Supervision
The Terminal Supervisor did not ensure clear and complete communication between himself and the train operator and the train operator did not verify his understanding of the terminal supervisor's communication.

Technological Environment
WMATA trains have minimal automated on-train announcements to advise passengers of travel information. This results in Train Operators having to allocate their limited attentional resources among safety critical operating tasks such as braking and stopping the train when arriving at stations and ensuring that they have speed commands, a permissive signal, proper switch alignment and a clear right-of-way when preparing to depart stations, and the non-safety critical task of making passenger related announcements. These divergent demands on Train Operators' attentional resources are comingled with each other at precisely the time when Train Operators' attention must be focused on the safe operation of their train.

Incident #3: SMS 201440428#2815

Date: April 28, 2014

Location: New Carrollton Yard: Signal D-99-38

WMATA Findings and Conclusions:

Train #934 was going in service, track #2 to New Carrollton station (D13), inbound, when the operator proceeded through D99-38 signal which was displaying a red signal aspect. Train Operator stopped Train #934 and contacted the Terminal Supervisor. Prior to the incident, the train consist was positioned at D99-38 signal as the gap train and was scheduled to go into revenue service at 934 hrs. Train Operator #1 boarded the lead car and noticed that the cab was already past the signal. The operator stated she had to open the bulkhead door and look out the #1 door to see if she had a lunar aspect. Because she already had permission by Terminal Supervisor 1 to proceed to the platform, she assumed she already had the lunar and it dropped out because the train was positioned past the signal. Also, The train operator failed to perform a ground walk around inspection and note the location of the governing signal before moving the train, violating Operating Rule 3.67. Because the operator failed to perform an interior/exterior inspection at D99-38 she failed to notice the lead cab wasn't clear of the signal, causing her to move the train before contacting the tower.

WMATA Corrective Action(s):

1. Train Operator received refresher training on Wednesday, May 7, 2014.
2. Corrective Actions covered by Corrective actions from subsequent A&I incidents #585, #593, and #595.

Atticus Findings and Conclusions:

The Train Operator was an experienced train operator, familiar with the track layout and operating norms of the New Carrollton Yard. On arriving at her train the Train Operator noted that signal D99-38 was displaying a red indication and that the leading end of her train was positioned past signal D99-38. After receiving permission to proceed to the station platform and being advised by the gap crew that an inspection of the train had been completed by them she made a judgment decision based on her observation of her train relative to signal D99-38 to proceed with her train to the station platform as instructed.

During Atticus' interview with the train operator, the train operator advised that after the New Carrollton yard had been built, WMATA train consists had increased to 8-car trains which resulted in very tight and congested yard conditions at the New Carrollton Yard. She also indicated that because there is no platform on the track that her train was located on the exact spotting location of trains by mainline crews and yard crews varies. For example when there is sufficient headroom a train can be yarded in this tail track clear of signal D99-38 if the movement is able to pull past signal D99-52. However, if there is not sufficient head room to provide an inbound train to be able to pull in passed signal D99-52 thus clearing signal D99-38, trains are most often left foul, straddling signal D99-38. After noting the position of train#934 (i.e. with the leading cab beyond signal D99-38) the train operator determined, incorrectly, that the train was straddling the circuit for signal D99-38 and as such it was permissible for her to proceed with her train to the New Carrollton station platform as previously instructed.

Root Cause:

Judgment Error
After observing a red signal indication at signal D99-38, assessing the position of her train positioned past the signal, being told by the gap crew that an inspection had been completed on her train and being given permission to proceed to the New Carrollton station platform by the terminal supervisor, the train operator made a judgment decision to proceed to the station platform as instructed.

It should also be noted that contrary to WMATA's Final Report of Investigation wherein the root cause of this incident was identified to be the Train Operator's failure to perform a pre-departure inspection, it is respectfully suggested that it is unlikely that the Train Operator would have been able to discern the exact position of the leading wheels of her train relative to the bond wires of signal D99-38 and whether her train was foul or clear of the signal D99-38 circuit.

Contributory Cause(s):

Crew Resource Management
The Train Operator received permission from the Terminal Supervisor but did not also receive permission from the Interlocking Operator as required.

Systemic Cause(s):

Inadequate Supervision

The Interlocking Operator did not communicate to Train Operator regarding the placement of train #934 relative to signal D99-38 nor did the previous interlocking operator ensure that train #934 was either clear of the bond circuit of signal D99-38 or obviously foul.

Physical Environment

The layout of certain tracks at New Carrollton Yard including the tail track in question and signal its system provides for very tight headroom for 8-car trains.

Organizational Procedures

It appears there is inconsistency in the yarding and lay-up procedures at New Carrollton Yard. At times, when track headroom permits, trains are provided a signal at signal D99-52 and are able to pull well clear of signal D99-38. At times inbound trains and yard movements are advised by the interlocking operator when they are clear of signal D99-38 and at other times crews are required to pull in without assistance from the interlocking operator and therefore leave their train either just clear or foul of signal D99-38.

Organizational Procedures

It appears that there is inconsistency in pre-trip inspection procedures particularly with respect to trains left in tail track(s) at New Carrollton Yard. It appears that at times pre-departure exterior and interior inspections are completed by yard or gap crews while at other times this inspection is the domain of outbound mainline crews.

Incident #4: SMS 20140530#29149

Date: May 28, 2014

Location: Anacostia Interlocking: Signal F06-F08

WMATA Findings and Conclusions:

While servicing the platform at Anacostia (F06), track #2, the operator noticed another train up ahead of him. He then took his time servicing the station. When he no longer could see the red lights of the train ahead he assumed the train had left so he proceeded and didn't see the red signal. He immediately lost point of power, coasted, and was contacted by ROCC. SAFE concluded that the T/O, overran F06-08 signal displaying a red aspect due to inattention while operating without speed commands. The T/O did not verify his cab signal (speed readouts) and moved his train without verifying
lunar signal and speed commands, failing to adhere to Rule 3.67 and 3.79.

WMATA Corrective Action(s):

1. RTRA issued a Lessons Learned document with an emphasis on Operating without speed commands.
2. Retrained incident Train Operator with an emphasis on proper operation when loss of speed commands occur. Train Operator received re-fresher training on rules and procedures on June 6, 2014 by the ROQT department.

Atticus Findings and Conclusions:

The Train Operator involved in this incident had nine (9) months experience at the time of incident and was therefore considered to be an experienced train operator. During his interview with Atticus he indicated that he took his time during his station stop at Anacostia Station because he was being delayed by a preceding train. He stated that when he was stopped at the station servicing the platform his attention was directed to passengers entraining and detraining, including acknowledging passengers by waving back to them. However, when he saw the preceding train depart out of sight he made his train announcements, closed the train doors and then immediately went to a point of power. He admitted to Atticus that he was at that point rushing because he was then feeling *"a little behind schedule"* after having to wait for the preceding train. He also stated that normally the 'lock out' of the switches is usually only 40 seconds to 50 seconds before the light changes which, in the instant case, he stated was longer. He also admitted to Atticus that he *"assumed the light was green"*, and that *"the light should have been green".*

It is interesting to note that, similar to other train operators, this train operator talked of his experience of *"being in the groove"* when servicing stations and when operations are on time. He stated *"you get a rhythm. Once your rhythm is broke then you're awkward because is broken. So now you had to do things slightly different. It's not an excuse but mentally my rhythm was broke because of having to wait at the station for the preceding train. But then everything was back in the groove again. I made my announcement, closed the doors, went to a point of power and looked out the window".* He stated that he then noticed signal F06-F08 displaying a red indication but that his train passed the signal before he could get it stopped. Also worthy of note is the fact that this train operator stated *"you can get so used to doing something routinely it could be dangerous. But I didn't have the experience to do anything routinely".* Critically, although he understood that routine behaviors can become automatic

regardless of changing circumstances and hence can be dangerous, he was completely unaware that his behavior in the instant case "being in the grove" was in fact an automatic response based on his past routine experience and that he did indeed have enough experience as a train operator to perform his duties as a train operator automatically without his full conscious awareness. In his words he was *"in his rhythm"* and because in the majority of instances he has a permissive signal when operating going to a point-of-power without full conscious awareness of speed commands, signal indication and switch alignment has not presented itself as a problem.

However, based on an understanding of human attention and the process of conducting this investigation and analysis of WMATA's 2014 red signal violations it is suggested that there are numerous instances where WMATA train operators pass interlocking signals without full conscious awareness but by virtue of the fact that the majority of the wayside signals encountered by train operators are permissive signals, this critical latent exposure to attention-related errors and potentially catastrophic accidents has remained unknown.

Root Cause:

Attention Error
On realizing that he would be delayed by a preceding train the train operator took his time servicing the station. During this time his attention was directed to passengers entraining and detraining, including acknowledging passengers by waving back to them. After seeing the preceding train depart out of sight he made his train announcements, closed the train doors and then immediately went to a point of power without full conscious awareness of his speed commands, signal indication, or switch alignment. In the Train Operator's words *"I would say it was a momentary lack of focus"*.

Contributory Cause(s):

Personal Readiness
The train operator became disengaged from primary task due to extended dwell time. Because he was delayed waiting for the preceding train, he was rushing to be on-time. In the train operator's words he *"wanted to be punctual"*.

Perceptual Error
The train operator admitted that he believed that the signal would be a permissive signal due to the length of time from when he saw the preceding train depart.

Procedural Error
Dual task interference. The train operators attention had been allocated to station related work. In the instant case this included acknowledging passengers by waving back to them and then on closing the train doors going to a point-of-power without full conscious awareness of his speed commands, signal indication or switch alignment.

Systemic Cause(s):

Organizational Culture
There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Incident #5: SMS 20140624#29828MX

Date: June 24, 2014

Location: Brentwood Yard: Signal B99-138

WMATA Findings and Conclusions:

At 2100 hours, Train ID 709 (Verizon Gap Train) from Shady Grove yard received permission to enter Brentwood yard at B99-06 signal. The Train Operator (T/O) was given instructions to operate to track 1 and stop ten feet in approach of 138 signal red. T/O did not see the signal and continued moving past it, causing damage to switches 147 and 149. Based on findings, SAFE concludes that the train operator became distracted and failed to follow standard operating procedures pertaining to red signals on mainline or in rail yards. The operator's report that he was not familiar with the yard and was looking for a bumping post indicates that he did not have adequate training for operating in Brentwood yard. This fact served as a distraction that caused him to operate his train past signal B99-138 red and completely miss it while looking for a bump post. There were no obstacles to hinder visibility of the signal or aspect. His loss of situational awareness when he approached the signal resulted in his failure to stop the train.

WMATA Corrective Action(s):

1. Retrained Train Operator with an emphasis Standard Operating Procedures and Yard Operation. The train operator was sent for training on July 2, 2014 to review standard operating procedures and yard operations.
2. Simulate a red signal, compliance check event for Train Operator to test his comprehension of Red Signal adherence. On August 5th, 2014 RTRA also conducted a simulated lay-up operation involving the operator, supervisors and Assistant Superintendent. The operator received instructions from the tower to lay up a train off mainline and to store on the same track and signal, B99-138. Following this exercise a RTRA supervisor also conducted ride observations to ensure that the operator was proficient on all aspects of train operations on mainline and yard.

Atticus Findings and Conclusions:

The train operator involved in this incident had only eleven (11) days experience as a train operator. He advised Atticus that he was not familiar with the track layout at Brentwood Yard having never been in the yard either during or following his training period. He admitted to Atticus that he was very anxious about being a new train operator, about being out on his own, and about going into Brentwood Yard but that *"it was his job and he just had to do it."*

He also admitted to Atticus that was rushing as he entered Brentwood Yard and that he was expecting to see a platform and bump post where he was to yard his train. As such, due to his heightened level of anxiousness and the expectation of finding a platform and bump post while yarding his train, which had been his prior experience when yarding trains, he quite likely experienced an attention failure referred to in the scientific literature as 'inattentional blindness'. In the instant case because of his increased anxious state and his expectation and attention focused on seeing a platform and bump post the train operator failed to notice signal B99-138 despite the fact that it was in his full view and displaying a stop indication at the time that he passed the signal.

It should be noted that this incident occurred at 21:00 hrs. which would have resulted in the two red aspects of signal B99-138 being quite prominent against the backdrop of clear, night time conditions. Interestingly, when questioned about where he was looking and what he was looking at while yarding his train in Brentwood Yard, the train operator stated that he was looking straight out of the front window of the cab and that he was looking for the platform and bump post.

It should also be noted that the train operator received specific yarding instructions from the interlocking operator who stated "permission to enter Brentwood Yard, you got a lead to Track 1, all safety stops, no closer than 138 red". However the train operator repeated back *"roger, lead to 1 Track, all safety stops, no closer than 10 feet, verifying lunar at B99-06".*

Therefore, it is evident that the train operator did not fully understand the yarding instructions given to him by the interlocking operator and did not clarify the instructions with him nor did the interlocking operator catch or verify the train operator's lack of understanding of the instructions given. Had this clarification been made, it may have resulted in the train operator properly understanding the instructions given to him and may have prompted him to ask for more detailed information regarding the track configuration at Brentwood Yard and the location of signal B99-138.

Root Cause:

Attention Error

The Train Operator, had only eleven (11) days experience as a train operator, and was not familiar with the track layout at Brentwood Yard. He admitted to Atticus that he was very anxious about being out on his own, about being a new train operator and about going into Brentwood Yard. As such, his level of anxiety and expectation that he would see a platform and bump post when he was yarding his train resulted in him experiencing an attentional error referred to in the scientific literature as 'inattentional blindness' (Inattentional blindness, also referred to as perceptual blindness, is a psychological lack of attention that is not associated with any vision defects or deficits. It may be further defined as the event in which an individual fails to recognize an unexpected stimulus that is in plain sight).

Therefore, in the instant case, contrary to the findings in the Original investigation report which stated *"More importantly you were not focused and paying attention to the safe operation of your train."* the train operator was in fact so focused on finding a platform and bump post he was effectively psychologically blind to signal B99-138 which was displaying a stop indication under clear nighttime conditions and of which he had a clear and unobstructed view.

This is only one of many instances where Atticus, during the course of its investigation and analysis of WMATA's 2014 red signal violations, found that not only do a number of WMATA employees in safety critical roles such as train operators and interlocking operators not have and understanding of how human attention works and under what circumstances it is likely to fail, but the operations and safety supervisors and managers that manage this group of employees also revealed a lack of understanding or an incorrect understanding and application of the science of human attention.

Contributory Cause(s):

Personal Readiness

The train operator, albeit certified, was an inexperienced train operator with only eleven (11) days experience as a train operator who was in a novel situation that was exacerbated by his heightened state of anxiousness at the time of the incident. Although the train operator admitted to Atticus that he was rushing at the time when he was yarding his train in Brentwood Yard, it is possible that he recalls a 'felt sense' of rushing as a result of his excessively anxious state-of-being immediately preceding the incident.

In a follow-up conversation with the Superintendent responsible for this territory, Atticus was advised that there would have been no operational need for the train operator to have been rushing on this assignment as he was simply required to stage his train at Brentwood Yard and then wait for an event at the Verizon Center to end before being required for revenue service some hours later.

Further, through the course of his interview with Atticus, this train operator came to realize that while at the time he did not fully understand the yarding instructions that he received from the interlocking operator, he now understands that he could have and should have asked for more specific instructions and directions on how and where to yard his train.

Crew Resource Management

The train operator received specific yarding instructions from the interlocking operator *"permission to enter Brentwood Yard, you got a lead to Track 1, all safety stops, no closer than 138 red"*. However the train operator incorrectly and incompletely repeated back *"roger, lead to 1 Track, all safety stops, no closer than 10 feet, verifying lunar at B99-06"*.

Therefore, it is evident that while the interlocking operator's initial yarding instructions were clear and complete, the train operator did not fully understand the instructions given to him by the interlocking operator and hence did not repeat the instructions back to the interlocking operator correctly. Nor did the interlocking operator catch or clarify the train operator's lack of understanding of the instructions given provided. Had this clarification been made, it may have resulted in the train operator more fully understanding the instructions given to him and may have prompted him to ask for more detailed information regarding the track configuration at Brentwood Yard and location of signals B99-138 and B99-06.

Adverse Mental State

The train operator by his own admission and as evidenced by his considerably agitated state at the time of his interview with Atticus, was extremely anxious about being a new train operator, about being on his own, and about going into Brentwood Yard immediately preceding this incident.

Perceptual Error

The train operator experienced a perceptual attentional error while he was yarding his train in Brentwood Yard due to his expectation of seeing a platform and bump post as had been his prior limited experience when yarding trains at Shady Grove. This particular type of attentional error is referred to in the scientific literature as 'inattentional blindness' (Inattentional blindness, also referred to as perceptual blindness, is a psychological lack of attention that is not associated with any vision defects or deficits. It may be further defined as the event in which an individual fails to recognize an unexpected stimulus that is in plain sight). Therefore, in the instant case, the train operator was effectively psychologically

blind to signal B99-138 regardless of the fact that it was displaying a stop indication under clear nighttime conditions and of which the train operator had a clear, unobstructed view.

Systemic Cause(s):

Organizational Culture

There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Organizational Procedures

Prior to being required to yard his train in Brentwood Yard, the train operator had not been provided any familiarization training at Brentwood Yard. Prior to the train operator being certified as a train operator, WMATA's Train Operator Training Program included yard familiarization training for train operator trainees at each of the rail yards and terminals on the WMATA rail system.

However WMATA's Train Operator Training Program training program was changed such that train operators were no longer provided familiarization training at each of WMATA's rail yards and terminals but rather only in the yard or terminal that the train operator was assigned to at the time of his/her training. Therefore, this Train Operator was required to perform train service into Brentwood Yard without any prior familiarization training or experience.

Incident #6: SMS20140630#29994

Date: June 30, 2014

Location: Greenbelt Interlocking: Signal E10-02

WMATA Findings and Conclusions:

On approaching Greenbelt Interlocking, Signal E10-02 the train operator observed that the signal was displaying a stop indication. The train operator attempted to contact the terminal supervisor who did not respond account he was out of the station operating a train. The train operator then contacted the ROCC and was instructed to proceed to the route selector box, select cancel to cancel the existing route, and select track #2. The train operator complied. The train operator overran signal E10-02 displaying stop due to not being familiar with the push button operation and inattention to his speed commands.

WMATA Corrective Action(s):

1. Train operator was suspended for 12 days.
2. Train operator received refresher training on rules procedures and Manual Route Selection procedures.
3. Terminal supervisor was retrained in relinquishing control of the interlocking to the ROCC.
4. Training of all train operators in Manual Route Selection procedures commenced July 8, 2014.

Atticus Findings and Conclusions:

Contrary to WMATA's conclusions that the train operator was unfamiliar with the Manual Route Selection procedures, Atticus' investigation revealed that the train operator was in fact familiar with the Manual Route Selection procedures, that he had operated an interlocking in manual route selection mode on two occasions during his training period and that he did in-fact operate the E10-02 route selector correctly, exactly 13 seconds prior to passing Signal E10-02 in the stop position. Although the train operator stated that he knew how to operate the route selector and that his mistake was that he didn't wait long enough for the signal to clear, when questioned in a follow up interview as to how it came to be that he passed Signal E10-02 displaying a stop indication, he stated that he was rushing and didn't notice the signal or the switch alignment. He further stated that he knew he should have had a flashing lunar signal and that he should have crossed over to Track #2 but that he didn't notice he wasn't lined for Track #2 until his train went straight onto the tangent track instead of turning out to Track #2, clearly indicating attention error as the root cause of this incident as opposed to the train operator being unfamiliar with the Manual Route Selection procedures.

Root Cause:

<u>Attention Error</u>
The train operator stopped at Signal E10-02 displaying a stop indication as required by MSRPH Operating Rule 3.67, correctly operated the route selector manually and then proceeded into Greenbelt interlocking past Signal E10-02 displaying a stop indication with a clear unobstructed view without full conscious awareness of his speed commands, signal indication or switch alignment.

Contributory Cause(s):

Memory Error

The terminal supervisor, who had control of the interlocking at the time of the incident experienced a lapse in memory when he forgot to return control of interlocking back to ROCC prior his departing the station to operate another train.

Systemic Cause(s):

Organizational Culture

There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of WMATA's "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Incident #7: SMS20140704#30116

Date: July 4, 2014

Location: Shady Grove Yard: Signal A99-118

WMATA Findings and Conclusions:

On Friday, July 04, 2014 at approximately 1436 hrs., that Train Operator (T/O) ran Signal A99-118 displaying a red aspect and consequently trailed switches #119 and #71.The Train Operator was assigned to consist 5031-30x1280-81x5074-75x6162-63 on track 15 however departed A99 track 14 operating consist 4070-71x6119-18x1060-61x6081-80 in service to Shady Grove (A15). No injuries reported and no damage to switches. SAFE concludes that Train Operator received permission to pass A99-120 signal on track 15, repeated the instructions; however the operator was on track 14 facing A99-118 signal. Train Operator acknowledged the lunar at A99-120 signal however moved her train past A99-118 signal red, trailing switches 71 and 119, violating rule Operating Rule 3.76 which states rail vehicles shall not be operated through improperly aligned track switches. The Interlocking Operator failed to acknowledge the Train Operator when she stated she was at A99-118 signal, failed to identify that the Train Operator was on the incorrect track and failed to identify that the operator was operating the incorrect lead car and consist.

WMATA Corrective Action(s):

1. Retrain Train Operator involved in incident - Train Operator received re-instruction and additional training from Instructor R.D. Brown on July 9, 2014. Train Operator received Shady Grove Yard LPI instruction on July 10, 2014.
2. RTRA Supervision will discuss the incident with Shady Grove Train Operators and develop lessons learned documents focusing on MSRPH or 3.76, Cardinal Rules 1.46, 1.79, 3.1, interlocking Procedures and Train Consist Verification Process no later than August 18, 2014.

Atticus Findings and Conclusions:

Firstly, it should be noted that this red signal violation incident occurred at the commencement of the afternoon rush at one of WMATA's busiest yard terminal facilities (Shady Grove Yard) on July 4th what is referred to by WMATA employees and managers as "Report Card Day". No other day is seen as important or in deed as "hectic" generally as July4th other than "Inauguration Day". July 4th whether real or perceived is the day that WMATA employees and managers in train operations claim that all other days of the year and employees themselves are judged on (referring to the on-time performance of train operations).

The train operator who had eight (8) months experience at the time of this incident was not familiar with the Shady Grove Yard having previously only worked out of the Glenmont Yard. It is important to note that Glenmont Yard is a relatively simple yard operation compared to the Shady Grove yard operation. As a result of the 'Pick' which occurred the previous day the train operator was assigned to Shady Grove. However her training and certification as a train operator did not include familiarization at the Shady Grove Yard nor had the train operator operated out of the Shady Grove yard prior to the time of this incident.

The first attention-related error made by the train operator which was a contributory cause of this incident was that she mistook the train consist located on Track #14 as being her assigned train which was in fact located on Track #15. Because she had been assigned to the train consist located on Track #15, and she was next to be due out of the yard, the interlocking operator set-up Signal A99-120 which governed train movements departing from her assigned track, Track #15. Although the train operator radioed to the interlocking operator on two occasions that she was located at Signal A99-118, he did not pick-up on the communications.

In Atticus' initial and follow-up interviews with the interlocking operator, the interlocking operator advised that his only reason for not picking up on the train operator's radio communications was that his attention at the time was directed at trying to orchestrate a proceed shove move of a disabled train through the yard to the maintenance facility without blocking or delaying the on-time departure of revenue trains and readying the departure of seven (7) remaining trains required for July 4th train operations. Spotty radio reception at Shady Grove Yard was also mentioned as a possible contributing cause of this missed communication (similar other complaints regarding the quality of radio communication transmissions were raised with Atticus by other train operations employees and managers with respect to other locations on the WMATA rail system). However, records indicate that the interlocking operator did advise the train operator that she had a lunar signal at Signal A99-120 which was the correct signal for her have if she had been on her assigned train consist which was located in Track #15. The train operator acknowledged the lunar signal at Signal A99-120 despite the fact that she was positioned at Signal A99-118 and it was displaying a stop indication.

The second attention error made by the train operator which is in fact the egregious error of primary concern, was that commenced movement of the train consist located in Track #14 operating the train consist located on Track #14 past Signal A99-118 which was displaying a stop indication at the time and ultimately continued in revenue service with the incorrect train.

Root Cause:

Judgment Error
After acknowledging the lunar signal at Signal A99-120, the train operator proceeded out of Shady Grove Yard past Signal A99-118, displaying a stop indication. The Train Operator was aware that Signal A99-118 was displaying a red, stop indication but deferred judgment to the interlocking operator when he advised her that she had a permissive signal at Signal A99-120. During Atticus' interview with the train operator, the train operator admitted to Atticus that she *"was just trusting the Tower (Interlocking Operator) and the Tower said I had a lunar".*

Contributory Cause(s):

Personal Readiness
The train operator was inexperienced having not previously operated a train in or out of Shady Grove Yard. As noted above, Shady Grove Yard is a very busy, complex yard operation compared with the Glenmont Yard with which the train operator was familiar and due to the July 4th train operations, time of day and circumstances at the time, was particularly hectic.

Crew Resource Management

There was insufficient understanding, clarification and verification of circumstances and direction between the train operator and interlocking operator regarding the train and track the train operator was assigned to and the train she was in fact on and the discrepancy between the signal indication of Signal A99-118 which was a red, stop signal immediately in front and to the right of the train operator's location on Track #14 and Signal A99-120 which was a permissive signal in front and to the left of the train operator's location on Track #14.

Systemic Cause(s):

Organizational Procedures

Due to the reassignment of train operators at the "Pick" the train operator was required to perform service out of Shady Grove Yard without prior familiarization or operating experience at that location.

Human Resources

Due to the requirement for additional train operators to meet FTE requirements prior to the opening of the Silver Line extension there was an increased urgency and push to qualify sufficient number of train operators which resulted in an increase in the size of the train operator training classes. Based on discussions with various train operators and training staff the increased urgency and push to qualify a sufficient number of train operators to meet the service demands of the Silver Line resulted in larger than usual train operator training classes (approximately 40 student train operators) which according to some individuals resulted in less than optimal training conditions for certain train operator classes.

Incident #8: SMS 20140816#31410

Date: August 16, 2014

Location: National Airport: Signal C10-36

WMATA Findings and Conclusions:

On Saturday, August 16, 2014 at 0803 hours, Train #403 operating on track#1, overran C10-36 Signal which displayed a red aspect. Trains were single tracking between National Airport and Pentagon City on Track #1. AIMS report displayed C10-36 with a red aspect for approaching Train #403 concurrent with two trains that were already inside the single track moving outbound with lunar signals. Train #403 did not enter the interlocking but did pass C10-36 RED, which occupied the block preventing Train #410 from continuing to receive speed commands and move outbound. ROCC instructed Train Operator to reverse ends and move Train #403 back into National Airport Station with an absolute block. Zero injuries or damage was reported for this incident.

WMATA Corrective Action(s):

1. Revise Operating Rule 3.67 to reflect the responsibility of ROCC Rail Controllers and Rail Transportation Supervisors to advise Train Operators that they are approaching a signal with a red aspect. T-14-20 was developed on November 28, 2014.
2. Retrain the Train Operator on the proper operation of holding at the station with doors open until speed commands are received. Reinstruction completed and RTRA Training Request Form signed by Train Operator on August 27, 2014.

Atticus Findings and Conclusions:

During the initial interview with the train operator Atticus was advised, by the train operator, that this incident was a "non-event" and that no discipline had been assessed. However, through subsequent investigation with local operating staff it was revealed that this red signal violation incident did in fact occur but that formal discipline was not assessed to the train operator because the time limit provision of the collective agreement was not met in a timely manner and not because the red signal violation incident did not occur, which in fact it did. Further investigation and follow-up interviews with the train operators by Atticus revealed that after completing his station work and observing the arrival of an opposing train the train operator closed his doors, made his train announcement, returned to his seat at the controls and immediately went to a point-of-power without conscious awareness of his speed commands, signal indication or switch alignment.

Special Note:

During Atticus' interviews with the train operator, the operator was extremely defensive throughout the entirety of the first interview and at the outset of the second interview. At the beginning of the second interview the train operator continued to maintain that he had speed commands, a permissive signal and correct switch alignment at the time of the alleged incident. Considering the irrefutable evidence to the contrary, Atticus became concerned that this train operator's ongoing refusal to acknowledge his responsibility in the matter and his lack of understanding of the underlying cause of this incident and the

attention skills and strategies necessary for him to prevent the likelihood of a future reoccurrence, Atticus decided to share some of its understanding of the science of human attention with the train operator. Specifically, Atticus explained how a red signal violation such as the one he alleged did not occur, could have possibly occurred. Importantly, in addition to information relative to the aspects of human attention applicable in his case he was provided with some practical attention strategies that he could put to use, immediately to help him prevent the likelihood of a red signal violation from occurring to him in future. Interestingly, when the train operator realized that Atticus was not making him the "focus of fault" but rather providing him an understanding of how circumstances in the operating environment can with certain limitations of human attention the train operator became very enthusiastic about his new understanding of human attention and particularly how a red signal violation such as the one under discussion could have happened and importantly what he could do to prevent the likelihood of a red signal violation from happening to him in future.

At the completion of the final interview and impromptu attention performance training with this individual, the train operator went on to say:

> ***"If I learned this much in 20 minutes then I can't wait to get the 4-hour training program".***

Root Cause:

Attention Error
The train operator completed making his his train announcements, closed the train doors and back to his seat and immediately went to a point-of-power without conscious awareness of his speed commands, signal indication or switch alignment.

Contributory Cause(s):

Perceptual Error
The train operator was aware of the single tracking work zone and had the expectation that he would depart National Airport Station immediately after the arrival of the first opposing train. However, the ROCC had a second opposing train in queue to arrive at National Airport before the train operator's train could depart National Airport which the train operator was not aware of. Although the train operator had a clear unobstructed view of Signal C10-36 and it was displaying a red, stop indication, on returning to his seat after closing his train doors and based on the expectation that he would be next in queue to depart National Airport station and his prior experience that he usually received a permissive signal after the arrival of an opposing train he immediately went to a point-of-power without full conscious awareness of his speed commands, signal indication or switch alignment .

Systemic Cause(s):

Operational Procedures
While not a current operating requirement, it may have been prudent for the ROCC to share critical operating information that it was in possession of regarding a novel situation (ROCC was ingle tracking and fleeting trains between National Airport and Pentagon City) with the train operator of Train #403.

Incident #9: SMS 20140916#32265MX

Date: September 16, 2014

Location: Largo Town Center: Signal G05-04

WMATA Findings and Conclusions:

On Tuesday, September 16, 2014, at approximately 1553 hrs., Train #621, an eight (8) car consist L3226-27x1275-74x1244-45x3090-91, in route from Largo Town Center (G05) to Wiehle-Reston East (N06), operated by T/O (C99/Alexandria Division), overran G05-04 signal which was displaying a red signal and associated switch (3A) positioned in the normal position. T/O stopped Train #621 approximately several feet past the facing points of switch 3A while an outbound train was crossing within the interlocking from track #1 to track #2. Based on ROCC Playback information, SAFE concludes that Train Operator overran G05-04 signal red. Train Operator admitted that she lost focus while changing train ID dial. Train Operator failed to adhere to Cardinal Rule 1.46 that states in part "Employees shall not permit unnecessary conversation, reading, lounging or any other action or condition of mind to divert their attention from the safe and efficient performance of duty." Train Operator failed to follow the procedure established for departing the Terminal area by checking her signal aspect, switch alignment, speed commands and finally verifying this information with the Terminal Supervisor.

WMATA Corrective Action(s):

1. RTRA Supervisors will perform a one on one discussion with Train Operators with an emphasis on Rule 1.46.

Atticus Findings and Conclusions:

The Train Operator had eleven (11) years experience at the time of incident and was therefore one of WMATA's more experienced Train Operator. During the later portion of a 3-hour break the train operator was requested by the terminal supervisor to cut her break short and to move up a train. On being requested to commence train service the train operator was in the break room approximately 15 steps from the train. The train operator admitted to Atticus that she was rushing to be on time after being told by the Terminal Supervisor that she was "due off platform a couple minutes ago". She also advised Atticus that she had just been notified by her supervisor ten (10) minutes prior to being requested to cut her break short and move up a train that she was required to submit an incident report in response to a complaint that had been levied against her by a fellow employee as a result of an altercation with that employee prior to the commencement of her first run of the day. While she was in no way making an excuse of the issue, the train operator did advise Atticus that she was thinking about having to submit the incident report and was worried that she might be subject to discipline by her supervisor in the moments immediately prior to her red signal violation. Although the train operator in this case did not think of the telephone call from her supervisor minutes before she was to resume train service as a contributing factor, Atticus has investigated numerous major rule violations that occurred shortly after a worrisome or disturbing communication for a superior, co worker or a family member. (Also see Incident #11: SMS 20141103#xxxxx)

Attention Error
The train operator completed her train announcements, closed the train doors and immediately went to a point-of-power while her attention was directed on inputting the Train ID for her train. As her attention was directed on inputting the Train ID she proceeded out of Largo Town Center Station without conscious awareness of her speed commands, the signal indication or the switch alignment.

Contributory Cause(s):

Personal Readiness
During the later portion of a 3-hour break the train operator was requested to move up a train. When requested to move up the train operator was in the break room approximately 15 steps to the train. The Train operator admitted to Atticus that she was rushing to be on time after being told by the terminal supervisor that she was "due off platform a couple minutes ago". The train operator did not take sufficient preparatory time to ensure that her attention was focused on the task at hand.

Adverse Mental State
The train operator advised that she had just been notified by her supervisor to submit an incident report in response to a complaint that had been levied against her by a fellow employee as a result of an altercation with that employee prior to the commencement of her first run of the day. The train operator advised Atticus that she was thinking about having to submit the incident report and was worried that she might be subject to discipline by her supervisor in the moments immediately prior to the red signal violation incident.

Procedural Error
Dual task interference. At the time of incident the train operator's attention was allocated to inputting the correct Train ID when she initiating movement of her train. She admitted to Atticus that she did not remember if she started to input the Train ID first and then went to a point-of-power or if she went to a point-of-power first and then started to input the Train ID. However, she believed that she went to a point-of-power first and then started to input the Train ID. Atticus agrees that she went to a point-of-power first and then started to input the Train ID. However, it is worthy to note that in any event, the train operator went to a point-of-power without full conscious awareness of her speed commands, signal indication or switch alignment.

Systemic Cause(s):

Inadequate Supervision
There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions. In the instant case this was reinforced by the terminal supervisor when she told the train operator that she was "due off platform a couple minutes ago".

Inadequate Supervision
The train operator was contacted by her supervisor during her break and importantly approximately 10 minutes before commencing revenue service at which time she was advised that she was required to submit an incident report in response to a complaint that had been levied against her by a fellow employee as a result of an altercation with that employee prior to the commencement of her first run of the day. Although she stated that it

was not an excuse, the train operator indicated to Atticus that she was thinking about having to submit the incident report and was worried that she might be subject to discipline by her supervisor in the moments leading up this red signal violation incident.

Organizational Culture

There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions.

Incident #10-X

Date: October 12, 2014

Location: Shady Grove Yard: Signal A-99-00

Following WMATA's initial investigation of this alleged red signal violation incident, and resultant suspension of the train operator involved for her violation thereof, it was determined that an error had been made interpreting the TWC Report by the ATC engineer at the time of the incident and that the train operator in question did in fact have a permissive signal at the time of the alleged incident. Therefore, this alleged red signal violation incident was expunged from the records. However, due to the incident records of train operations and SAFE were not in accord with each other at the time of Atticus' investigation, WMATA should check all applicable files to ensure their accuracy.

Incident #10: SMS 20141030#33649MX

Date: October 30, 2014

Location: Braddock Road: Signal C12-02

WMATA Findings and Conclusions:

On Thursday, October 30, 2014 at approximately 1218 hours, Train #412 operating on Track #1, overran Braddock Road Station C12-02 Signal that displayed a red aspect. ROCC was conducting a turn back crossover move with Train #701 from Track #1 to Track #2. Train #701 had an authorized crossover route, completed the move, and cleared the interlocking before incident Train #412 departed Braddock Road Station and overran the red signal. Switch 1A was in the normal position and as a result, Train #412 did not trail the switch. Based on T/O's account of incident via written statement and ROCC playback information, SAFE concludes that this incident is a result of operator error and inattention. Signal C12-02 was clearly showing a red aspect when the operator proceeded through. The T/O was not aware of his speed readouts and moved his train without verifying a lunar signal or contacting ROCC, failing to adhere to MSRPH Operating Rules 3.67 and 3.69. Although ROCC informed Train Operator that there was train movement within the interlocking, there was no communication that the leaving signal was displaying a red signal.

WMATA Corrective Action(s):

1. Train operator suspended for twelve (12) days.
2. Retrain Train Operator involved in incident – Operator received re-fresher training on November 24, 2014.
3. ROCC issue a Rule governing Rail Controller responsibilities when trains are approaching interlocking displaying a red signal upon entrance - T-14-20 was issued on November 28, 2014 requiring Rail Control Center Controllers to advise Train Operators when Operators are approaching signals on mainline that are red.

Atticus Findings and Conclusions:

The train operator had thirteen (13 months) experience as a train operator at the time of incident. En-route to Braddock Road the train operator had a line supervisor riding with him and other than discussing operating rules that portion of the run was unremarkable. Approaching Braddock Road Station the ROCC contacted the train operator and advised him that he had a permissive block to the 8-car mark at Braddock Road station and to, *"be aware of a train crossing over in front of you"*. He repeated this instruction from the ROCC back to the ROCC via radio. However, neither the train operator or the supervisor made any mention of the ROCC's instruction to one another.

On arrival at Braddock Road station the train operator commenced servicing the station and the supervisor exited the train but continued to talk with the train operator from a position on the station platform immediately adjacent to the operator's location cab window where the two continued their conversation until the arrival of the opposing train. Interestingly, the train operator made a note of the fact that the opposing train also had a supervisor riding on it as it crossed over in front of him. On arrival of the opposing train the train operator's supervisor who he had been talking with on the station platform, bid him

farewell and left. It is assumed that the supervisor at this point assumed that the train operator would receive a permissive signal and would shortly thereafter depart Braddock Road Station. Believing the same to be true, the train operator then closed his cab window and walked over to the control panel where he immediately went to a point-of-power without full conscious awareness of his speed commands, signal indication, or switch alignment.

Although the train operator initially claimed that he thought he remembered seeing permissive speed commands he later acknowledged that he might has just been remembering another time when he had permissive speed commands. Importantly the train operator stated *"I can't tell you even if I checked it or if I didn't. Your brain tricks you"* With respect to the train operator's perception that he would depart Braddock Road immediately after the arrival of the opposing train the train operator stated *"Once the other train crossed over, technically in my mind it was done and I left"* referring to the fact that once the opposing train arrived, the previously communicated restriction by the ROCC (i.e. the train operator was given a permissive block to the eight (8) car mark and told to *"be aware of a train crossing over in front of you")* had been met and therefore "technically" he should have been able to proceed as was more usually the case. The train operator went on to say *"it's natural instincts. It's why I pushed the master controller".*

Root Cause:

Attention Error

The train operator after completing his conversation with his supervisor, who was on the station platform at the time, he closed the train doors crossed over to the control panel and immediately went to a point-of-power without full conscious awareness of his speed commands, signal indication or switch alignment. In the train operators own words, *"it's natural instincts. It's why I pushed the master controller".*

Contributory Cause(s):

Perceptual Error

The train operator had the expectation, fueled by the meaning that he created based on his interpretation of the instruction received from the ROCC that he would in fact be the next in queue to depart Braddock Road Station after the arrival of the first opposing train. This expectation was unwittingly reinforced by the train operator's supervisor when the supervisor, who had been talking with the train operator from the station platform, abruptly ended his conversation with the train operator and left immediately following the first opposing train crossed over in front of and cleared Train#403 at Braddock Road Station.

Personal Readiness

The train operator's attention was allocated to continuing his conversation with his supervisor who was standing on the station platform (The supervisor had been riding in the cab of the train with the train operator previously and detrained on arrival at the Braddock Road Station. However, after detraining he continued to talk with the train operator while the train operator waited for the arrival of an opposing train into Braddock Road Station. On arrival of the first opposing train, the supervisor said goodbye to the train operator and departed.

Procedural Error

Dual task interference. The Train Operator's attention was allocated to his continuing his conversation with his supervisor while his supervisor was standing on the station platform as opposed attending to the primary safety critical task of understanding the immediate operating requirements for his train and keeping front-of-mind the fact that his operating authority only extended to the 8-car mark.

Systemic Cause(s):

Inadequate Supervision

The supervisor who was riding with the train operator, by all accounts a conscientious supervisor who was performing supervisory train riding duties during which time he verified the train operators understanding of certain operating rules and discuss the application of others. However, he did not confer with the train operator regarding the permissive block operating authority received from the ROCC either during their inbound movement into the Braddock Road station or during his on-going conversation with the train operator while they were waiting for the arrival of the opposing train at the Braddock Road station. Had this restriction in operating authority, which only provided for movement of Train #403 to the 8-car mark at Braddock Road station, been discussed with the train operator during their arrival into or while standing at the Braddock Road Station this red signal rule violation incident may not have occurred.

Incident #11: SMS 20141103#xxxxx

Date: November 3, 2014

Location: Shady Grove Yard: Signal A99-112

WMATA Findings and Conclusions:

Atticus was advised this incident was still under investigation by WMATA's SAFE department as of 04-07-15.

WMATA Corrective Action(s):

TBD

Atticus Findings and Conclusions:

The train operator was experienced having seven (7) years experience as a train operator. The train operator was discombobulated due to an equipment failure on his first assigned train as he was departing the Shady Grove Yard the first time (Train Operator's first train stopped unintentionally in the middle of the interlocking due to a brake malfunction and could not be moved).

Root Cause:

Attention Error

The train operator entrained his second train consist after being directed to abandon his first assigned train due to a mechanical failure, set his jacket and bag on the spare seat in the cab of the leading car on the train, locked the doors, sat down in the operator's seat and immediately went to a point-of-power commencing movement out of Shady Grove Yard past Signal A99-112 which was displaying a red, stop indication, without full conscious awareness of his speed commands, signal indication, or switch alignment.

Contributory Cause(s):

Adverse Mental State

As a result of a mechanical failure on his first train and his inability to resolve the mechanical problems the train operator was instructed to leave the disabled train in the interlocking and to take control of a second assigned train. As a result of his being unable to resolve the mechanical problems and having to abandon his first train in the middle of Shady Grove Yard interlocking at the start of the morning rush and then having to take command of a second train well after his scheduled departure time resulted in the train operator experiencing increased level of stress. In addition the train operator was also at-the-affect-of a "disturbing" phone call that he received just prior to departing the Shady Grove Yard the first time on his originally assigned train.

Personal Readiness

The train operator advised Atticus that he was rushing as a result of being unable to resolve the mechanical problems and having to abandon his first train in the middle of Shady Grove Yard interlocking at the start of the morning rush and then having to take command of a second train well after his scheduled departure time. He further advised that on entering the cab of the lead car on his second assigned train, hastily set his jacket and bag on the spare seat in the cab of the leading car on the train, locked the doors, sat down in the

operator's seat and immediately went to a point-of-power without full conscious awareness of his speed commands, signal indication, or switch alignment

Perceptual Error

The train operator stated that because his assignment was already due to depart Shady Grove Yard he assumed that the route was already lined for his movement

Systemic Cause(s):

Physical Environment
The train operator's first assigned train experienced equipment failure due to a brake malfunction.

Organizational Culture
There is a pervasive "Big Rush-Rush" operational culture within WMATA train operations that unwittingly is a significant systemic cause in nine (9) of the eleven (11) red signal violations that occurred during 2014. For train operators the immediate and most common source of the "Big Rush-Rush" operating culture is from the ROCC and terminal and line supervisory functions. The train operator advised Atticus that there is insufficient preparatory time in the schedules of WMATA trains to allow train operators to complete their required interior and exterior inspections and related preparatory duties to be able to depart on time if any problems are encountered.

Summary of Atticus 'Recommendations and WMATA Actions Matrix

SUMMARY OF ATTICUS' CONCLUSIONS AND RECOMMENDATIONS

Category	Summary of Recommendations	WMATA Actions
1. Organizational Culture	1.1 WMATA leadership should consider relaxing the extent of its focus on on-time performance and the resultant unintended rushing by train operating employees to meet on-time performance expectations. Areas for consideration include train operating schedules, station dwell times, end-of-line turn-around times, employee break times and yard preparatory allowances.	FTA CAP RED-15-007 Action Plan addresses this recommendation: - 6 month review of schedule adherence - Increased the pre-trip inspection time in 2015 WMATA Safety Stand Down & published safety bulletin May 2016 "Safety Trumps Service"
2. Technological Environment	2.1 WMATA leadership should consider automating the announcement of routine, repetitive route information messaging to on-board passengers while en-route thereby removing this non-safety critical task and distraction to train operators when operating trains.	Automated announcements currently on the 7K (e.g. Next Train Stop). Exploring possibility on other series rail cars.
3. Organizational Procedures	3.1 WMATA leadership should consider revising its incident investigation reports and 'Lessons Learned' documents to include that they uniformly provide a clear delineation the root cause(s), contributory cause(s) and systemic cause(s) of incidents under investigation.	FTA SMI R-7-42-b CAP addresses this recommendation: - SAFE will work with Tri-State Oversight Committee and FTA to establish and pilot an enhanced investigation process for incidents. July 2016 positions allocated that will lead this effort.
	3.2 WMATA leadership should consider implementing a safety policy that prohibits contacting train operators while they are engaged, or about to engage, in train operations unless it is an operational or critical safety related matter.	Implemented Permanent order T-16-10 Radio Protocols that addresses how communication will be conducted between ROCC, Train Operator, etc.
	3.3 WMATA leadership should consider tempering the tone of language directed towards employees in employee investigation reports consistent with appropriate and effective educational and behavioral change techniques.	WMATA is rolling out performance conversations training for supervisors focusing on communication with employees in 2016.

Category	Summary of Recommendations	WMATA Actions
3. Organizational Procedures (Cont'd)	3.4 WMATA leadership should consider revising its root cause investigation procedures for its train operations and safety managers to enhance their understanding of the causal role that human factors, particularly human attention-related errors, plays in rule violations and accident causation.	FTA SMI R-7-42-b CAP addresses this recommendation: - SAFE will work with Tri-State Oversight Committee and FTA to establish and pilot an enhanced investigation process for incidents. July 2016 positions allocated that will lead this effort.
4. Inadequate Supervision	4.1 WMATA leadership should reinforce its radio communication protocols among train operators, terminal supervisors and interlocking operators to prevent on-going miscommunication among the parties.	FTA SMI R-1-6-a/R-1-6-b addresses this recommendation: - Development of new Radio Communication Course with 100% read back, standardized terminology - Rolled out July 25, 2016 - Issued permanent order 7/19/16 communicating requirements.
5. Crew Resource Management	5.1 WMATA leadership should consider reinforcing the caliber of its crew resource management practices among train operators, interlocking operators, terminal supervisors and the ROCC.	FTA SMI R-1-6-a/R-1-6-b identified above addresses this recommendation. Clear and standardized directions communicated with 100% repeat back between train operators/ interlocking operators/ terminal supervisors and ROCC reduces potential for error. Rolled out training 7/25/16; implemented permanent order 7/19/16.
6. Procedural Errors	6.1 WMATA leadership should review its procedures for how trains are yarded/set-out at New Carrollton Yard. Currently there are discrepancies with regards to whether certain trains have or have not been previously provided interior/exterior inspections and when train are yarded whether trains have been yarded just clear or foul of the bond circuits of certain controlling signals.	WMATA's storage policy is never to foul an adjacent track. WMATA's Rail Performance Monitoring System provides a yard configuration for storage and car availability. Personnel utilize this system at all yards. New Carrollton Yard procedures will be reviewed.

Category	Summary of Recommendations	WMATA Actions
7. Adverse Mental State	7.1 WMATA leadership should consider providing train operating employees with information and training to assist them in the managing of their mental state and attention as required when engaged in train operations.	WMATA has implemented a Fatigue Risk Management System (FRMS) that is available to all WMATA employees via the Metroweb. The FRMS provides information on fatigue topics, from suggestions on managing fatigue, to a calculator that determines if you are getting enough sleep. WMATA SAFE has an FRMS Safety Manager that is dedicated to this effort and a valuable resource for employees with any questions.
8. Perceptual Errors	8.1 WMATA leadership should consider providing train operating employees with training to assist them in identifying and managing their expectations and automatic, habitual responses to the routine and repetitive aspects of WMATA's train operations.	As part of the new train operator training under development an increased focus will be placed on managing the routine and repetitive functions of train operations. New Train Operator program to be completed by January 2017.
9. Personal Readiness	9.1 WMATA leadership should consider the immediate implementation and mandatory use of the "Point-of-Power job aid for train operators.	Initial Point of Power recommended in the report defined (3) items. WMATA modified the Point of Power to include 1)Red Signal means STOP; 2)Verify Lunar Signal; 3)Get permission before moving train; 4)Check speed commands; and 5)Ensure correct switch alignment. These Point of Power decals are being installed on Train Operator Consoles – 85% complete to date.
	9.2 WMATA leadership should consider providing train operating employees with training to assist employees in managing their personal readiness in preparation for and during train operations.	WMATA's FRMS identified in no. 7 addresses this recommendation.
10. Human Resources	10.1 WMATA leadership should assess its train operations FTE requirements in terms of its exposure to and potential for human error when train operating employees are routinely required to move up a train, make a "quick and safe turnaround" or consistently miss scheduled breaks.	Regular schedules are geared to allow sufficient time for turnarounds and breaks. Even when faced with schedule delays or interruptions WMATA management ensures employees are provided required breaks, etc.

Category	Summary of Recommendations	WMATA Actions
10. Human Resources (Cont'd)	10.2 WMATA leadership should consider shifting its approach towards train operating employees from one that focuses on their omni-present potential for failure (e.g. "You are only as good as your last move") to one that encourages operational competency, professionalism and exemplary performance in their craft.	WMATA is rolling out performance conversations training for supervisors focusing on communication with employees and an emphasis on positive communication.
11. Training	11.1 WMATA leadership should consider providing attention performance training for its train operators to educate them in the science of human attention and provide them with the skills and strategies necessary to consistently monitor, prioritize and focus their attention on safety critical tasks.	As part of the new train operator training under development there will be a greater focus on situational awareness. New Train Operator program to be completed by January 2017.
	11.2 WMATA leadership should consider providing attention performance training for its operations, safety and training staff to educate them in the science of human attention and provide them with an understanding of how to manage conditions and situations in the work environment to reduce the potential negative impact on train operations and the safety performance of train operations employees.	WMATA is pursuing two actions that will implement this recommendation: - WMATA's FRMS identified in no. 7 addresses this recommendation. - As part of the new train operator training under development there will be a greater focus on situational awareness.
	11.3 WMATA leadership should consider revising its current yard familiarization training for train operators to include familiarization training at each of its terminals and yard locations. When necessary (e.g. following major infrastructure or operational changes, refresher training should also be considered.	FTA CAP RED-15-004 action plan addresses this recommendation: Line familiarization training is being developed for operations employees to clearly identify the differences on each line such as unusual switches, pocket tracks, turnouts, etc. Yard familiarization is also being developed that will include an overview of the normal path where railcars lay up, ladder tracks, etc. Targeted completion date January 2017.