



**NTSB** National Transportation Safety Board

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*Office of Railroad, Pipeline &  
Hazardous Materials Investigations*

# **Human Performance**

# Multiple Lines of Evidence

- Autopsy findings
- Toxicological test results
- Work/rest schedule
- Human performance factors
- Risk for undiagnosed obstructive sleep apnea (OSA)

# Autopsy Findings

- Performed by the state's Chief Medical Examiner
- No preexisting medical condition
- No postmortem evidence of a sudden medical event

# Toxicological Test Results

- Doxylamine found in her urine
- An over-the-counter sleep aid
- Painful lesion interfering with sleep
- Doxylamine not found in the blood

# Work/Rest Schedule

- Part-time employee, about 6 hr. a day
- Regular work schedule, Monday – Friday
- Normally retired between 10:00 and 10:30 p.m. each night and called by a friend at 6:30 a.m. each morning.
- Could not determine if operator maintained this schedule in the days leading up to the accident.

# Human Performance Factors

- 5:51 p.m. time of accident, which coincides with a circadian low point
- Low level of muscular activity
- Seated operator
- Relatively low workload

# Risk for Obstructive Sleep Apnea

- Body Mass Index (BMI) = 38.6 (obese)
- Obesity significantly associated with OSA
- OSA associate with fatigue and cognitive and psychomotor deficits
- Accident rates considerably higher

# Conclusion

The operator of the striking train was at a high risk for having undiagnosed sleep apnea, and she may have been chronically fatigued as a result of the condition.

# Risk Factors for Microsleep

- Routine and long-practiced tasks
- Familiar route
- Low demand on mental resources
- Low level of muscular activity
- Fatigue from poor sleep quality due to discomfort and/or undiagnosed OSA

# Conclusion

The operator of the striking train failed to respond appropriately to the controlling signal indication or to take advantage of several opportunities to slow or stop the train and to prevent the accident likely because she experienced a micro-sleep episode after departing Waban station.

# Previous recommendation to all U.S. Rail Transit Systems

- R-01-27:  
Ensure that your fatigue educational awareness program includes the risks posed by sleeping disorders, the indicators and symptoms of such disorders, and the available means of detecting and treating them.

# MBTA Fatigue Education Program

- In 2002, R-01-27 classified “Open - Acceptable Response”
- MBTA does not have a fatigue awareness program that adequately addresses sleep disorders among its train operators
- MBTA’s medical clinic not screening for sleep disorders in medical data sheets
- Reclassify R-01-27 as “Open – Unacceptable Response” and reiterate to the MBTA

# Conclusion

The MBTA continues to have an inadequate fatigue awareness program to educate train operators about the risks of fatigue and an inadequate program to identify and address potential sleep disorders for its train operators.

# Risks Posed by Sleep Disorders in the Rail Transit Industry

- Undiagnosed sleep disorders pose a serious risk to transit operators.
- Operators with or at risk for sleep disorders need to be identified and effectively treated.



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