NAFMP
North American Fatigue Management Program

Schedules That Kill Profits: The Silent Costs of Driver Fatigue

52nd Annual California Bus Association Convention & Tradeshow

Rohnert Park, California - October 27, 2026

Get this slide deck at NAFMP.org/events

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Overview

1. Sleep Biochemistry
2. Killer Schedules
3. Characteristics of Fatigue and Its Silent Costs
4. Fatigue Management Program (FMP)
   - Safety Culture
   - Fatigue Risk Management System (FRMS)
     - Sound Scheduling · Detection Technology · Sleep Disorders
5. Next Steps

SECTION 1

Sleep Biochemistry

Poll

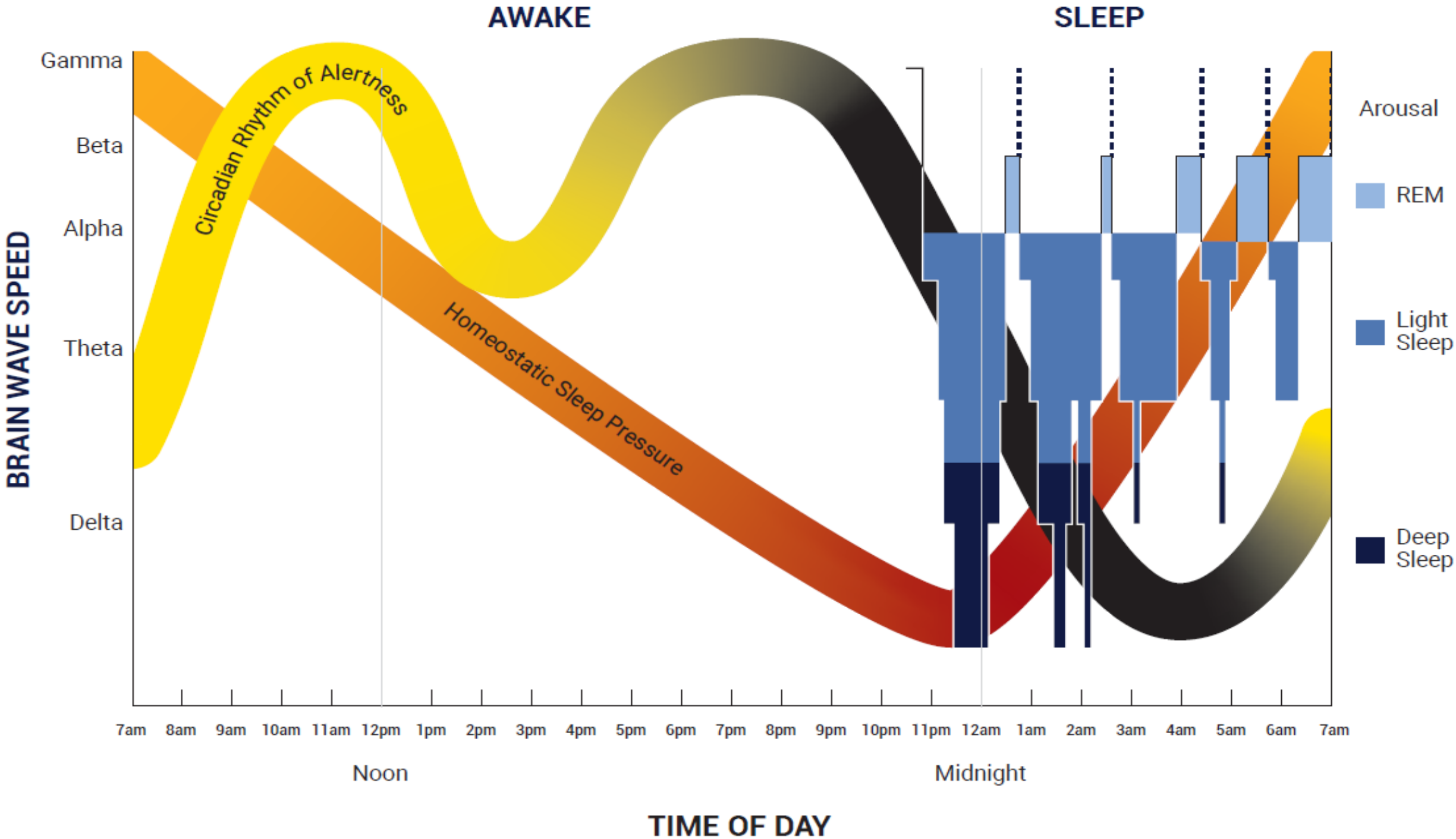
What will kill you faster?

A No Sleep

B No breathing

C Starvation

D Dehydration


AWAKE
SLEEP
Gamma
Beta
Alpha
Theta
Delta
BRAIN WAVE SPEED
Circadian Rhythm of Alertness
Homeostatic Sleep Pressure
Arousal
REM
Light Sleep
Deep Sleep
7am 8am 9am 10am 11am 12pm 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm 12am 1am 2am 3am 4am 5am 6am 7am
Noon
Midnight
TIME OF DAY

SECTION 2

Killer Schedules

Crash 1 – Facts

- At 1:48 a.m. July 12, 2023, a motorcoach carrying 21 people veered off Interstate 70 near Highland, Illinois, colliding with three parked combination vehicles
- Three passengers died
- The driver and 11 other passengers sustained injuries of varying severity

TIME OF CRASH

1:48 a.m.

July 12, 2023

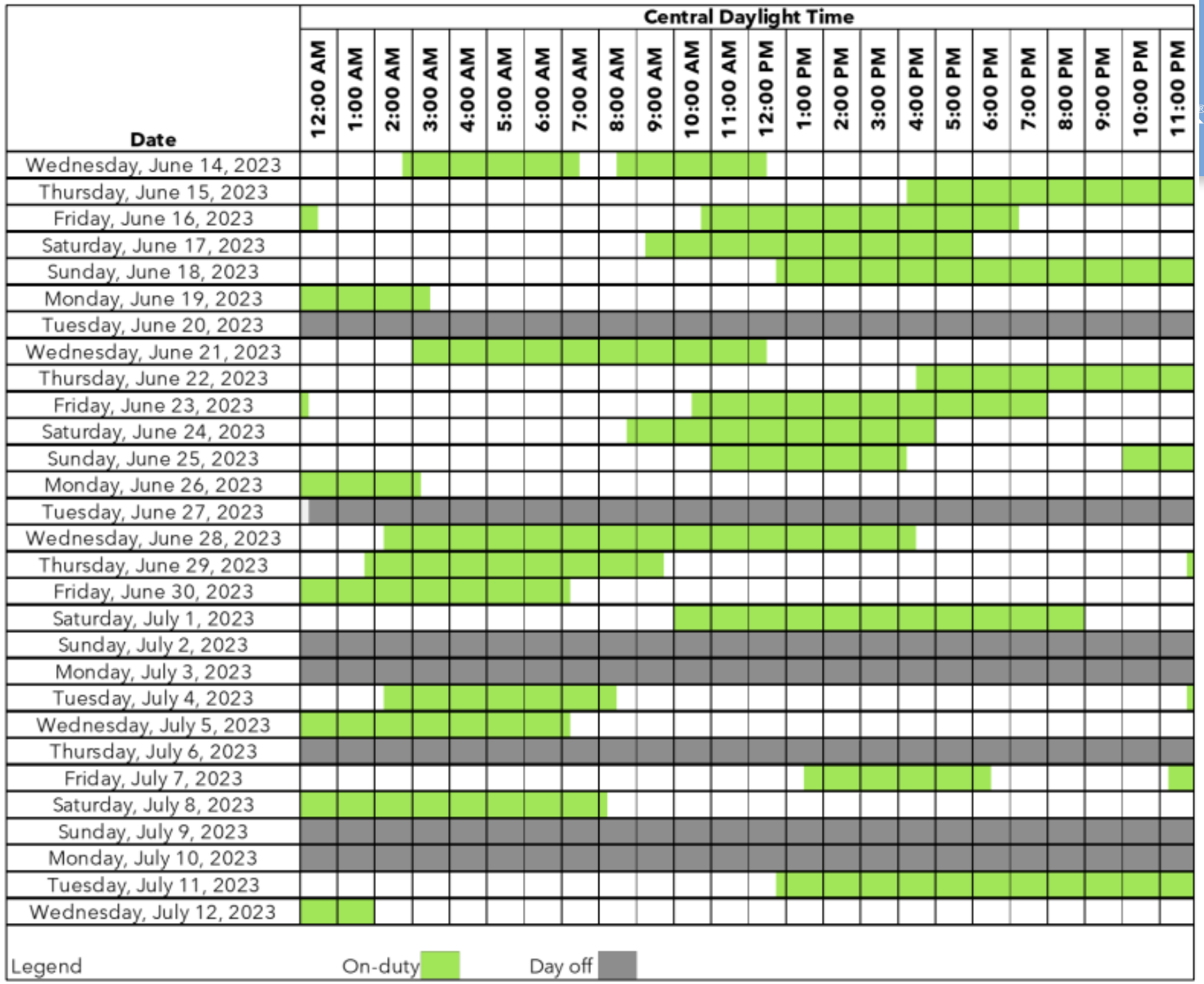
Highland, Illinois

Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY23MH015.aspx

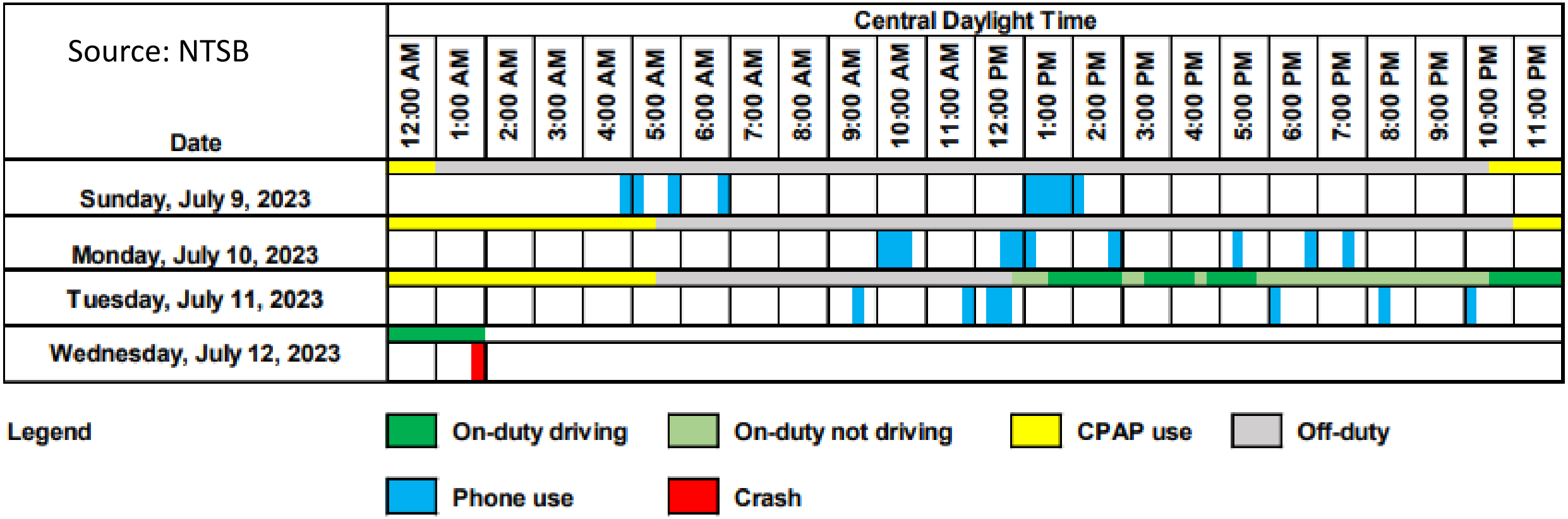

Mack combination unit
Kenworth combination unit
Prevost motorcoach
Freightliner combination unit
Direction of travel
N
Source: NTSB

Schedule

Source: NTSB



Schedule


Source: NTSB
Central Daylight Time
Date
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Sunday, July 9, 2023
Monday, July 10, 2023
Tuesday, July 11, 2023
Wednesday, July 12, 2023
Legend
On-duty driving
On-duty not driving
CPAP use
Off-duty
Phone use
Crash

Crash 2 – Facts

- At 6:17 a.m. June 11, 2023, a truck-tractor with a tank trailer carrying 8,500 gallons of gasoline crashed while exiting northbound I-95 in Philadelphia, Pennsylvania
- The driver lost control on a curved exit ramp, causing the truck to overturn and strike a concrete barrier
- The resulting fire destroyed the truck, caused the collapse of northbound I-95 lanes and fatally injured the truck driver

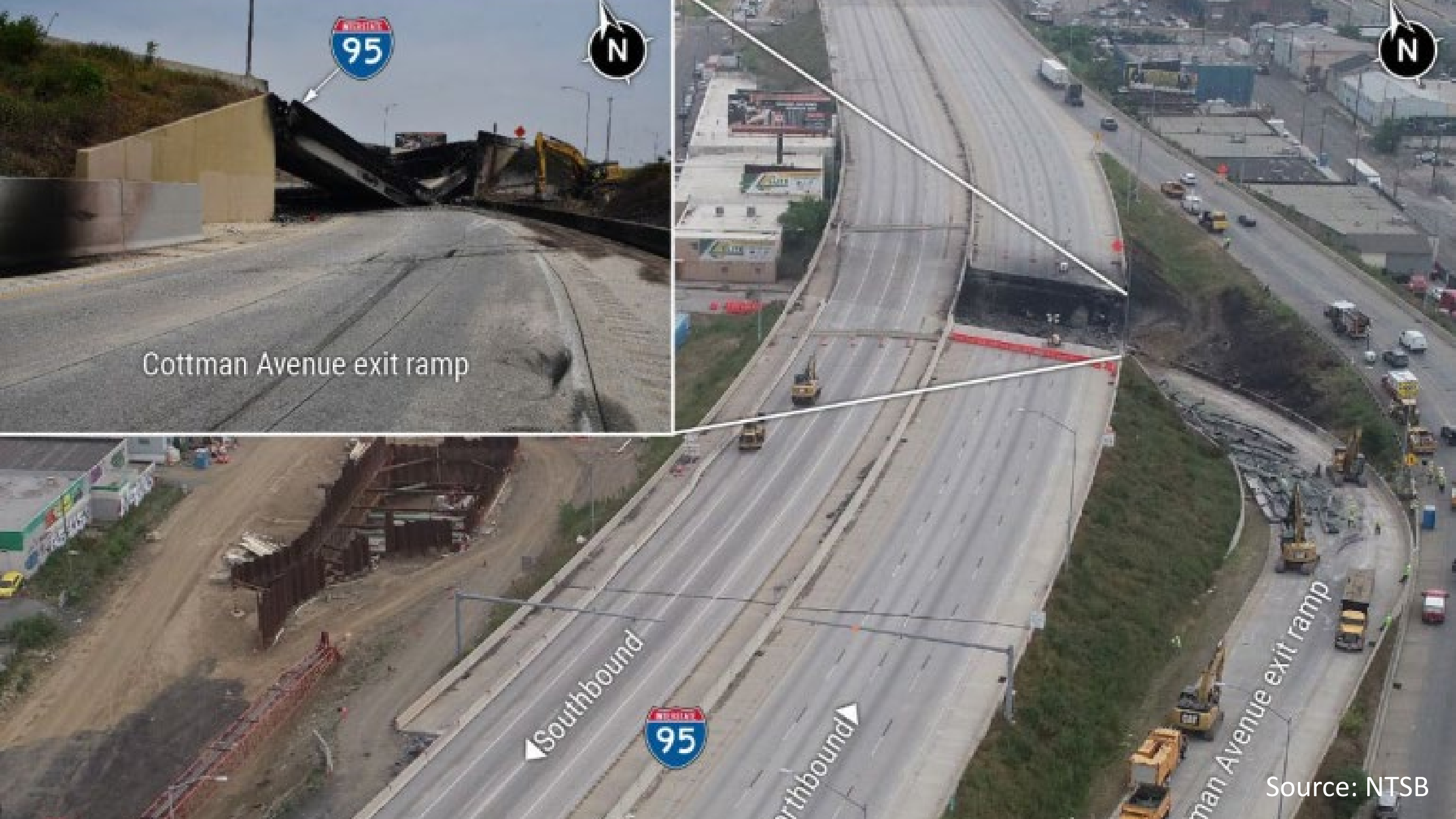
TIME OF CRASH

6:17 a.m.

June 11, 2023

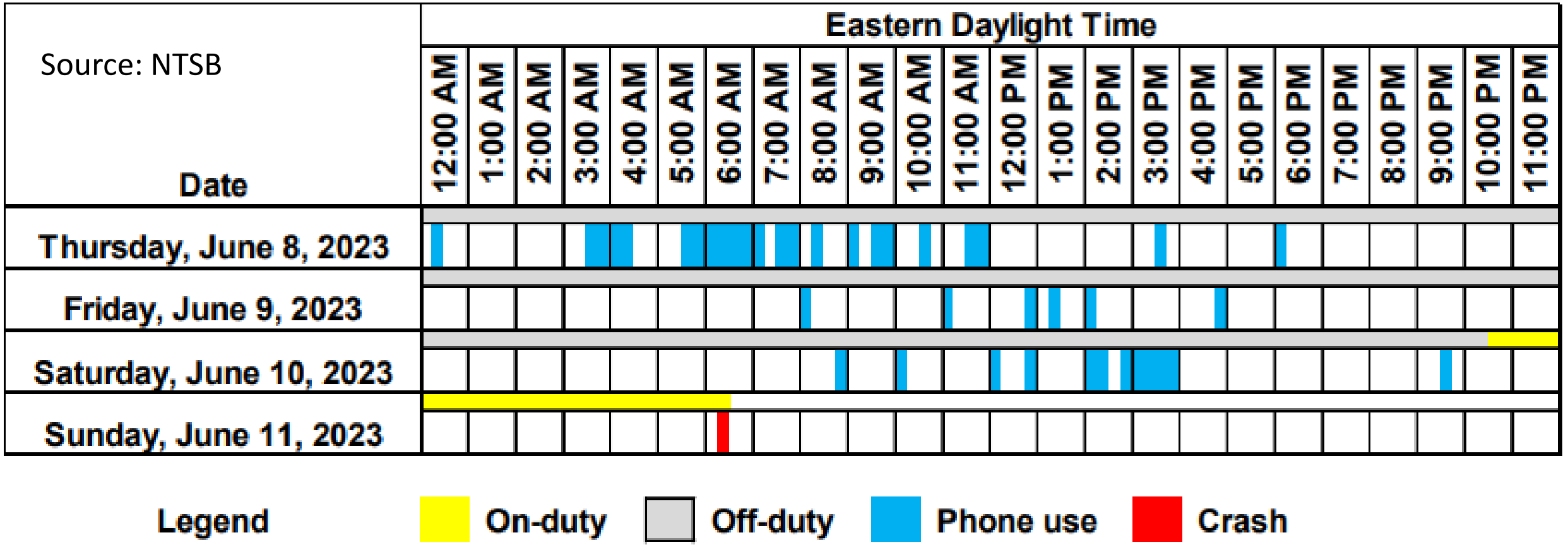
Philadelphia, Pennsylvania

Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY23FH014.aspx


95
N
Cottman Avenue exit ramp
Southbound
95
N
Cottman Avenue exit ramp

Source: NTSB

Schedule


Source: NTSB
Eastern Daylight Time
Date
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Thursday, June 8, 2023
Friday, June 9, 2023
Saturday, June 10, 2023
Sunday, June 11, 2023
Legend
On-duty
Off-duty
Phone use
Crash

Crash 3 – Facts

- At 6 a.m. Jan. 28, 2023, a bus and a box truck collided head-on on New York State Route 37 in Louisville, New York
- The truck crossed the centerline striking the bus, which was transporting workers to a construction site
- This crash resulted in six fatalities, two serious injuries and five minor injuries among the bus passengers, along with minor injuries to the bus driver and serious injuries to the truck driver

TIME OF CRASH

6 a.m.

Jan. 28, 2023

Louisville, New York

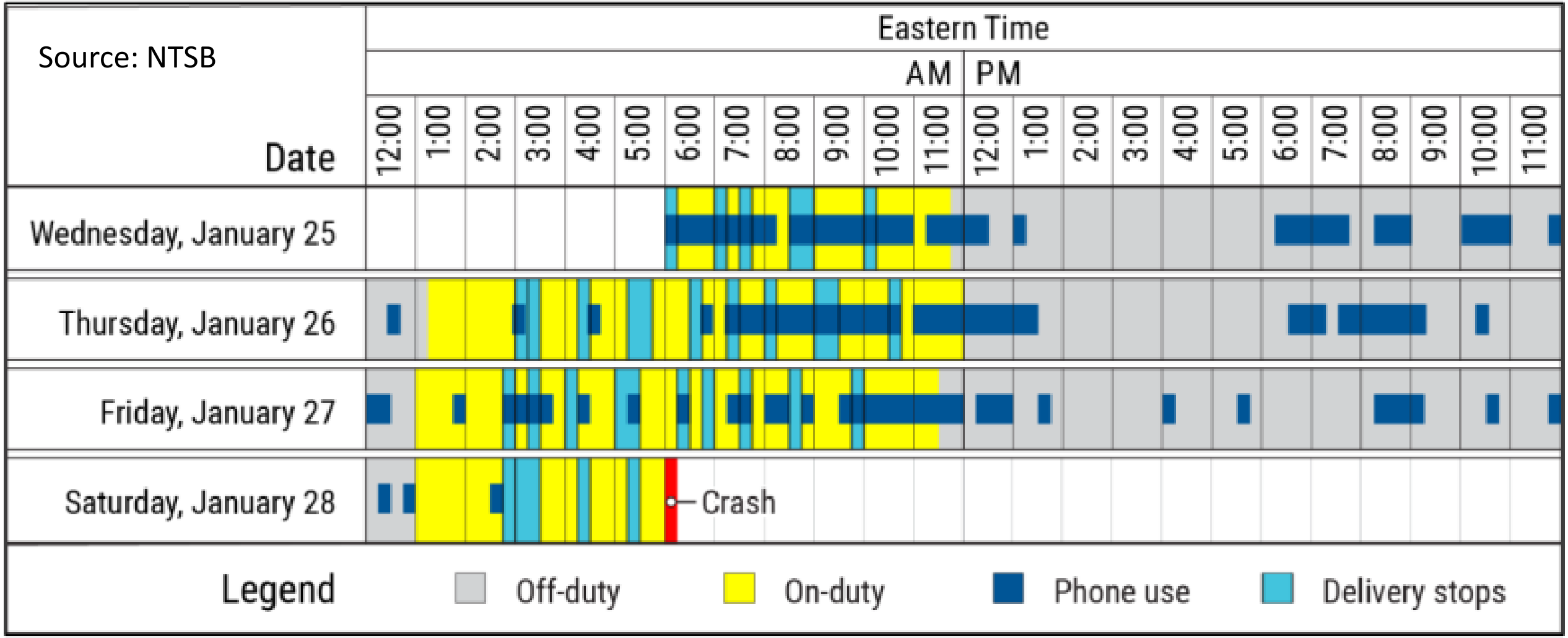
Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY23FH005.aspx





Source: NTSB

Schedule


Source: NTSB
Eastern Time
AM
PM
Date
12:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
Wednesday, January 25
Thursday, January 26
Friday, January 27
Saturday, January 28
Crash
Legend
Off-duty
On-duty
Phone use
Delivery stops

Crash 4 – Facts

- At 1:36 a.m. Dec. 16, 2022, a truck-tractor with a semitrailer crashed into the rear of a slower-moving bus on Interstate 64 near Williamsburg, Virginia
- The truck, traveling between 65 and 70 mph with cruise control, did not brake before impact, while the bus was moving at 20 to 25 mph
- The collision resulted in the deaths of three bus occupants, serious injuries to nine bus occupants and the truck driver, and minor injuries to 11 bus occupants

TIME OF CRASH

1:36 a.m.

Dec. 16, 2022

Williamsburg, Virginia

Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY23MH004.aspx

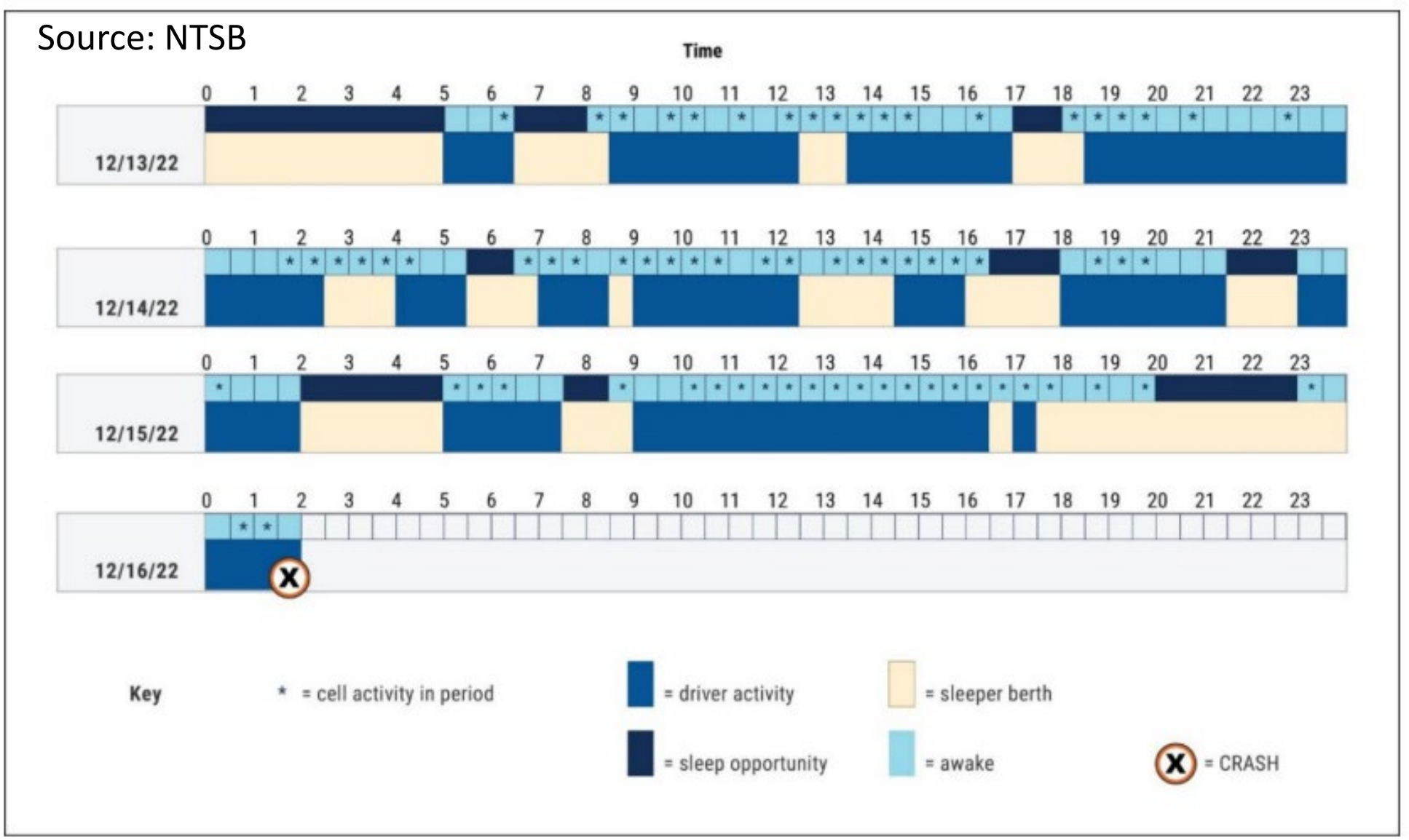




Source: NTSB

Schedule

Source: NTSB



Crash 5 – Facts

- At 10:07 p.m. June 9, 2021, a truck-tractor with a tank trailer crashed into a queue of stopped passenger vehicles on SR-202 in Phoenix, Arizona
- Traveling at 62-64 mph without slowing or steering, the truck initiated a chain-reaction collision involving seven other vehicles
- The crash resulted in four fatalities and 11 injuries among passenger vehicle occupants, with the truck-tractor and one car consumed by fire

TIME OF CRASH

10:07 p.m.

June 9, 2021

Phoenix, Arizona

Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY21MH008.aspx



Source: NTSB



Source: NTSB

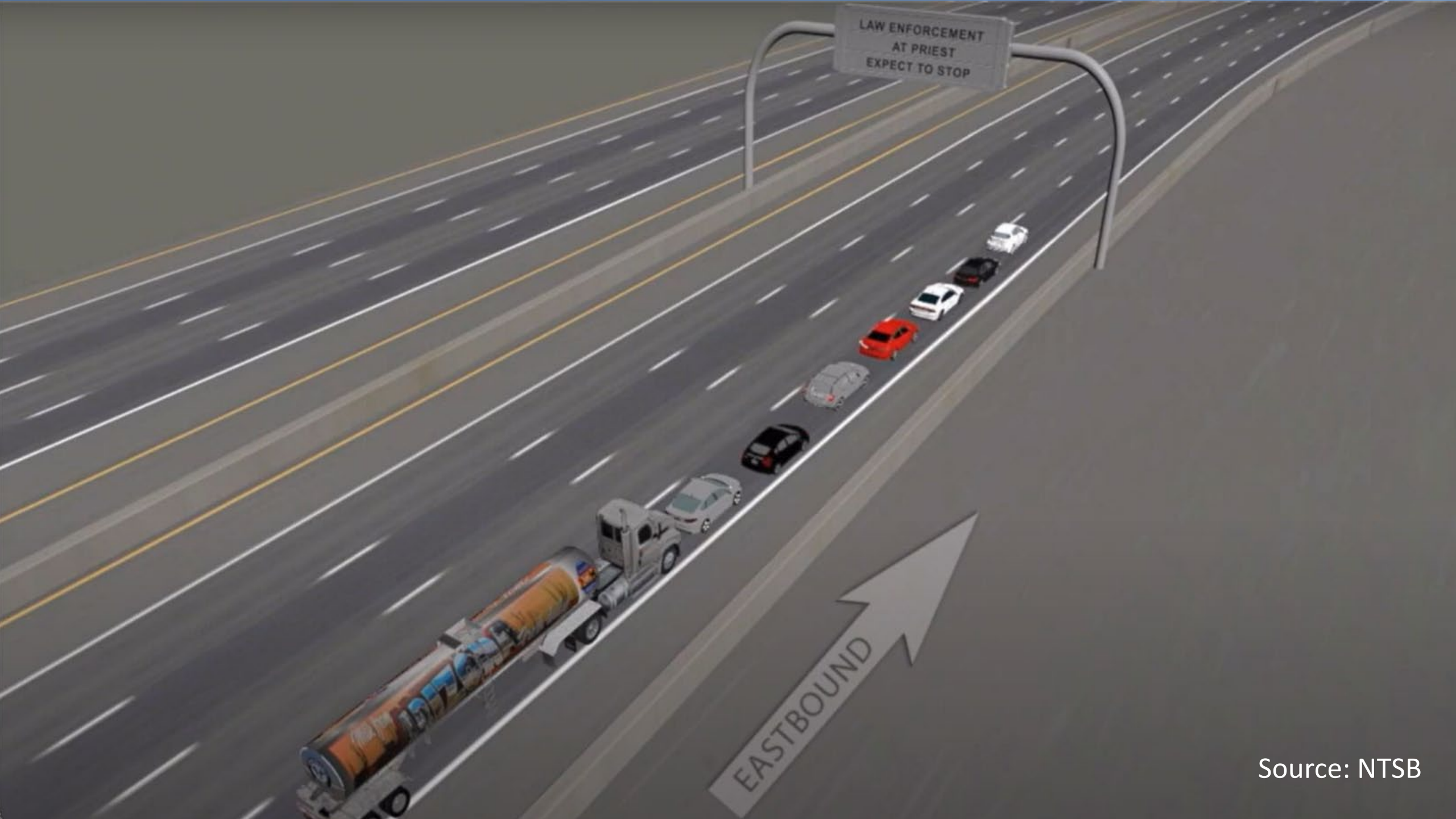


Source: NTSB


Source: NTSB



Source: NTSB



Source: NTSB


Chevrolet
Tank trailer
Truck tractor
Nissan
Lexus
Mercedes
Dodge
EASTBOUND
Toyota
Ford
Fatally injured: 4 persons
Hospitalized: 11 persons

Source: NTSB

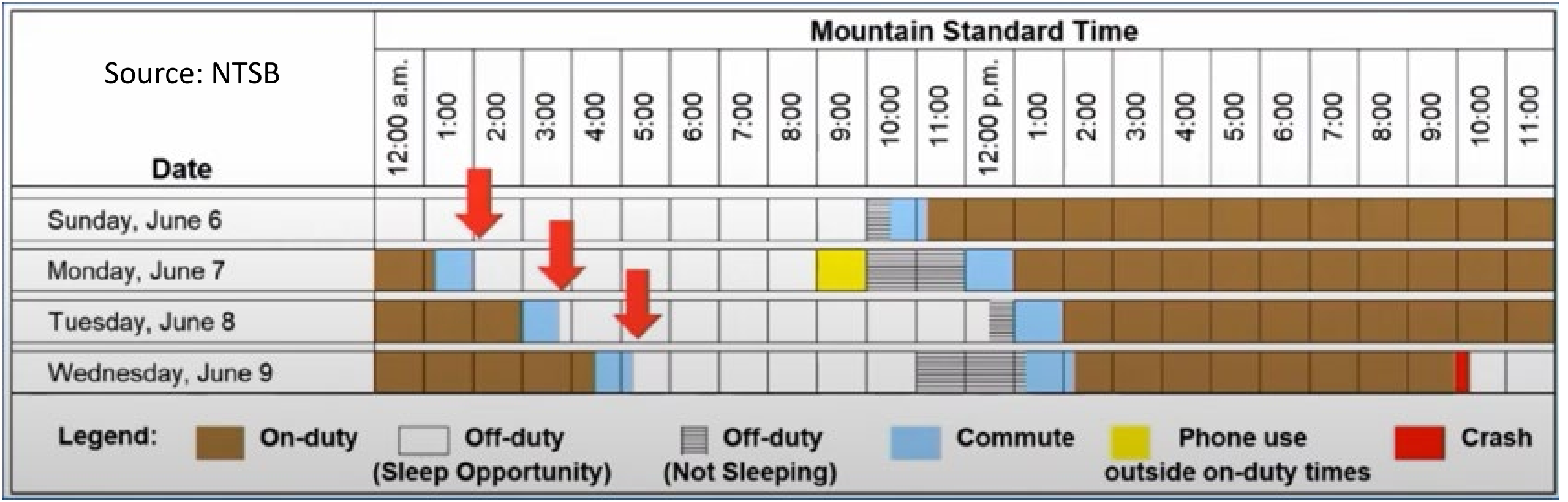

Toyota
Mercedes
Ford
Right shoulder barrier


Truck-tractor
Chevrolet

Source: NTSB

Schedule

Source: NTSB



Crash 6 – Facts

- At 6:45 a.m. June 12, 2020, a truck-tractor with a semitrailer struck the end of a slowed and stopped traffic queue on Interstate 39 near Arlington, Wisconsin, which had formed due to prior collisions
- This initiated an eight-vehicle crash that resulted in four fatalities and three serious injuries

TIME OF CRASH

6:45 a.m.

June 12, 2020

Arlington, Wisconsin

Source: NTSB https://www.ntsb.gov/investigations/Pages/HWY20FH006.aspx


Peterbilt truck-tractor
Mack truck
Freightliner truck-tractor
VW sedan
Kia SUV
Source: NTSB

SECTION 3

Characteristics of Fatigue

Poll

Alertness and fatigue are like an on/off switch, you are either awake or asleep

A True

B False

Alertness Spectrum

Delta brain waves	Deep sleep	**1 to 4 Hertz**
Theta brain waves	Sleeping or daydreaming when awake	**4 to 8 Hertz**
Alpha brain waves	Awake and calm	**8 to 12 Hertz**
Beta brain waves	Awake, alert, busy, and focused	**12 to 38 Hertz**
Low beta waves	Thinking	12 to 15 Hertz
Beta waves	Performing or focusing	15 to 22 Hertz
High beta waves	Excited or anxious	22 to 38 Hertz
Gamma brain waves	Highly alert and consciousness	**30 to 80 Hertz**

Poll

The only cause of fatigue is insufficient sleep

A True

B False

Alertness Has Supply & Demand

Supply Factors

- **Internal individual susceptibility:** circadian rhythm, amount of sleep, time of day, time awake, stimulants, other drugs, health, genes, mood

Demand Factors

- **Task related:** Time on task, task complexity, task monotony
- **Environmental:** Road conditions, weather, stress (heat, noise, vibration), vehicle design, social interaction, other stimulation

Poll

In truck/bus crash statistics, driver fatigue is…

A. The number 1 cause

B. Not a significant cause

C. Underrepresented

Crash Causation: 87% Driver Related

Non-Performance	Driver fell asleep, was disabled by heart attack or seizure or physically impaired for another reason
Recognition	The driver was inattentive, distracted by something inside or outside the vehicle or failed to observe the situation adequately for some other reason
Decision	Driver was driving too fast for conditions, misjudged the speed of other vehicles or followed other vehicles too closely
Performance	Driver panicked, overcompensated or exercised poor directional control

Crash Causation Associated Factors

14%	Inadequate Surveillance
13%	Fatigue
10%	Felt Under Work Pressure From Carrier
9%	Inattention
8%	External Distraction

54%

Total: Crashes where diminished vigilance was involved

Source: FMCSA Large Truck Crash Causation Study

NTSB Report

- The Safety Board believes that the incidence of driver fatigue is underrepresented in FARS in general and in FARS specifically with regard to CMV drivers
- Research has suggested that CMV driver fatigue is a contributing factor in 30 to 40 percent of all CMV crashes

RESEARCH SUGGESTS

30–40%

of CMV crashes have driver fatigue as a contributing factor

NTSB Report: Factors That Affect Fatigue In Heavy Truck Accidents

Volume 1: Analysis | Volume 2: Case Summaries

CMV Driving Worsens Fatigue

- Tight schedule to get enough sleep
- Extended work hours + commuting
- Changing work schedules
- Work/sleep periods conflict with circadian rhythm
- Limited time for rest & naps
- Unfamiliar & uncomfortable sleep locations
- Sleep disruptions
- Difficulty finding nutritious food on the road
- Limited opportunities for exercise
- Personal, work and environmental stressors

Poll



Why manage fatigue?

Fiduciary Duty for Lifetime Earnings and Profits

Lower Fatigue Related Crashes

Cost Reduction

- Driver retention
- Medical costs
- Maintenance

Lower Legal Liability Exposure

Labor force

- Safer
- More productive
- Healthier & happier

ARTICLES

Nailing the Top Ten Industry Issues through Fatigue Management

Part One | Part Two

Silent Killer of Drivers and Profits

Fatigue is a physiological state that forces the brain to prioritize survival over demanding cognitive functions

SECTION 4

Fatigue Management Program

Fatigue Management Program (FMP)

Safety Culture

1) Education
2) Training
3) Continuous communications – Including partnerships

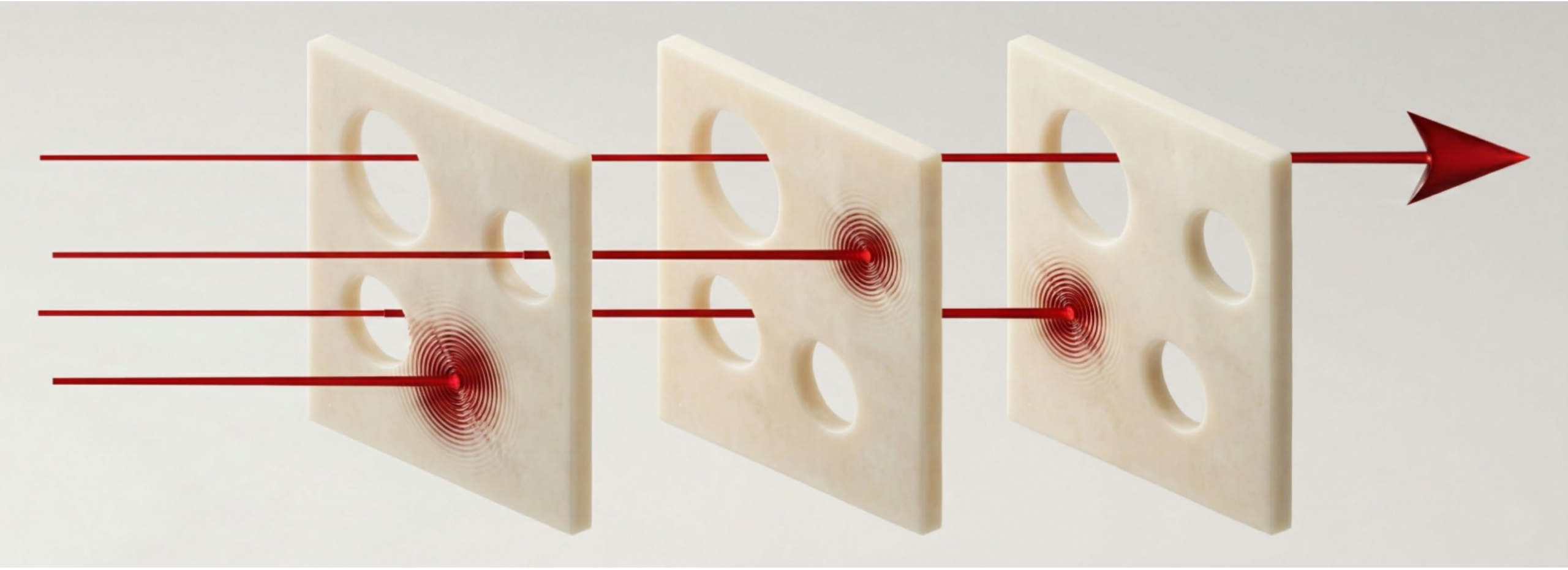
Fatigue Risk Management System

1) Operations
2) Identify risks with processes and controls
   - Predictive, proactive, reactive
   - Sound scheduling, sleep disorders management program, fatigue detection technologies
3) Risk assessment
4) Measures and countermeasures
5) Evaluation

RESOURCES

FMP Template | Module 2: Safety Culture and Management Practices Implementation Manual

The Swiss Cheese Model

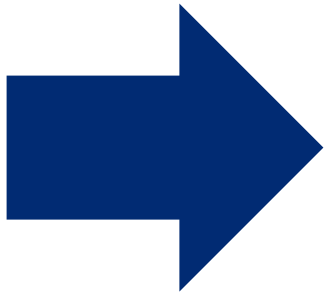


SWISS CHEESE LAYER

Safety Culture

Safety Culture

- Knowledge
- Skills
- Attitudes



- ✓ Behavior Change
- ✓ Elimination of Stigmas

Education & Training Courses

eLearning Platform & PowerPoint Downloads

Motor carrier executives and managers
Module 1 (Intro), 2 (Safety Culture), 7 (Sleep Disorders), 10 (Technologies)

Motor carrier trainers
Module 5 (Train-the-Trainer)

Motor carrier dispatchers and driver managers
Module 9 (Scheduling)

Freight Shippers, Receivers, Brokers
Module 6 (Role of shippers & receivers on driver safety)

Drivers
Module 3 (Driver Ed), 8 (Sleep Disorders) & 9 (Scheduling)

Driver Families
Module 4 (Family Ed)

Wellness Affects All Body Systems

Messaging
Nervous · Endocrine · Immune · Reproductive

Plumbing
Respiratory · Cardiovascular · Digestive · Urinary

Support
Skeletal · Muscular · Integumentary

- Sleep Hygiene (Webinar)
- Positive Relationships (Webinar)
- Mindfulness (Webinar)
- Nutrition (Webinar)
- Exercise (Webinar)

Objective Signs of Fatigue

- Eyelid drop or loss of focus
- Yawning
- Wandering, scattered or disjointed thoughts, dreamlike visions
- Head movements, gentle swaying, jerking
- Reduced field-of-view (AKA: tunnel vision, highway hypnosis, white line fever)

- Fidgeting, shifting positions, adjusting windows & HVAC
- Progressive weaving, crossing rumble strip, drift and jerk steering
- Delayed or incorrect responses
- Microsleeps

Fatigue Management Strategies

- General
- At home
- On the road
- Night driving
- Changing time zones
- Team driving

More on Safety Culture

WEBINAR	Safety Culture: Transforming Fatigue Management from a Liability into a Competitive Advantage
ARTICLE	Don’t Stay in the Expensive Blind Spot of Stigmas
MODULE 2	Safety Culture and Management Practices

SWISS CHEESE LAYER

Sound Scheduling and Routing Practices

Scheduling Practices

- Sound scheduling and routing
- Time of day, recent sleep, continuous hours awake, cumulative sleep debt
- Shared responsibility mitigating driver fatigue in work schedules
- Regular schedules
- Forward vs backward scheduling

- Consider travel time to employment location
- Consider rests and naps during work shift
- Maximum of 16 hrs. per day or less
- Maximize benefits of scheduling tools
- Develop customized strategies for managing fatigue

Scheduling

WEBINAR The Scheduling Puzzle: Sleep Science and Driver Fatigue

MODULE 9 Driver Scheduling and Tools

SWISS CHEESE LAYER

Fatigue Detection Technologies

Fatigue Management Technologies Types



01

Scheduling & Trip Planning



02

Fitness for Duty Testing



03

Performance Monitoring



04

Driver Monitoring

More on Fatigue Detection Technology

WEBINAR	The Alertness Toolkit – A Motor Carrier's Guide to Fatigue Management Technologies
WEBINARS	Solution Series Webinars
MODULE 10	Fatigue Monitoring and Management Technologies

Technology Catalog Sources

2024

Good-Practice Guidance – To support industry uptake of rapidly emerging Fatigue and Distraction Detection Technologies (FDDT)

By Australia's National Heavy Vehicle Regulator (NHVR)

2020

Review of Commercially Available Devices to Detect Fatigue and Distraction in Drivers

By Institute for Road Safety Research in the Hague, Netherlands

2019

Commercial Motor Vehicle Operator Fatigue Detection Technology Catalog and Review

By National Surface Transportation Safety Center for Excellence

Fatigue Technology Best Practices

1. Must be integrated into overall FMP
2. Take full advantage of the technology capabilities
3. Develop well-defined protocols
4. Explain the role of technology to drivers
5. Create meaningful driver expectations
6. Present consistent and detailed feedback to drivers
7. Maintain a positive atmosphere
8. Reinforce that safety is everyone's responsibility

SWISS CHEESE LAYER

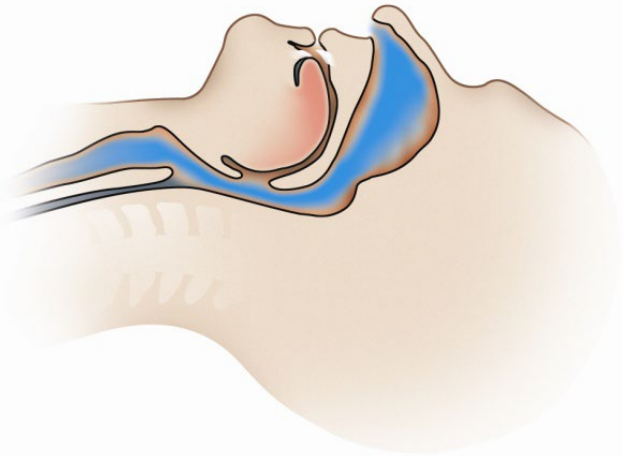
Sleep Disorder Management

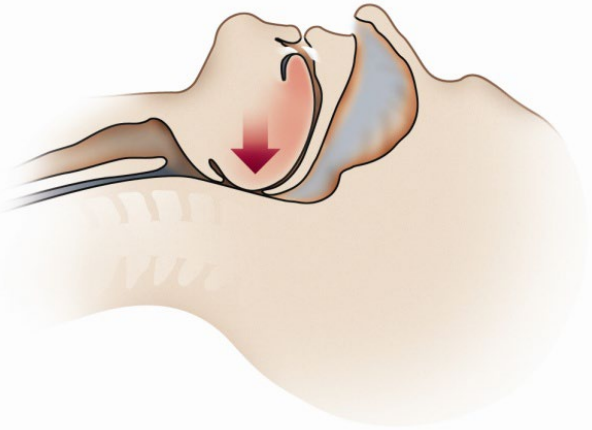
Fatigue Susceptibility

Sleep Deprivation	• Sleep-related behaviors • Sleep hygiene
Individual Differences	• Genetic variations • Health & fitness
Medical conditions	• Medications • Sleep disorders – Insomnia, narcolepsy, restless leg syndrome, sleepwalking, abnormal circadian rhythms, obstructive sleep apnea (OSA)

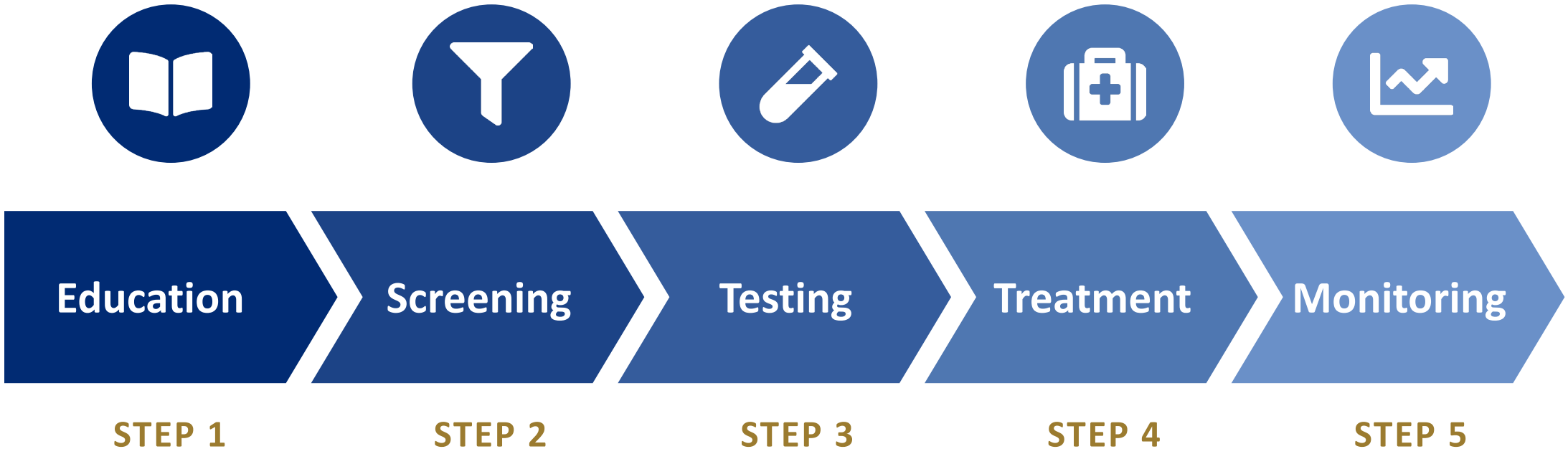
Obstructive Sleep Apnea

- **Apnea** = stoppage of breathing lasting 10+ seconds
- **OSA** = breathing stops repeatedly during sleep due to closures of the upper airway
- Apnea rate per hour:
  - <5 = normal
  - ≥5 = OSA
- OSA severity (mild, moderate, severe) based on rate
- Some people with severe OSA can have 100 per hour





Sleep Disorders Management Program



More on Sleep Disorders Management

WEBINAR	Guide to Establishing a Sleep Disorders Management Program
MODULE 7	Motor Carrier Sleep Disorders Management
MODULE 8	Driver Sleep Disorders Management

SECTION 5

Next Steps

NAFMP

North American Fatigue Management Program

nafmp.org

NAFMP Website Free Resources

Tools	FMP Template · Implementation Manual · ROI Calculator
Courses	eLearning Platform · PowerPoints with and without audio *For carrier's executives, safety managers, dispatchers, instructors, drivers, driver's families, shippers & receivers*
Webinars, Info Sessions & Articles	Gallery · List · Categories · Sign up for article notifications
Podcast	The NAFMP Pod · Available from eight platforms
Events	Download individual event · Subscribe to Calendar of future events

Connect with me to coordinate a free fatigue management session or course for your organization



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Scan vCard and add me to your contacts



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