

NATIONAL TRANSPORTATION SAFETY BOARD METHODOLOGY FOR INVESTIGATING OPERATOR FATIGUE IN A TRANSPORTATION ACCIDENT

Initial Screening Questions

If any of the following is true, proceed with the detailed methodology:

- Does the operator's 72-hour history suggest little sleep, or less sleep than usual?
 - Did the accident occur during times of reduced alertness (such as 0300 to 0500)?
 - Had the operator been awake for a long time at the time of the accident?
 - Does the evidence suggest that the accident was a result of inaction or inattention on the part of the operator?
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Detailed Methodology

It is important to establish two factors before concluding that operator fatigue contributed to an accident. First, determine whether the operator was susceptible based on sleep lengths, sleep disturbances, circadian factors, time awake, and/or medical issues. Second, if it is determined that the operator was likely experiencing excessive fatigue, evaluate information concerning the operator's performance, behaviors, and appearance at the time of the accident to determine whether they were consistent with the effects of fatigue.

A finding that the operator was susceptible to the development of a fatigued state in the absence of performance or behaviors consistent with fatigue should not be used to support operator fatigue as a probable cause or contributing factor in the accident, but may still be an important safety issue to be addressed in the accident report.

Part 1: Determine whether the operator was susceptible to fatigue.

Sleep Length

Determine whether the operator had acute or chronic sleep loss by documenting sleep/wake patterns for at least 72 hours before accident and learning about the operator's "normal" sleep habits.

- Ask operator:
 - Describe your typical sleep pattern of when you go to bed, awaken, and how much sleep you get during days off.
 - What time did you fall sleep the night before the accident? What time did you wake up? What was the quality of your sleep? (Repeat for two nights before, three nights before, etc.)
 - Did you take any naps? When, where, for how long, and why?
- Interview family members, hotel staff or other witnesses who can help complete the operator's sleep/activity schedule before the accident.
- Use receipts, cell phone records, work schedules, log books, alarm clock setting, or other records to help complete the operator's sleep/activity schedule before the accident.

Fragmented/Disturbed Sleep

Determine if the operator's sleep was fragmented (e.g., multiple sleep episodes per 24-hour period) and/or disturbed (e.g., awakenings during sleep due to internal or environmental factors) in days leading to accident.

- Use sleep/wake information collected in "Sleep Length" to examine the lengths and patterns of sleep episodes for split sleeps or daytime sleep.
- Ask operator (or determine through interviews with family members):
 - Are there factors in your environment (e.g., noise, light, phone calls, etc.) that interfere with your sleep?
 - Was your sleep pattern different or disrupted in the days leading to the accident?

Circadian Factors

Determine if accident happened during a circadian low point. The primary circadian trough is approximately midnight to 0600, especially 0300 to 0500, while a secondary "afternoon lull" occurs at approximately 1500 to 1700. Also, determine if the operator suffered from circadian issues due to recently crossing multiple time zones or to rotating, inverted or variable work/sleep schedules.

Sleep Disorders, Health, and Drug Issues

Determine if sleep disorders or other medical factors (e.g., disease or drug use) were present in the operator's history.

- Ask operator:
 - Do you have difficulty falling asleep or staying asleep?
 - Have you ever told a doctor about how you sleep? If so, why, when, and what was the result?
 - What drugs/medications do you use regularly, and did you take any in days prior to the accident?
 - Do you have any medical concerns that affect sleep (e.g., chronic pain, GERD, etc.)?
- Review operator's toxicological results for substances that may affect sleep or alertness.
- If applicable, have the operator evaluated by a physician who specializes in sleep medicine.
- Other evidence sources include the operator's medical or pharmacy records, or any drugs or medicine found within the wreckage.

Time Awake

Determine how long the operator had been awake at the time of the accident, using interviews or records to estimate wake up time from most recent significant sleep before the accident.

Additional Suggestions

- Check work records and records of previous accidents/incidents (including DMV and/or insurance records) for evidence of prior falling asleep during vehicle operation.
- Determine what kind of training the operator had received regarding fatigue management.
- Review operator's environment and tasks for unusual conditions on the accident day that would depress arousability, like low lighting, operational delays, or boredom.
- Determine whether representatives of management of labor union parties have indicated complaints of operator fatigue in the recent past?

Part 2: Determine whether the operator's performance, behaviors, or appearance were consistent with the effects of excessive fatigue, and whether their performance or behaviors contributed to the accident.

Operator Performance

Determine whether the operator's performance was consistent with the effects of fatigue.

- Use available evidence to determine whether the operator's performance was deteriorating prior to the accident. For example:
 - Did the operator overlook or skip tasks or parts of tasks?
 - Was there steering or speed variability?
 - Did operator focus on one task to the exclusion of more important information?
 - Was there evidence of delayed responses to stimuli or unresponsiveness?
 - Was there evidence of impaired decision-making or an inability to adapt behavior to accommodate new information?

Operator Behaviors and Appearance

- Determine whether the person's appearance or behaviors before the accident were suggestive of sleepiness/fatigue, as based on witness interviews, operator report of being tired, audio or video records of the operator's behavior.