

U.S. Department of Transportation

Federal Railroad Administration

Date:

APR 18 2003

Reply to Attn of: G-03-02

Memorandum

Human Factors Chrcadian Rhythms Supplement Subject: From:

Director, Office of Safety Assurance and Compliance

Regional Administrators To: Deputy Regional Administrators **Operating Practices Specialists**

Technical Bulletin G-03-01 regarding this subject is rescinded and reissued using G-03-02.

SYNOPSIS

This Technical Bulletin prescribes the Human Factors Circadian Rhythms Supplement and takes effect immediately upon receipt. It must be completed and submitted as an integral part of an accident investigation report if employee fatigue or a deterioration of employee alertness may have caused or contributed to the accident. A separate report should be completed for each employee.

[Note: this Technical Bulletin supersedes Technical Bulletin G-92-15, dated November 2, 1992.]

BACKGROUND

The Office of Safety has undertaken a program to develop objective, scientific methods for assessment of fatigue that might contribute to accidents and incidents. These methods are under continuing development, and this post-accident survey will be refined based on comments from users and scientific review. There are two key elements of the approach. The first is the use of a mathematical model of sleep and circadian rhythm effects on performance as an assessment tool for retrospective analysis of performance at the time of events. The predictions of the model are only as good as the information fed to the model about the work schedule and information or inferences about the use of off-duty time for sleep. Answers to some of the questions and the schedule table are valuable sources of information for the model and are necessary to predict likely levels of performance and possible fatigue. Questions about typical sleep habits, napping patterns, call times, and personal time are all designed to help estimate probable sleep patterns under the ten-day work schedule, especially when accurate and specific sleep diaries are not available.

The second key element of the approach is the collection of supporting information that could substantiate and amplify the predictions of the model, such as information on subjective alertness, fatigue related behaviors, sleep disorders, and the use of medications. Supporting information from these questions enhances our confidence in the predictions from the model.

The Office of Safety recognizes that no fatigue assessment is 100% accurate, but a scientific assessment using a rigorous model is better than subjective guesswork and it is certainly better than no assessment at all. It is imperative that these kinds of data begin to be collected so that a database can be accumulated that allows for a more accurate general assessment of fatigue as a contributing element to human factors errors, incidents, and accidents. A ten-day retrospective of the work and sleep schedule should provide an adequate basis for an assessment of fatigue based on current scientific evidence.

It should also be noted that this Supplement represents but one component of the Office of Safety's overall strategy for addressing the fatigue problem that confronts railroad employees. Other components deal with educational and training measures designed to increase the awareness of an employee and his/her family to the symptoms of fatigue and solutions thereto. Still, additional components deal with fostering a culture change within the railroad industry to recognize the significant role that fatigue plays on the safety of an employee, including quality of life issues. Albeit, most of our early endeavors have been targeted toward the educational and training sphere, this is consistent with scientific recommendations. However, development of a database that provides for analytical interpretation of the fatigue factor in an accident/incident will enhance efforts to implement measures for minimizing the impact of this factor in future accidents/incidents. To the maximum practical extent, this database must be founded on documentation that can be verified and that is the purpose of the Supplement. By their nature, some of the questions listed in the Supplement require responses that are subjective. This cannot be avoided and was implied above. On the other hand, other questions and responses should elicit information that is verifiable and will support the analytical process. Together, the subjective and objective responses will greatly contribute toward validating or calibrating the mathematical model and its findings.

INSTRUCTIONS

The questions on the following pages are designed to be addressed primarily to the crewmembers involved in an incident or accident, their supervisors, and possibly co-workers. Substantiate work schedule information with company records. If the crewmember is not available for questioning, then complete the questionnaire based on company records and co-worker information, and indicate the source of the information. Some questions about off-duty activities and sleep schedule may require that the employee make an estimate. An estimate by the employee is better than no information at all, and the entry should be annotated as an estimate. Question 2 regarding preferred bedtime and napping patterns is designed to assist in an accurate estimation of sleep under the work schedule. For example, if the person normally works a regular job starting at 2300 hrs, he/she may have a typical bedtime of 0900 hrs with an afternoon or evening nap. That information is very valuable. If the typical pattern was disturbed during the days prior to the event, then indicate that variation in the schedule table.

Attachments (2)

CREW MEMBER QUESTIONS AND SCHEDULE INFORMATION

- 1. Develop the on duty off duty cycle for the ten-day period prior to the accident/incident. If in that ten-day period the employee was continuously subject to call, develop the on duty off duty cycle from the last day that the employee was not subject to call. Use a 24 hour format and include dates with the time of the beginning and end of each duty period. Note any deadhead time or other time not available for sleep (van transport time, for example). Include the type of assignment, i.e. yard, local, through freight, extra board, deadheading, etc. *Use the schedule worksheet at end of the form*.
- 2. Collect information on typical sleep habits, such as preferred bedtime, regular naps, and any time normally reserved for personal affairs. For example, many on-call engineers reserve their afternoons from noon (1200 hrs) to eight in the evening (2000 hrs) for personal time. Use the schedule worksheet at end of the form to record any known sleep periods during the ten days immediately prior to the accident/incident.

 Preferred Workday Bedtimes (schedule permitting):

 Regular naps:
 Reserved time most days:

3. Commuting distance from residence to home terminal.

a. Miles one-way ______ b. Travel time one-way ______

4. Normal calling time: _____ hrs. ____ mins. Calling time for this assignment: _____ hrs. ____ mins.

5. Was employee called for a job/assignment he/she would expect to be called for? If the answer is no, explain.

O Yes

O No – Explanation:

6. If employee was working "on-call" and he/she was following train/crew line-up information, was the *actual call*: O Accurate O Early O Late. Indicate how early or late:

- O 1 2 hours
- $\bigcirc 2-4$ hours
- O 4 hours or more Number of hours _____, minutes _____
- Not applicable

For the off duty period prior to the accident/incident, describe the employee's activities, i.e. sleep patterns, diet, recreation, family activities, etc.

In the employee's last off duty period prior to the accident/incident, how well was the employee able to sleep? For c, d, and e, explain why, if known.

a. Easily

7

8.

b. Slight difficulty

c. Moderate difficulty

- d. Great difficulty
- e. Not at all

Explanation:

9. How well rested did the employee feel when he/she last awoke? For b, c, and d, explain why, if known.

- a. Well rested
- b. Moderately rested
- c. Slightly rested
- d. Not at all rested

Explanation:

10. During the time period just prior to the accident/incident did the employee feel:

- a. Fully alert
- b. Moderately alert
- c. Drowsy
- d. Fighting sleep

11. Was the employee experiencing any of the following prior to the incident?

- O Trouble keeping his/her head up
- Couldn't stop yawning
- **O** Nodding off
- O Feeling weak or dizzy
- Trouble recalling something he/she recently saw or heard (conversation, signal, train order requirement, etc.)
- 12. If 'yes' to any item in #11, to what did the employee attribute his/her fatigue or deterioration in alertness?

What did he/she do to control it?

13. Were there any unusual workplace issues that may have affected the employee's performance?

- **O** Weather
- **O** Equipment problems
- O Difficulties with supervisors or co-workers
- Communications issues
- O Others Explain:

14. Ask if the employee has a sleep disorder and if "Yes", describe the problem:

- O No
- **O** Yes Explain:

Has the person been screened for sleep disorders, such as sleep apnea?

- O No
- O Yes

15. Has the employee received training regarding fatigue, circadian rhythms and sleep disorders?

- O No
- O Yes rate the quality of the fatigue training:
 - m Poor
 - m Adequate
 - m Above average
 - m Outstanding

16. Ask if the employee has recently taken prescription or non-prescription medications and what they were.

Schedule Worksheet:

Activity * (On-duty, Deadhead, Off-duty, Sleep, etc.)	Beginning Date and Hour (Example: 10/19/02 2035)	End Date and Hour	A (accurate) E (estimate)
Begin with day of accident/incident and work backwards for at least 10 days:			
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* OD = On-duty OF = Off-duty DH = Deadhead C = Commute S = Sleep