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## FATIGUE CASE STUDY

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Fatigue and stress tend to interact, with stress causing fatigue and fatigue causing stress. As stress and fatigue increase, one's abilities diminish. Fatigue is simply a state of diminished physical and/or mental efficiency.

As fatigue progresses, errors of omission increase followed by errors of commission and eventually followed by microsleeps which are involuntary sleep lapses lasting from a few seconds to a few minutes. Fatigue can cause uncontrolled and involuntary shutdown of the brain regardless of the how hard you try, professionalism, or the training level of the person.

Fatigue is defined as the state of feeling tired, weary, or sleepy that results from prolonged mental or physical work, extended periods of anxiety, exposure to harsh environments, or loss of sleep. Boring or monotonous tasks will increase feelings of fatigue. Generally, fatigue interrupts attention and causes slow and inaccurate performance. *Fatigue affects individual vigilance and performance.*

Fatigue induced human error, inattentiveness, and failures of cognitive reasoning cause 80% of all transportation accidents. Unfortunately, our 24-hour society is habitually sleep deprived. Eight (8) hours of sleep is normally required to avoid creating a sleep debt, but few of us ever obtain this amount.

### **PERFORMANCE DECREMENT FROM FATIGUE**

Most adults require 8 hours of restful sleep to stay out of sleep debt. Each of us is a little different and we must all determine what a good night's sleep is for us. Many researchers say your baseline night's sleep can be determined by recording the number of hours you sleep until you wake up naturally without the use of an alarm. With aging there is usually a significant decline in habitual daily sleep due to increased awakenings. This results in more daytime fatigue, sleepiness, dozing, and napping.

When we consider the performance decrement from fatigue there are two areas we need to consider: Hours of wakefulness and sleep debt.

1. Hours of Wakefulness = Total number of hours you have been awake.
2. Sleep Debt = the number of hours of less sleep you get per night. This is computed from what we call a baseline night's sleep (How many hours you could normally sleep per night and feel rested). Example: If you normally sleep 7 hours per night and because of moving to a night shift you sleep 3 hours less during the day, you would then accumulate a 3 hour sleep debt per day. You then multiply nightly sleep debt by the number of days to calculate total sleep debt. Remember

sleep debt can be due to getting up early, working late, shift changes, excess work hours, etc.

3. **Work Day:** To calculate your work day, simply add hours of wakefulness + sleep debt. Example: On day 4 of a night shift you are on hour 7 of the shift. You have been getting 3 hours less sleep per night for the previous 4 days ( $4 \times 3 = 12$  hours of sleep debt). Add the 7 hours from the shift to the 12 hours of sleep debt to come up with a 19 hour work day.

Nineteen (19) hours of wakefulness equals the mental performance level of a legally drunk driver in most states (.08 Blood Alcohol Concentration). Twenty Four (24) hours of wakefulness is the equivalent of 0.14 Blood Alcohol Concentration. During a fatigue impaired state we may not have balance problems or slurred speech but we do suffer the mental/cognitive impairment associated with alcohol. Here is a simple chart to help you determine impaired performance:

<u>Work Day</u>	<u>Equivalent Blood Alcohol Concentration</u>
10 Hours =	0.0
12 Hours =	0.01
14 Hours =	0.03
16 hours =	0.05
18 Hours =	0.07
20 Hours =	0.09
22 Hours =	0.10
24 Hours =	0.14

Research shows 10 days of minor restrictive sleep leads to progressively worsening performance and eventually a zone of impairment (Unsafe to drive or engage in safety-sensitive tasks). Sleep debt recovery will not occur after a single sleep period. It usually requires 2 nights of recovery and 10 hours of sleep. With the above information you can figure out exactly how sleep debt will affect you or your team.

### **Scenario for the Fatigue Example**

You are the Budget Technician at Medium Size National Park. Due to staffing limitations during the year, many of the park divisions have not kept their AFS 3 Reports up to date. As a dedicated “team player”, you have taken it upon yourself to balance the park’s end-of-the-year close out.

Your regular shift is Monday through Friday, 8:00 to 5:00, but because there are only five days (this coming M-F) remaining in the fiscal year, you have been approved to take 2 hours overtime each day.

Your baseline sleep is normally 8 hours, going to bed at 11:00pm and getting up at 7:00am. Because of the OT, your commute, and family responsibilities, you wind up sleeping 2 hours less each night, now getting up at 5:00am each morning, (and back to sleep at 11:00pm).

Compute your workday at 3:00pm on Monday.

Hours of wakefulness (from 5:00am to 3:00pm) = 10hrs

Sleep debt on Monday = 2hrs.

Workday at 3:00pm = 12 hrs

Compute your workday at 3:00pm on Wednesday.

Hours of wakefulness (from 5:00am to 3:00pm) = 10hrs

Cumulative sleep debt (2hrs Mon, Tues, and Wed) = 6hrs.

Workday at 3:00pm = 16hrs.

Compute your workday at 3:00pm on Thursday

Hours of wakefulness (from 5:00am to 5:00pm) = 10hrs.

Cumulative sleep debt = 8hrs.

Workday at 3:00pm = 18hrs.

At 3:00pm on Friday afternoon, everyone pitches in to complete the budget close out by 5:00pm. Compute your workday at 5:00pm on Friday.

Hours of wakefulness (from 5:00am to 5:00pm) = 12hrs.

Cumulative sleep debt = 10hrs

Workday at 5:00pm = 22hrs.

Have the participants refer to the Blood Alcohol Concentration chart in their Student Manual.

22 hours Workday is the equivalent of .10 BAC.

How useful to the team and to Medium Size National Park's budget will you be Friday afternoon?

What are the risks driving home from work on Friday afternoon?