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MX Fatigue *focus*

“GROUNDED”

A New FAA Fatigue Video
by
Dr. Bill Johnson



About the Author: Dr. Bill Johnson is the Chief Scientific Technical Advisor for Human Factors in Maintenance Systems for the FAA. He has over 30 years applied research and development experience with a focus on human performance in maintenance and repair of complex systems. His research efforts concentrate on every day solutions that affect human behavior and performance. Bill served as an FAA Designated Mechanic Examiner, he is a Private Pilot and an Airframe and Powerplant Mechanic.

FAA’s Flight Standards, Civil Aerospace Medical Institute, and Chief Scientist Program combined forces to create a new 20 minute video to promote fatigue awareness. The new video is not a typical “government training film” and is not a talking head. The back cover of the video package reads:

“There is trouble on the home front and fires at work! Gregg is an airline engineering manager who needs some rest. Can he get an aircraft back in the air and also correct his poor sleep habits? Or, will he go through life “Grounded?” The video is about sleep but it is not a sleeper. Watch the story and learn ways to correct your own sleep habits.”

The video is unique for a training film because of the interesting story line that encompasses about 24 hours in the life of an aviation maintenance manager. A unique combination of flash back and flash forward time events leaves the viewer with a “surprise ending.” A number of special effects, achieved through sounds and rapidly changing scenes keep the video interesting. Many scenes take place in the fatigue-induced daydreams of the main character, which is further complicated by interactions with his alter-ego. While well-intentioned, the main character displays the bad behavior and poor decision-making, a result of poor sleep, as he tries to correct an “Aircraft on Ground” situation. An imaginary sleep specialist comes to the rescue, throughout the program, providing excellent advice that is the basis for much of the program’s fatigue education.

The primary target of the video is aviation maintenance workers. However, the story is generic and appeals to all audiences. This is achieved by setting the scenes in the family home, the auto commute to work, a doctor’s office, and in the work environment.

“Grounded,” is packaged with a 90 minute computer-based training module and quiz. It can be used directly from the web (click links below), downloaded, or ordered on a CDROM. To see more go to FAA’s maintenance fatigue website at www.mxfatigue.com



Training



Video



Order form

Your Next Action: Please sit down and watch the video from start to end, without interruption. Many maintenance viewers have commented that they like the video with the closed captioning turned on. While viewing the video, see if some of the fatigue signs and sleep behavior are part of your life. Try to address the issues.

Finally, if you see value in the video, ask your managers to be sure that your fellow workers have a chance to see the video. Give your friends the link (mxfatigue.com). You might even show it to some family members?

“Can We Have A Sidebar **talk** On Fatigue?”

by Roger Hughes

Aviation Human Factors
Industry News



About the Author: Mr. Roger Hughes is a Human Factors Educator and the writer, editor, and distributor of the Aviation Human Factors Industry News. He is Founder of Decoding Human Factors, Inc. and a former jetBlue Airways Human Factors Manager.

As teachers we never know if our message is reaching our audience and what the impact is on their behavior based on the course content. We provide written or oral examinations that prove a body of knowledge has been successfully comprehended. But what about the behavioral change piece. In the realm of human factors it is truly observable and measurable human behavior that we are interested in. Did what we have to say or what the student read or acted out during roll-play sessions really have an impact? Our objective is to answer this in the affirmative, but how can we be sure?

I have a keen interest in the area of human fatigue. I make sure that at least one article is published in each issue of *Aviation Human Factors Industry News*. I have assisted in constructing the Fatigue Management section for the *FAA Operator's Manual for Human Factors in Aviation Maintenance*.

In human factors seminars when we talk about the Dirty Dozen, precursors to human error, fatigue usually gets its fair share of attention. But the nagging question still remains: Will the discussion of fatigue, relevant science, and mitigating strategies have a positive impact in changing attitudes and behaviors?

For some, I can gladly report that it has. The following are three-sidebar discussions I've had with individuals who either have read articles on human fatigue or have been part of an audience that listened to a convincing speaker on the subject.



One individual after working his last scheduled midnight shift before going on his day's off would drive home, pack the car, and drive 250 miles with his wife to their country home. He admitted being dog tired even before the trip began. He thought the reward was greater than the risk. After attending a human factors safety briefing where the science and mitigating strategies of fatigue were discussed, he made a conscious decision that the risk was much greater than the reward. From then on he ensured that he napped before he began the journey to his summer home.

I was at an airport traveling home from Florida when I was approached by a man who worked for the same company I did. He recognized me as the author of *Aviation Human Factors Industry News*. As a subscriber he focused on the articles related to sleep as he was struggling for answers to his own sleep disorder. He told me he used to only get 5 hours of sleep per night, but since reading and employing some of the sleeping strategies he now is up to 6 and hopes to see further gains towards 7 to 8 hours.

One man I worked with suffered from migraine headaches for the majority of his adult life. He was

virtually out-of-service when they struck. He had gone to many specialists but to minimal avail. After reading and attending a few human factors educational sessions he decided to go to a sleep clinic to be checked out for sleep apnea. Bingo! He was diagnosed with sleep apnea. Lack of sleep can cause headaches, which if neglected turns into migraine headaches.

After working with the sleep clinic doctors, he is now celebrating one year without a debilitating migraine headache.



Does fatigue awareness and training really make a difference? YES!

These are powerful examples of individuals who were willing to change from the status quo. Their quality of life has and continues to improve because they were ready to listen to the messenger and the message. How has your life improved from your companies fatigue risk mitigation educational program? Your instructor is waiting for your sidebar discussion. Go and make their day!

Video Production Reinforces the Sleepy Society Challenge

by
Dr. Bill Johnson



The production of the new FAA fatigue video, *Grounded*, was a reinforcement that we are a tired society. The video crew included a broad variety of talent. Of course, there were the writers, actors, producers, and camera crews. However, a quick "behind the scenes" look shows make-up artists, stunt drivers, lighting and audio technicians, traffic control police officers, post-production editors, closed-captioning writers, food caterers, and even the curious passers-by who want to see the workings of a video shoot. Initial viewer reviews also generated unexpected reaction.

Producers and actors were enamored with the proposed story for the video. They were thrilled with concepts like the opening motorcycle vs. car chase scene, about mixing reality and day dreams, about combining B&W with color, about shooting video in an airline hangar and jetliner cockpit, and about mixing the timetable of the events as if it was a industrial "Pulp Fiction." From the start everyone knew that this was not "your father's government training film."

While everyone was excited about the production they really were most interested in the topic – Fatigue. They were generally tired. Most of the crew commented that they do not get enough sleep and are usually fatigued. They wanted to learn more so they could improve their own fatigue situation. Their motivation increased when they found out that the target audience was aircraft maintenance personnel, who had no regulations regarding the number of hours or days of continuous duty. Because of the high public visibility of flight crew fatigue, most had not given much thought to other aviation workers, like mechanics or cabin crew. One commented that wide-awake pilots can't fly broken aircraft inspected and repaired by sleepy maintenance personnel.

Most of the video production crew and passers-by did not know the FAA motivation for the film. They merely knew that it was a government training film about sleep and that most of them were sleepy. Here are some examples:

Audio Technician: Was interested because he was suffering from sleep apnea. Under the advice of his doctor he was sleeping with a positive air flow breathing device. He also was on a strict diet to get his weight down. It was working! He was happier and so was his spouse, who no longer had to endure the loud snoring.

Make-up Artist: She was tired from working two jobs and raising an infant. She wanted to find the best ways to take advantage of the time that was available

for sleep. She was interested in tips on sleeping habits.

Actor (playing the role of a sleep specialist): Was fatigued while trying to manage a new family-owned restaurant/bakery and respond to auditions and movie roles in her budding acting career. Again, she wanted to know how to ensure quality sleep.

Passers-by: There was a jogging path next to the road where the chase scene was filmed. A female runner stopped and inquired about the video. When she heard the word "Fatigue," she started off on a diatribe that she slept only 2 hours the night before. It made this writer think that she may be better off sleeping than running.

Police Officer: Dekalb County, Georgia (part of Atlanta) was cooperative enough to close a major road for nearly eight hours so that the chase scene could be shot safely. The streets were controlled by three police officers, two of whom planned to work their afternoon police shift. They wanted to be sure that the video was available to the local police department.

Producer's Wife: The producer was directing video during the day and reviewing it late into the night. His wife claimed that the fatigue video was turning him into a zombie. As the production days added up it was very clear that he was a victim of sleep deprivation. He clearly needed to learn from the program.

Viewers' Perspective – "Real or Memorex": Many of the initial viewers wrote us messages with their reaction to the film. At least four commented that the video was a story about their personal life. The best comment came from Gregg Brown, Senior Quality Manager at Southwest Airlines. Like the primary video character, Gregg shared the same first name, and his daughter had the same name as the video's sleepy teenager who was running late for school. The "Real Gregg" – from SWA, admitted that he fought the same fatigue and technical issues as depicted in the movie. He wondered if FAA Big brother had been watching him before we did the video. We assured him that we were not watching but were delighted that "Grounded" hit the mark for him.

Finally

The "bottom line" on this rundown of sleepy crews, passers-by, and viewers shows that the video is a microcosm of our society. You don't have to work in aviation to have fatigue issues. We are a tired society. With some commitment, each of us can address the fatigue issue. We hope the video motivates you to grab a bit more quality sleep. As the video sleep specialist says. "Sweet dreams."

3:35P	On Time
3:45P	Cancelled
4:15P	On Time
4:24P	Delayed
4:30P	Cancelled
5:00P	On Time
5:12P	On Time
5:15P	On Time

Scheduling in a less than perfect world



by Jennifer Zaslon & Dr. Van Dongen

About the Authors: Jennifer Zaslon is a student at the University of Surrey in the UK. For her Professional Training Year, she is working at the Sleep and Performance Research Center of Washington State University, Spokane. Currently she is working on a field study assessing aircrew fatigue in ultra-long-range and long-range flights. Dr. Van Dongen is a Research Professor and Assistant Director of the Sleep and Performance Research Center at Washington State University Spokane. His research focuses on basic and applied aspects of fatigue risk management, and he has made seminal contributions to the understanding and prediction of changes in fatigue over time.

In a perfect world, there would be no need for night shifts, extended shifts or double shifts; commutes would be short; and work/life balance would never be an issue. However, the aviation industry is an around-the-clock operation, organized around passenger needs, productivity and costs, and rules and regulations. As such, a perfect schedule for aviation maintenance is an unachievable luxury, and the industry relies on mechanics' solution-oriented "get the job done" mentality. This mentality is admirable and critical for many elements of the aviation industry, but in our less than perfect world it also means that mechanics face fatigue and its consequences.



Cause of Fatigue

Fatigue is a function of time awake, prior sleep length, and past sleep/wake schedule (sleep/wake history). The longer the period of wakefulness and the shorter the last sleep period, the greater the need for sleep. This need interacts with the circadian rhythm of the biological clock inside the brain. The circadian rhythm tells the brain to be awake during the day and to sleep during the night. The circadian rhythm opposes the need for sleep during the daytime hours and enhances the need for sleep at night. Overall fatigue is thus determined by the interplay of the need for sleep with the circadian rhythm (1). Accordingly, insufficient sleep and nighttime activity in extended or night shift operations contribute to an increase in fatigue risk. Although extended shifts or night shifts cannot be completely avoided in the less than perfect world, some methods are available to help mitigate fatigue risk.

Potential Solutions for Fatigue in a Less Than Perfect World



education and training have their limitations; for instance, daytime sleeping continues to be difficult due to the biological clock, which opposes daytime sleep

Solution 1: Education is a critical element of fatigue management. Mechanics can learn about and implement healthy sleep habits, while avoiding practices that increase fatigue. However,

(2). Sleeping during the day may be facilitated by avoiding bright light at the end of a night shift to help the circadian rhythm adjust to the shift schedule (3), although such a strategy is difficult to maintain. On the other hand, properly timed bright light can help to improve alertness (4), particularly during the nighttime hours, but this effect wears off quickly once the lighting is dimmed.

Solution 2: There are mathematical models that predict fatigue based on circadian rhythm and sleep/wake history. These models can be used to distinguish more fatiguing (riskier) from less fatiguing (safer) schedules (5). The models can predict optimal performance times and identify the most beneficial times for napping (see solution 3) or recovery sleep, while accounting for the cumulative effects of fatigue, for any given schedule (6). Where there is flexibility for schedule variations, using mathematical models allows the best schedules with the lowest predicted fatigue to be selected without compromising the integrity of the operation (5). Note that model predictions of fatigue usually do not take into account quality of sleep (e.g., illness or troubled sleep) or other situational factors; they typically assume a best case-scenario for a healthy operator under normal sleep conditions.



Solution 3: Napping is a powerful strategy for optimizing available rest opportunities to reduce fatigue. Studies on planned cockpit napping in pilots have shown unequivocally that napping can be

beneficial in the operational environment (7). The timing of a nap (with regard to both circadian rhythm and prior sleep) and its length are important factors with regard to effectiveness. Taking a nap during the day before a night shift (i.e., prophylactic napping) has been shown to improve subsequent performance when compared to the absence of a nap (8). Naps taken after sleep loss are comparatively less effective but still beneficial. Studies have indicated a dose-response relationship between the length of the nap and the ensuing performance benefit: the longer the nap, the greater the effectiveness (9). Naps placed during the circadian trough (approximately 03:00–06:00) and the mid-afternoon dip (approximately 15:00–18:00) are easiest to initiate (10). However, napping involves a

risk of sleep inertia—the drowsy feeling experienced immediately upon awakening—which results in transient performance impairment (11). This impairment tends to wear off in about 15 minutes, although it could last up to an hour or more; it can be suppressed with caffeine (12).

Solution 4: Limiting time on task, either by switching to a different task or by introducing a rest break, helps to improve fatigue, at least subjectively (13). Performance degrades faster with time on task when a person is sleep-deprived, and rest breaks can then be particularly helpful to mitigate fatigue. Furthermore, rest breaks improve safety because they temporarily remove the mechanic from the hazards of the work environment. That said, the benefits of a rest break are short-lived and, circumstances allowing, using the rest break for a nap may be a better option.

Solution 5: Finally, wake-promoting compounds can be used, the most common being caffeine. Caffeine is popular because of its wide availability and rapid effect (typically within 15–20 minutes after ingestion), and almost everyone has experience with it. Caffeine has been shown to reduce fatigue effectively under conditions of sleep deprivation (14), and it is thought to be safest and most potent when used in moderation (only when really needed).

Take Home Message

Even though aviation maintenance occurs in a less than perfect world with less than perfect schedules, there are a number of viable strategies for reducing fatigue and its adverse effects on performance. Aviation maintenance is currently at the forefront of examining science-based solutions for fatigue management, but more needs to be done to implement such solutions into day-to-day operations. We will probably never see the day when all aviation maintenance occurs during normal daytime work hours, so managing fatigue is crucial. Fortunately, doing so effectively is possible and readily achievable.

*Prescription wake-promoting compounds (stimulants) and sleep-enhancing compounds (hypnotics) are not discussed here. They may be beneficial for treating sleep disorders, and should only be used under medical supervision.

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If you are interested in earning credit for the FAA's AMT award program, this Fatigue training course will be available on the FAASAFETY.GOV site in January 2011.

All resources available at: MXFatigue.COM