



FAA

**Welcome
to the
Fatigue Countermeasure Workshop:
Fatigue Basics
Module**

Audio Companion

Welcome to the Fatigue Countermeasure Workshop. This audio companion has been designed to be used in conjunction with the online course for learners that do not have audio or need additional resources in completing the course.

Section 1 – Welcome

1 Welcome to Fatigue Basics

This lesson describes basic information about fatigue. Given that many jobs, like yours, include a safety sensitive component, fatigue can quickly become a hazard in the workplace. The goal of this course is to provide you with fundamental knowledge about fatigue that can be used to help you perform your job more safely.

2 Lesson Objectives

This lesson will introduce you to some very basic information about fatigue. For example, what is fatigue and what causes it? How common is fatigue and what are the associated safety implications? How does fatigue impact human performance? And, why is this training important?

Read through the lesson objectives listed here. Then click Next to continue.

3 Course Exam Requirements

At the end of this course, you will be presented with a Course Exam that tests your knowledge on information learned in this course. There will also be a Review at the end of this, and each lesson in the course. The Review and Key Points from each lesson will help prepare you for the Course Exam.

The questions in the Reviews & Course Exam are based on the content presented in this lesson. Be sure you have a thorough understanding of all sections before moving forward.

4 Lesson Navigation

Read through the navigation guidelines here. Then, click Next to continue.

Section 2 – Case Studies

5 Overview

Fatigue can have serious consequences both on and off the job. Fatigue is linked to on-the-job accidents, but also affects your family life, health, and emotional well being. This course will teach you about fatigue and sleep, and provide you with techniques to help counteract the effects of fatigue, both at work and at home.

6 Effects of Fatigue

As an Aviation Maintenance Technician (AMT) you perform many different kinds of tasks, many of which are safety related. Fatigue takes a serious toll on your ability to fulfill your job responsibilities, and has been linked to forgetfulness, poor decision-making, slowed reaction time, reduced vigilance, poor communication; and nodding off.

7 Fatigue Accidents

So, imagine, if you are working fatigued, what tasks or activities could have serious consequences if not performed correctly? Could you pick up an oil can instead of Skydrol? Drop a wrench? Forget to replace an oil cap? Could you miss-rig flight controls? Press the engine start rocker switch instead of the radio master? Or even leave the nose steering bypass in place?

Fatigue has been linked to many serious crashes and accidents, some of which you will learn about now.

8 Charlotte, NC: Air Midwest Flight 5481, Jan 2003

Air Midwest flight 5481 crashed on takeoff killing 21 people. The NTSB determined that the aircraft took off tail heavy and the pilot was unable to keep the nose down because elevator travel was limited or restricted due to improperly rigged flight control cables.

Click the buttons to learn more about the factors that caused the crash, then click Next to continue.

9 Florida Everglades: ValuJet Flight 592, May 1996

Another fatigue-related maintenance event occurred in the Florida Everglades in 1996.

Just prior to the accident three ValuJet DC-9's were in Miami at an MRO facility for various modification and maintenance functions. The MRO technicians were removing and replacing the oxygen canisters from two aircraft due to expiration due dates. The technicians were under a great deal of pressure to complete the work on time. The technicians were working 12 hour shifts, 7 days a week. Technicians were working in a fatigued state.

Click the buttons to learn more about the NTSB's conclusion and recommendation then click Next to continue.

10 ASRS Reports

The Aviation Safety Reporting System, or ASRS, is a voluntary system that allows aviation workers to confidentially report near misses and close calls in the interest of improving air safety. The ASRS is run by NASA, a neutral party, since it has no disciplinary authority. The ASRS uses reports to identify system deficiencies, and issues alerting messages to persons in a position to correct them.

These examples illustrate how fatigue can quickly become a hazard on the job. Seemingly small things that are overlooked or forgotten due to lapses in attention provide one example of why fatigue can be so dangerous in your profession.

Roll over each report to read real-life fatigue examples reported by maintenance personnel, then click Next to continue.

Section 3 – What is Fatigue?

11 What is Fatigue?

So... what is fatigue? We all know it when we feel it, right?

Fatigue isn't easy to define, nor is it easy to measure. It's important to know fatigue does include that feeling of sleepiness and that urge you may have to go to sleep, but that's not all there is to it.

Fatigue is a complex state that includes a lack of alertness and a reduced capacity for mental and physical performance. This is in addition to the drowsy, weary, or sleepy feeling you may experience when fatigued.

Fatigue has psychological, physiological, and emotional implications that can impact the safe performance of routine and non-routine activities.

12 Triple Threat

In the aviation industry, we frequently examine fatigue in terms of its symptoms, such as forgetfulness; poor decision-making; slowed reaction time; reduced vigilance; poor communication; impaired mood; nodding off; or becoming fixated, apathetic, or lethargic.

To fight against this triple threat, you need to get adequate quality sleep. Sleep is the antidote against fatigue and is essential to being a well balanced individual. When you don't get enough sleep, fatigue negatively affects all elements of your being.

Rollover each area to learn more about the effects of fatigue on each area. When you are finished, click Next to continue.

13 How Common is Fatigue?

The occurrence of fatigue is more common than some people realize and it can have some very negative consequences for those who experience it. In a recent study of the US workforce, researchers wanted to find out what percentage of workers experienced fatigue at least once in the last two weeks.

What percentage of the people in the general workforce population do you think responded yes, that they had been fatigued at least once in the last two weeks? Use the slider to select your answer then click the Check My Answer button to continue.

14 How Common is Fatigue?

Nearly 38% of the U.S. workforce reported having experienced fatigue within the previous two weeks. Of those, 9% will have lost productive work time as a consequence of fatigue. This translates into billions of dollars per year! Some of the lost time comes from work absence, but by far the largest part of it is a result of impaired concentration that leads to increased time to complete tasks. These statistics don't specifically account for alternative work schedules, such as night shifts or extended shifts that render workers even more vulnerable to fatigue.

A 2001 study of AMTS found that on average AMTS were getting about 5 hours of sleep per night. In other words, AMTs typically operate with too little sleep since people generally need 8 hours of sleep per night.

In a survey of aviation safety inspectors for maintenance, 82% of ASIs thought fatigue was a safety issue. Another survey of maintenance personnel found that 30% believed fatigue was a factor that negatively affected work performance.

15 Components of Fatigue

There are two distinct components or ways to talk about fatigue, either physiological or subjective.

Physiological fatigue is a biological process that depends on the interaction between sleep loss and the circadian rhythm. The circadian rhythm is your body's internal clock and is intimately related to sleep and fatigue. It approximates a 24 hour cycle and it is set primarily by daylight. Together, these factors contribute to the body's response to the physiological need for sleep, which is to try to sleep. The only way to reverse physiological fatigue is through sleep.

Subjective fatigue on the other hand is based on how you feel and how fatigued you report feeling. In a sense, this is still physiological fatigue, but can often be masked by motivation, caffeine, physical activity, and environmental stimulation. These factors influence the level of fatigue that is reported, but not the underlying physiological fatigue that is present.

Fatigue is very difficult for people to reliably estimate, especially when they are fatigued! Often subjective measures of fatigue are much more optimistic than physiological measures. This means that on average, you are probably more fatigued than you realize and therefore, a bigger safety threat than you realize.

Section 4 – Fatigue Hazards

16 Fatigue Hazards Overview

Fatigue can be detrimental in your personal life and is often correlated with increased health issues, impaired driving performance, and difficulties dealing with your home and social life.

Working non-traditional hours may have negative implications for worker health. When compared to daytime workers, those working shifts or extended hours tend to have a higher number of health complaints, greater use of sick leave, and more visits to the doctor. Workers with non-traditional shifts also report greater stress, higher alcohol and drug use, greater weariness, and a lower sense of overall well-being.

Gastrointestinal

Evidence suggests that fatigue and irregular sleeping patterns can disrupt the body's natural processes. For instance, the circadian rhythm plays a role in digestion, which results in workers

with non-traditional working hours being four to five times more likely to develop a gastrointestinal disorder such as peptic ulcers, indigestion, heartburn, flatulence, upset stomach, or constipation. The digestive system slows at night making it more difficult to digest food. Workers who have extended work hours tend to eat at irregular times which can lead to an increase in digestive issues.

Heart

Working non-traditional hours is associated with greater incidence of heart disease and high blood pressure. It is believed that it may be partially due to increased stress that often accompanies these work schedules. It is especially important to be familiar with your own family history. Diet, exercise, not smoking, and especially getting enough sleep are some of the most effective things you can do to prevent cardiovascular disease from developing.

Psychological

There is evidence to suggest that workers experiencing fatigue may be more susceptible to disorders such as depression and anxiety. It is believed that this may be related to difficulty balancing work with family and social life. Unfortunately, this can become a very negative cycle as fatigue is often considered a result of depression and anxiety.

17 Safety Hazards

Fatigue can also be detrimental in the workplace, impairing judgment and the ability to think clearly. This means that people are more likely to commit errors and engage in risky behavior when they are fatigued. Fatigue also compromises the ability to react quickly to situations and to communicate effectively. In the event that a situation arises, someone who is fatigued is less likely to be able to respond immediately or communicate important information effectively.

Another threat of fatigue is microsleeps. These are brief periods of sleep that may come on unexpectedly when someone has not received adequate rest. This abrupt nodding off is the body's way of inducing much needed rest and is especially dangerous because it may occur without warning. As many as 80% of workers who work round-the-clock shifts have experienced microsleeps.

Click next to continue.

18 Fatigue Impairs Performance

The effect of fatigue on hand-eye coordination closely resembles the effects of alcohol. In fact, generally, the longer an individual has been awake, the more their performance is impaired.

One study showed that after approximately 17 hours of continuous wakefulness, performance is consistent with someone with a blood alcohol content of .05, and after 24 hours of continuous wakefulness, performance is similar to someone with a blood alcohol content of .10! That is considered legally drunk and too impaired to operate a vehicle.

Section 5 – Fatigue Regulations

19 Current FAA Regulations

Federal regulations set duty time limitations for maintenance and preventive maintenance personnel.

Accordingly, AMTs should be relieved of duty for at least 24 consecutive hours in any 7 consecutive day period. Alternatively, they may also be provided with the equivalent for a calendar month.

20 Current FAA Regulations

Although the code sets schedule limits, the flexibility in current regulations allows mechanics to work up to 26 days straight in a month. This could result in 52 days straight in two months, depending on how the schedule is assigned or arranged.

Given the flexibility of the current regulations, it is important for both operators and maintenance technicians to be aware of fatigue and the impact it can have on your health, safety, and performance. Awareness is the first step to effectively managing your fatigue risk.

Section 6 – Common Misconceptions

21 Common Misconceptions

People hold several misconceptions when it comes to fatigue. Read each statement presented, and check whether you agree or disagree with it. When you are finished, click next to continue.

Section 7 – Fatigue Contributors

22 Primary Contributors to Fatigue

There are a variety of factors that can produce fatigue; however, it's often the result of a combination of factors. Primary contributors to fatigue are considered to be direct causes and actually make fatigue unavoidable.

The primary contributors to fatigue are presented below. **Rollover each contributor** to learn more about it.

23 Secondary Contributors to Fatigue

While primary contributors are considered to be direct causes of fatigue and actually make fatigue unavoidable, secondary contributors don't necessarily result in fatigue, but they are very likely to lead to fatigue - especially if you experience more than one factor or if they occur in combination with one or more primary contributors.

The secondary contributors to fatigue are presented below. Rollover each contributor to learn more about it. When you are finished, click next to continue.

Section 8 - Symptoms

24 Fatigue Symptoms

There are many signs and symptoms that may indicate fatigue. The symptoms generally fall into one of these three categories: physical, mental, or emotional.

It's important to note that that these are the most common examples of symptoms, not an exhaustive list. Also, these symptoms don't necessarily indicate fatigue; rather, a collection of symptoms signifies that a person is experiencing at least some level of fatigue.

Physical Symptoms

Physical symptoms can include things like: yawning, heavy eyelids, eye-rubbing, nodding off, headaches, nausea, slowed reaction times and lack of energy. Nodding off and micro sleeps can be especially dangerous when performing safety-critical tasks or operating machinery.

Mental Symptoms

Mental symptoms of fatigue can include: difficulty concentrating, attention lapses, poor communication, poor anticipation, mistakes, forgetfulness, unclear thinking and poor decision making. Lapses in attention or making mistakes even on well-practiced tasks can result in serious errors (as seen in ASRS reports of fatigue).

Emotional Symptoms

Emotional symptoms of fatigue can include symptoms such as withdrawal, lack of motivation, irritability, low morale and emotional sensitivity. Emotional symptoms are especially likely to be problematic in social situations and influence how a person approaches or deals with coworkers, friends, and family.

Section 10 - Summary

29 Summary of Fatigue Basics Section

Well done, you have completed the Fatigue Basics lesson. Before moving on to the next lesson, here's a summary of what you have learned. If you would like to review this lesson, use the Back button. Remember, the questions in the Course Exam are based on the content presented in this lesson. Be sure you have a thorough understanding of each section before moving forward. If you are ready to move on to the next lesson, click next to continue.