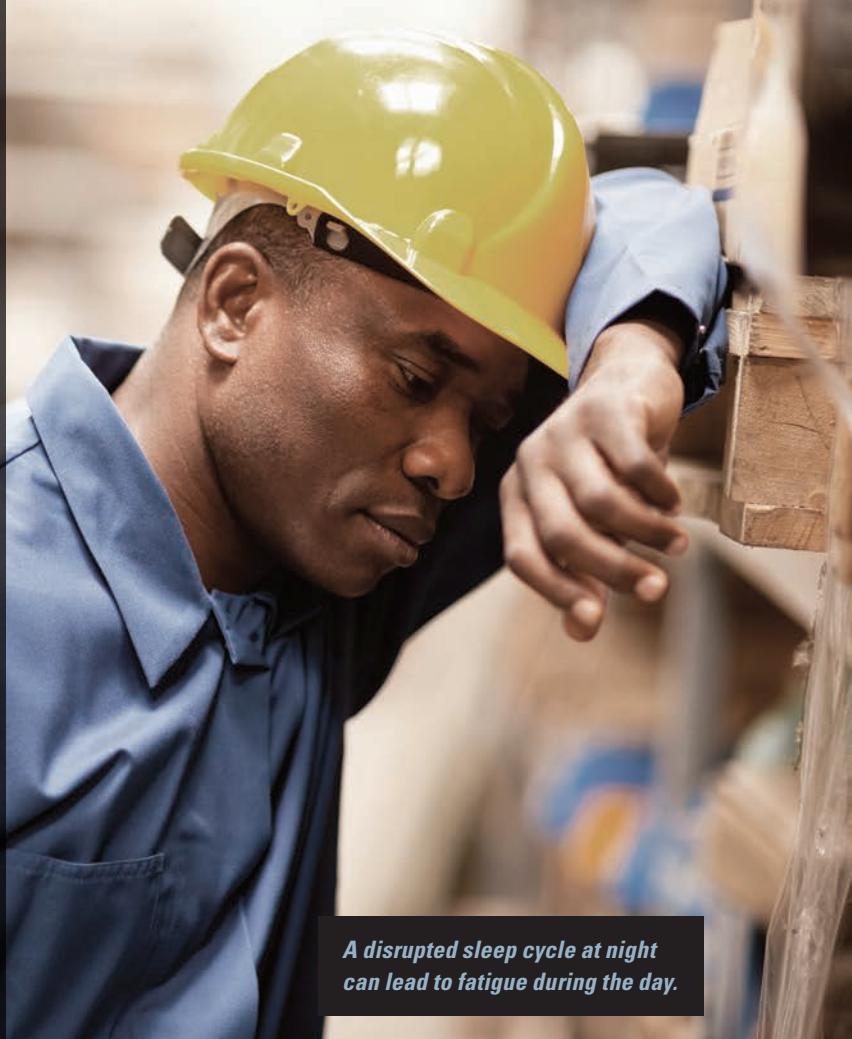


# [H]=Human Factors

*How Night Can Be Hazardous to Your Flying Health*



*A disrupted sleep cycle at night can lead to fatigue during the day.*

Last winter in the D.C. metropolitan area was rough. While our drop in temps wasn't quite as vicious as some others I could name (I'm talking to YOU, Boston) the shorter days and frigid weather turned this typically super active, outdoorsy aviation enthusiast into a slow, sleepy, stay-indoors hermit. I

wasn't proud of it, but the fact of the matter is that our human biology and constitution all but ensures we can't help it. Thankfully though, we are also wonderfully

---

**Because sunlight plays such an active role in producing and regulating key hormones in your body, absorbing as much of the light as you can when it is available is a good idea.**

adaptive. If I want to perform at the same activity and cognition levels as I do in the sunnier, long days of the warmer months, all I (and you) have to do is incorporate a few mitigation strategies to be successful. This entire edition of *FAA Safety Briefing* is dedicated to just that.

## Human Hardwiring

First, we humans just don't perform as well in the dark as we do in the day. This is primarily due to the fact that we don't see as well in the dark. For largely visual creatures, this can be a bit of a problem. That's because for us, night equals sleep.

For the majority of us, our eyes are fantastically good at picking up critical details like depth, distance, and color, and transmitting that information to our brains to be ordered and interpreted. This all starts with light. Light travels in a straight line, bounces off objects and into our eyes through the pupil. The light then passes through the lens. The lens focuses the light onto the retina. Depending on how far away the object is, the lens changes shape to keep the light focused on the retina. After receiving the focused light, the retina transforms it into an electrical impulse that travels to the brain via the optic nerve. With a decrease in light, this transaction becomes much more limited.

We also need sleep. For most of us, it's normal to get sleepy when night falls. Scientists and medical doctors haven't really settled on a unified reason of why we need it exactly — particularly because of the fact that it has been proven that our brains are nearly as active as during the day — but they all agree that we *do* need it. Some of the prevailing theories are:

- Sleep keeps us quiet and dormant during those hours that might be most dangerous to us as one of the more fragile species atop the food chain.

- Sleep is the body's way of replenishing all of the energy we expend during the day.
- Sleep enables the body to launch restorative efforts that ensure muscle growth, repair minor tears in tissue, encourage healthy hormone release, and break down the unhealthy byproduct from the chili cheese fries that passed as "dinner."

All of these functions are important, but probably the most important theory applicable to aviation is that experts believe sleep is the time when our higher levels of cognitive function get the tune-up they need, sharpening memory, strengthening neurotransmitters, and enhancing recall.

The reason we are more inclined to sleep at night versus day is also up for debate. Most scientists agree this is because of our years and years of conditioning to hunt and gather during the day (again, we see better then and there are bigger, badder creatures prowling at night). In addition, melatonin and vitamin D (key factors, respectively, in controlling your wake and sleep cycles, and promoting bone growth) are better developed during the day. So now that winter is upon us, the colder, shorter days and longer nights wreck what was a finely tuned process within us. For some people the effect is so severe it can lead to what is known as "winter depression" — a nasty condition whose symptoms can include irritability, restlessness, and difficulty concentrating.

## Got Rhythm?

No doubt by now you have heard about that biological clock that tells people when to sleep. As a quick refresher, our circadian rhythm follows a roughly 25-hour cycle. It controls physical, mental and behavioral changes in our bodies, and it is very much affected by key environmental triggers like sunlight and temperature. In a typical day, when the sun starts to go down, our bodies produce the hormones that make us sleepy. This rest cycle occurs naturally every night (if our electronic gadgetry doesn't mess things up too much), and winter has the same basic effect. Because we are biologically hardwired to slow down with the lack of light, winter can make it difficult to maintain the same level of activity as you might have in May or June. And, once our circadian clock throws a hand, it can be notoriously difficult to find that rhythm and balance again. The best way to combat this challenge is to seek out sunlight, remain active, keep healthy through diet and exercise, and to get plenty of *uninterrupted* sleep.

## Sunlight and Armchair Aerobatics

Because sunlight plays such an active role in producing and regulating key hormones in your body, absorbing as much of the light as you can when it is available is a good idea. By simply opening up your blinds to let more sunlight into your home or getting outdoors into the natural light for a few hours, you can help maintain the balance you need.



Chart courtesy of Health-Science-Degree.com



*When flying at night you have to strike a healthy balance between what your body needs and what your inner aviator wants.*

For the record, the soft glow of your tablet *does not* count. In places where the winter sun simply refuses to shine for any significant amount of time (hello, Alaska!), some people resort to using sun lamps or over-the-counter supplements to stimulate melatonin and vitamin D production.

It is also helpful to keep your mind engaged. Many people decide that operating during the winter months is not for them. Understandable, but instead of bedding down your aircraft completely and forgetting flying for two to three months, take advantage of the hibernation time to hone your flying skills through

activities such as participating in FAA Safety Team (FAAST) sponsored seminars, watching FAAsafety.gov videos and, of course, reading publications

like this magazine. Training devices are also a possible winter substitute for the real thing. These training tools also allow for you to practice tricky scenarios and emergency procedures from the safety of the ground. If you have incorporated a new avionics suite into your flight regime, quite often the manufacturing companies have online training that will help increase your knowledge and skill in using it. If you don't have access to a training device, simply sitting in a chair and running through your checklists — reaching out to "touch" dials, levers, knobs, and controls as you would if you were really flying — goes a long way to committing the information to both muscle and mental memory.

Winter can also be a great time to catch up on a little "light reading" by settling in with a cup of cocoa and going through the practical test standards, your

aircraft's flight manual, and training handbooks like the recently revised, information packed *Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-25A) or the *Airplane Flying Handbook*. (FAA-H-8083-3A, [http://www.faa.gov/regulations\\_policies/handbooks\\_manuals/](http://www.faa.gov/regulations_policies/handbooks_manuals/)). Catching up on regulatory changes and refreshing your memory by reviewing sections of the Aeronautical Information Manual can also do wonders for keeping your head in an aviation mindset. You will be better prepared for early spring flying.

Keeping your body healthy goes hand-in-hand with keeping your mental skills sharp. Winter months also tend to bring the winter goodies. While I'll be the first to admit I am an absolute pushover in the face of anything "pumpkin spice," I also know that the unintended consequence of too many tasty treats can be a general feeling of lethargy and slightly tighter trousers. To combat this challenge, eat balanced, nutritional meals and maintain a healthy body weight through exercise. Make indulging in seasonal sweets a special treat and not a daily occurrence (yes, I know — easy to say; hard to do).

### **Practice Good Sleep Hygiene**

The National Sleep Foundation describes sleep hygiene as "a variety of different practices that are necessary to have normal, quality nighttime sleep and full daytime alertness." One tip to consider is to avoid napping during the day. While good for growing children, in adults it can disturb the normal pattern of sleep and wakefulness. It pains this avid coffee drinker to say so, but you should also minimize use of stimulants such as caffeine, nicotine, and alcohol

---

**Once asleep, most people need eight hours (during a 24-hour period) to sustain performance indefinitely.**

too close to bedtime. While alcohol is well known to speed the onset of sleep, it does not contribute to high quality sleep. Finally, as mentioned before, exercise is good for maintaining a healthy weight, but it can also promote good sleep. To make sure you don't overdo it, try relaxing exercises such as yoga or *tai chi* before bed to help ensure a restful night.

Food can be disruptive. Stay away from large meals, and it is probably best to lay off the spicy Italian sausage right before turning in for the night. Lastly, associate your bed with sleep. I'm totally guilty of this crime against good sleep hygiene, but it's not a good idea to use your bed to watch TV, fiddle around on the computer, or read. These actions tend to stimulate your brain too much for sleep. In addition, such habits weaken the mental link between "bed" and "rest."

Once asleep, most people need eight hours (during a 24-hour period) to sustain performance indefinitely. Making sure your sleep covers the hours between 0200 and 0600 is preferable, because this timeframe provides the most recuperative bang for your buck. Although not ideal and not without limits, shorter periods may be nearly as beneficial as a full night, so long as you take such an opportunity immediately before flying. Always keep in mind, though, that too much napping throws your natural rhythm off kilter.

## Out of Sync

Let's just say these mitigating strategies don't work, and you get all out of sync. You are drowsy by day, and sleep at night is intermittent at best. Please recognize that this is a BIG deal and the lack of sleep can quickly escalate into sleep deprivation. Acting as a pilot or a required crewmember when you're out of sync has been shown to degrade your performance and can significantly affect your risk assessment for any given flight. Sleep deprivation symptoms are sneaky and can creep up on you if you aren't careful. While one night of poor sleep won't do you in, a week or more can bring about crankiness or irritability, forgetfulness, clumsiness, and decreased cognitive ability. Long term effects can include significant reductions in performance and alertness. Your ability to think and process information would be critically compromised. Reducing your nighttime sleep by as little as one and a half hours for just one night could result in a reduction of daytime alertness by as much as 32 percent. This is not the time to "soldier on;" rather, this is the time to make the effort to get back in the groove.



***It's not a good idea to use your bed to watch TV, fiddle around on the computer, or read. These actions tend to stimulate your brain too much for sleep.***

The FAA is very concerned about the effects of sleep deprivation and fatigue. To that end, a whole team of human physiology/factors/psychology experts at the Civil Aerospace Medical Institute (CAMI) have conducted numerous laboratory and field experiments on the effects of fatigue with ATC, technical operations, maintenance technicians, flight attendants and pilots, and have developed a host of risk mitigation

strategies and awareness initiatives. Recently, fatigue mitigation elements have been written into 14 CFR part 117

(<http://go.usa.gov/3FNQ>) and the associated AC-120-103A (<http://go.usa.gov/3FN9e>) covers flight, duty and rest requirements and fatigue risk management systems (FRMS), respectively. While the target audience is air carrier, there is a great deal of information applicable to GA in these resources. Consider checking them out so you can develop your own personal fatigue risk assessment.

We live in a time where we can manipulate our habits and our surroundings to get the most out of each and every day. As the old adage says, though, "with great power comes great responsibility." Our ability to alter things does not circumvent our base level biological imperatives. The trick is to strike a healthy balance between what your body needs and what your inner aviator wants. 

---

## **Reducing your nighttime sleep by as little as one and a half hours for just one night could result in a reduction of daytime alertness by as much as 32 percent.**

Sabrina Woods is an associate editor for FAA Safety Briefing. She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.