

Tired Techs Countering Fatigue With Common Sense

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Decades ago, one of my A&P school instructors cautioned the class, "It will be years before you get to drive to and from work in the sunlight, so you'd better learn to sleep during the day." Since working nights and odd hours are facts of life for aviation technicians, he cautioned, "If you are looking for a 9-to-5 type of job, aviation is probably not for you." It was good advice.

Late flights, unscheduled maintenance and unpredictable workloads often lead to long hours, missed meals and angry or disappointed voices over the phone. But there's another consideration, and a dangerous one, lurking behind the time clock: it's fatigue, and all the problems that can ensue therefrom.

Fatigue-related errors are a major contributor to both civil and military aircraft accidents. Flight crew rest rules have long existed to help reduce mistakes, but errors from weariness continue. The difficulty trying to regulate crew rest is that you can't force a pilot or anyone else to actually rest on command like flipping a switch, particularly one who's anxious or has lots of undone chores to be accomplished or is six chapters into a page-turner.

Aviation is hardly alone in being vulnerable to fatigue-related mistakes. Most forms of transportation including trucking, rail and maritime operations are susceptible. Some medical professionals work long and irregular shifts and, coincidentally, many medical mistakes have been traced back to fatigue. Both nuclear power plant accidents at Three-Mile Island in Pennsylvania and at Chernobyl in the Ukraine, as well as the Bhopal chemical plant disaster in India had operator fatigue as a contributor.

Maintenance technicians are just as susceptible to making fatigue-related errors as a counterpart in any other profession, but the problem is particularly insidious when flying machines are involved. Maintenance mistakes can take months to surface and it can be difficult, if not impossible, to properly identify the true root cause. To help defend against the weary wrench syndrome, employ to-the-issue information and effective countermeasures.

You Are Getting Sleepy . . .Very Sleepy . . .

We have all experienced the effects of fatigue - from lack of sleep, too much exertion or, possibly, illness. To better understand how to combat fatigue, a basic knowledge of the physiology behind it is necessary.

The human body operates on a cyclic and predictable pattern or rhythm. Though adaptable to change, the underlying cycle remains. This cycle, known as circadian (from Latin: circa diem meaning about a day) rhythm, describes how the body enters a period of wakefulness (ergotropic) and restfulness (trophotropic) over a period, as noted by the Romans, of about a day. The internal clock that regulates the process is located in the hypothalamus of the brain and is influenced by the cycles of daylight and night. The internal biological clock combined with environmental cues regulate the body to make people diurnal, or active during the day. You can try to fight the clock, but in the long run, your body begins to wear down. You just can't fool Mother Nature!

In general, all humans show the same type of phasic behavior, but there are individual differences in how each person handles fatigue. This varies with age, health and gender - men being slightly more resistant. Typically, people experience a circadian low, with a drop in body temperature, heart rate and blood pressure at approximately 4 a.m. each day, with a lesser low around 2 p.m.

This natural low point makes it difficult to achieve top mental and physical performance during a night shift and is even more challenging when moving from normal day activity to night work. Shift workers are particularly susceptible to fatigue due to the difficulty of achieving quality sleep when out of synch with the body's natural clock. Sleep deprivation can accumulate over time - called sleep deficit - thus compounding the problem.

When a person is fatigued, the impairment shares some of the same symptoms as moderate alcohol intoxication, with reduced cognitive performance, delayed response, slower reaction times, impaired reasoning, reduced vigilance and lesser hand-eye coordination. Exacerbating plain sleepiness can be on-the-job factors such as heat or cold, noise, work position and repetitive actions, all of which contribute to fatigue in a less noticeable, yet real, way. And anyone who's visited a maintenance hangar knows that aircraft technicians typically work in extreme temperatures and unpleasant, noisy or cramped work spaces, accelerating fatigue.

Performing tasks that require intense concentration and vigilance are among the most hazard-laden when undertaken in the fog of fatigue. Consider borescope inspections. These involve scores, even hundreds, of disk blades that need to be evaluated with extreme precision and attention to detail. If one tiny blade crack is missed, a catastrophic failure in flight could result. Called vigilance tasks, these types of activities are much more susceptible to fatigue-induced mistakes than repetitive motion/skill type events, like removing a panel or changing a wheel assembly. With increased impairment, the danger is increased for overlooking steps in the task, such as forgetting to reconnect a plug, close a panel or leaving something behind, like a tool.

Another danger of fatigue is that because of the reduced mental acuity, and lack or awareness of their impairment, those affected may think they are functioning on all cylinders.

"The science of fatigue management indicates that asking fatigued people to let you know if they are OK to perform airworthiness level work is like asking drunks if they are OK to drive," said Jack Tunnell, manager of Aircraft Maintenance for Frito-Lay, Addison, Texas. "Their judgment is impaired and you can't rely on fatigued individuals to evaluate their own performance level." Battling the Sandman

To develop an effective fatigue-fighting strategy, you need to have a good understanding of your operation and your people. Duty limits are one way to address fatigue, but technician duty can mean anything from doing paperwork, to a major component change in 100 degree heat. If there is a crisis, do you send a technician home when there's still a broken aircraft on the ramp, and when he's been doing paperwork in an air-conditioned office? Limits that are routinely broken do not accomplish the goal of safe and efficient maintenance.

The key to success is managing alertness levels through a combination of education and awareness. Alertness management is a combination of science and good shop practices. Start by teaching your technicians the basics about fatigue: circadian rhythms, sleep deficit, vigilance tasks and then some good common sense. Diet and exercise are a big part of staying healthy and will help fight fatigue; so will drinking plenty of water and passing on the fried chicken in favor of a Cobb salad with roasted chicken chunks. When used properly, caffeine can provide a temporary boost, but be careful to not overdo it.

Each individual has to understand how their body reacts to fatigue.

"Understanding their energy level is very important," said Richard Komarniski, president of Grey Owl Aviation Consultants Inc., in Onanole, Manitoba, a company that specializes in human factors training for maintenance technicians. "Most people have a high energy level when they first come into work, and that is when you want to schedule the more critical tasks," he added.

Of course, good planning is essential to any good maintenance operation, but even the best plans can fall apart when aircraft break. If your technicians have to stay late, you should insist there be a second set of eyes on hand when illumination is produced by burning the midnight oil.

"When fatigue is an issue, technicians should embrace the safety net. Don't be a superman when it comes getting your work double-checked; there is no room for ego when it comes to safe maintenance," Komarniski added. If the workload is piling up, or an unscheduled event takes place, having a plan to use temporary or surge manpower is prudent. Often the latter comes in the form of moonlighting technicians, who may already be fatigued, so use caution when using temporary help.

Sometimes if a job starts running too long, it's often better to knock it off, even if the consequences mean missing a flight. "If a technician has been at the hangar since 0800, and an aircraft comes back in at 1630 with a problem, I don't want that technician working until midnight to make a trip. It's been my experience that after about 12 hours, the majority of people are no longer functioning effectively," said Kevin Smith, chief of Aircraft Maintenance for Raleigh, N.C.-based Progress Energy.

For small maintenance departments without the resources for calling reinforcements at a moment's notice, missing a flight can mean disappointment for the boss. This is where having a clear policy or written guidelines can help smooth things over with your principal passengers. Letting the boss know that he can't make a flight because of a safety concern is a lot easier to explain when in the context of fatigue. He probably would not want his doctor operating on him in a fatigued state, either.

When pulling a long shift, don't forget that your technicians will be tired and some will face a long drive home. Many flight departments have a bunk room to allow technicians and flight crews to get some rest. If you do not have the room for a bunkhouse, consider putting a technician up in a local motel. This will help prevent a possible highway tragedy and is good for morale when your technicians know you are looking out for them.

Fighting fatigue takes a common-sense approach and general acceptance that irregular hours can create a dangerous situation. Start by making your people, below and above, aware of the problem and consequences, set simple performance guidelines and then follow them. Set duty limits based on your operation's needs and the practical availability of your technicians, and double the safety net where appropriate. Above all, set reasonable expectation levels for your technicians, enforce the rules and maintain open lines of communication. If a technician tells you he or she is done in, take the appropriate action. You are responsible for providing your technicians with countermeasures for fighting fatigue and keeping aircraft safe, so don't fall asleep at the wheel. B&CA

Human Factors Training for Maintenance Technicians

Looking to train your technicians on fatigue and other human factors that affect safe maintenance? Richard Komarniski, president of Grey Owl Aviation Consultants, Inc., has over 30 years experience in aviation maintenance and training. His company provides an extensive portfolio of training programs tailored for maintenance technicians. For additional information, visit the Grey Owl Web site at

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More Fatigue-Fighting Resources

-The FAA Human Factors Web site: <http://www.hf.faa.gov>

-Flight Safety Foundation, Flight Safety Digest, February 1997 ("Special FSF Fatigue Countermeasures Task Force Report: Final Report: Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation")<http://flightsafety.org>

See Also:

[NASA Online Publications](#)

[Alertness Solutions](#)

<http://www.hf.faa.gov>