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MX Fatigue *focus*

FATIGUE COUNTERMEASURE TRAINING COURSE 2011 AMT AWARD PROGRAM CORE COURSE By Phil Randall



About the Author: Phil Randall is the Assistant National FAASTeam (FAA Safety Team) Manager and also serves as the FAASTeam National Airworthiness Group Lead. He has over 45 years in the aviation maintenance industry and has received three national FAA Visionary Awards for his work in promoting safety in our industry utilizing various formats.



It is hard for me to believe that this past January we began our third year of asking the AMT's that participate in the FAA's Aviation Maintenance Technician (AMT) Awards Program to complete a "Required" aviation safety course. The required or "CORE" course is selected by the FAASTeam's National Airworthiness Lead from the top ten maintenance fatal accident casual factors. Without a doubt, the 2011 CORE Course was the easiest choice ever made and it is the best yet!

First, let's look at why we have a CORE course. When we decided to place the AMT Awards Program on FAASafety.gov we also decided that we needed to require that safety issues be addressed. When you get down to it safety is what we are all concerned about. If you think that you will never have or cause an accident, then you might want to sit down and do some serious soul searching.

Recently I took time to read the comments made by those that have already taken and completed the "Fatigue Countermeasures Course" and was very pleased with what I read. Sure, there was the one AMT that said, "This was a complete waste of my time", but the rest gave testimony as to how the course had changed not only their work life, but their home life as well. When we read results like this we know we are on the right track.

We are having meetings now to begin preparation for not only next year's course, but course topics for several years down the road. You may ask where we get the ideas for the courses. The FAASTeam looks at the "Top Ten" accident causes where maintenance is either the cause or a contributing factor and selects one or more of these for our CORE course. We then research our presentation files, talk with others within the FAA, and talk with our FAASTeam National Industry Members; together we create your course.

The "Fatigue Countermeasures Training" course was developed with support from scientists, the FAA, industry, and labor from across the country. The FAA's multi-disciplinary maintenance fatigue workgroup deserves all the credit for this breakthrough course. I personally want to thank them for their hard work and devotion to aviation safety. I hope that each of you, as I am, are looking forward to 2012 and beyond for more great courses that address critical safety issues in our workforce.

If you haven't taken the course please do and if you have, please spread the word. We all have the duty to work as safe as we can, don't let us down.

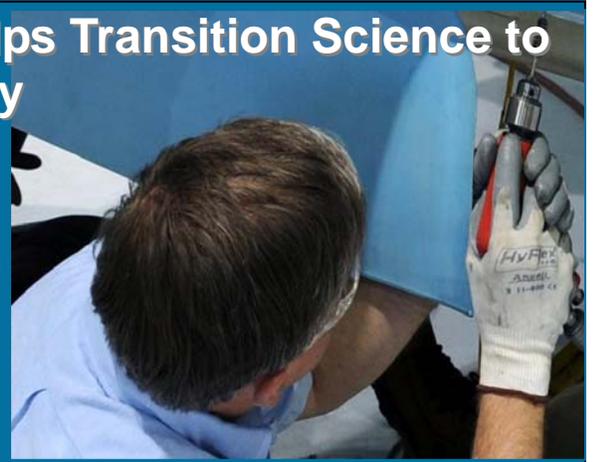
AVS Maintenance Fatigue Workshop Helps Transition Science to Workplace Reality



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 is a pilot and an aviation maintenance technician.



Organized labor, airline managers, scientists, airframe manufacturers, FAA Inspectors, and others met last week, in Oklahoma City to discuss human fatigue in the maintenance work environment. Public attention often focuses on flight crews, air traffic controllers and other workers. However, fatigue also contributes to quality, efficiency, and safety issues in maintenance. Regulations regarding the duty time for maintenance personnel are limited. The workshop addressed that issue and more.

Don Osterberg, Senior Vice President for Safety and Security at one of the world's largest trucking companies was a key speaker. He told the group that maintenance personnel, their aviation companies, and the FAA are not vocal enough about the fatigue challenge in maintenance. He said



that we know the challenges as well as the solutions and that all parties should do something about it now. He looked at our industry from the outsider's view. He said that if we really have a safety culture and if safety really is #1 then we should match our actions to our words with respect to the risks of worker fatigue.

Like aviation, the trucking industry holds safety as the highest value. They have some of the same constraints as aviation. That includes: weather, night time schedules, long hours, and demanding delivery schedules, and a lot of critical scheduled mechanical and electronic

maintenance. Schneider Trucking (You've seen their orange trucks on the road) created a formal program addressing employee sleeping habits in 2004. Their program not only reduced the number and severity of accidents but also showed a \$13M savings in health insurance claims within the first year. Safer performance and money saved is a very strong case for managing fatigue, in any industry.

The group acknowledged that many aviation maintenance fatigue issues are a result of corporate convenience, personnel desire to make the overtime pay, and regulations that permit schedules and practices that impact fatigue. Companies may establish shift schedules that are an inherent hazard to safe work. Workers may "swap shifts" to work a 40 hour week in less than 3 days. Maintenance workers readily acknowledge that dire circumstances, where a broken airplane must be repaired, can result in continuous work often exceeding 40 hours. These are issues that must be addressed. Another unavoidable challenge is the night time nature of aircraft maintenance. Most aviation maintenance is done during the nighttime, when there is an unavoidable risk of sleepiness.

There was 100% agreement that the industry needs stronger regulations that require companies and individuals to manage fatigue. That does not mean that FAA should simply set a strict rule on the duty time of maintenance workers. Instead there should be

regulations insisting that companies manage the hazards resulting from fatigue. Years of proven scientific research has provided tools for safe scheduling, tools for predicting and assessing fatigue, and training materials for workers and their managers. There are other solutions like letting people call in fatigued, without penalty. With proper attention to work assignments and schedules, a company could also be sure that workers who are likely a fatigue risk should not be allowed to perform critical tasks.

The workshop provided the ideal venue to showcase many of the maintenance fatigue risk management tools developed by the Civil Aerospace Medical Institute and the Flight Standards Aircraft Maintenance Division. That includes a new web-based fatigue training program that the FAA Safety Team launched in January 2011. Already, over 2,500 participants have taken the Fatigue Awareness Training as part of the AMT Awards Program. FAA research created an assessment form to determine if fatigue may have contributed to an incident. The FAA team is also automating a model to help maintenance organizations calculate and show the cost and safety return on investments in fatigue programs.

If you want to learn more about FAA's maintenance fatigue products go to www.mxfatigue.com or to FAASafety.gov.



Maintenance Fatigue Workshop Photos





SAFETY CULTURE FOR FATIGUE: DO YOU HAVE ONE?

By Dr. Terry L. von Thaden

About the author: Dr. von Thaden is a professor at the University of Illinois Urbana-Champaign, the President of Illumia Corporation, and hails from a flying family. Her research involves the study of information and culture in high-risk, safety-critical complex operations. She developed the SCISMS – Safety Culture Indicator Scale Measurement System through multi-year research from the FAA and Air Force Office of Scientific Research.

Money is the bottom line, not safety. Numerous times I, or other techs didn't want to sign off aircraft because we were so tired we weren't sure we were complete. Needed to reinspect, but we are often ignored by management sitting in their office. We avoid reporting for fear of getting a reputation... I just want to be safe and not get someone killed. Sometimes, I'm not sure because I'm not directly thinking on my feet. (Anonymous Mechanic)

In the current maintenance environment, you will find comments like this one. Although technician perceptions of fatigue may differ by shop or operation, overall, technicians report negative perceptions of their work environment regarding duty schedules.

Sleep science tells us that humans require, as a rule of thumb, approximately 8-10 hours of sleep per day. FAA research has shown that the average maintenance technician gets approximately 5 hours of sleep per day. Most technicians feel they have little control and report that sleep loss is out of necessity. Some example reasons include: working back-to-back (i.e., double) 8, 10, or 12 hour shifts, a secondary job, or a long commute. Since adequate sleep is not considered a choice, educational programs are likely insufficient as a standalone solution.

With the increase in aircraft demand compounded by a looming retirement of 53% of the maintenance technician workforce, the current pressure on technicians to do more with less will continue to mount.

Technician fatigue is problematic and compounded by less than effective organizational safety cultures. In our recent and long term safety culture research data, maintenance organizations across the board provide negative reports on the issue of fatigue. Shops with 2-shifts report fewer fatigue concerns than those with 3-shifts, but they are not immune to fatigue issues. The majority of technicians responding to the safety culture survey perceive their supervisors are unavailable when they are needed; sometimes don't distribute the workload evenly among technicians; many times don't shield technicians from outside pressures (e.g. flight crews, dispatch); and often fail to recognize when technicians engage in unsafe practices. To add to the problem, technicians in a negative safety culture report being berated when they attempt to report safety and/or fatigue concerns. The following comments illustrate some of the core issues that currently undermine a safety culture for fatigue.

- "Aircraft are safe to operate, but there are always little things that should have been fixed or taken care of, that are not. I don't know if it's because we're too tired to care or if the company pressure to get the aircraft on the line is more important. I'm thinking about it now though."*
- "We work in a system. Changing personal habits doesn't necessarily mean we can effect change in the workplace. When you're forced to accept work conditions, it affects the rest of your life."*
- "We consistently operate with minimum personnel. We have more work in the summer months when our operations increase. We consistently put in extra hours (13-hour shifts)...Then we need to work extra days (with no pay increase) because there isn't enough people. The managers don't want us taking breaks. I've been ratted on for taking a 20-minute lunch. I brought these issues up time and again but nothing ever changed. If I could work somewhere else, I would."*
- "We're known in the industry for poor maintenance. How can we change this reputation when we're so tired and overworked all the time we can't even catch up on sleep? For example there have been times when a maintenance problem has been identified as hazardous to the line pilots. We have no time to truly correct problems; so it has the probability of setting a pilot up for failure. When I do actually get sleep, this keeps me awake at night."*
- "Since management sees people that report safety concerns as troublemakers they tend not to report. The utility mgr who is also the safety rep. keeps a log of my write-ups and can even tell me how many times did I write this or that discrepancy. When I report something he says "You're too black & white" and ignores me."*

So, does your organization have a safety culture for fatigue? You be the judge.

To effectively develop a positive safety culture, we must have management buy-in and leadership support. Organizational policy must lay the foundation for technicians to achieve a positive and healthy work tempo/duty/rest balance, but policy alone does not achieve the goal. Middle management must support and ethically connect policy and professionalism. The very basis of a positive safety culture requires ethical decision making at every level of the organization – technicians, supervisors, and executives.



Worker Fatigue, Problem Procedure or Both?

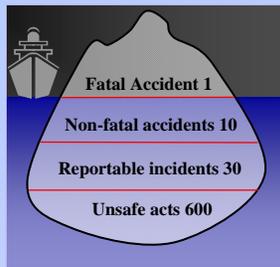


By Dr. Bill Johnson

Voluntary reports from the Aviation Safety Reporting System (ASRS) reveal hazards in the maintenance work environment. Sometimes you must read “between the lines” to understand the real issues.

One ASRS fatigue-related report said something like “...I and 2 other mechanics worked the grounded aircraft during a brake change, the last task in a long list that night. Numerous hours were worked by the 3 of us, 19 hours per day for 3 days personally.” The crew did not replace a critical spacer when they installed the wheel, causing wobble/shimmy on that wheel set. He went on to say “I submitted a change to the company suggesting the spacer be an RII (double inspection) item.”

The mechanic told ASRS that he suggested a fix to a company procedure rather than a fix to duty time. Was the reader fatigued when he wrote this



Iceberg Model

suggestion? The issue in this incident may not be a procedural problem; perhaps mechanics need a better scheduling system. In this instance, the mechanic said nothing about schedule changes or fitness for duty.

With only a few added words the mechanic’s suggestion could have been brilliant. He should have recommended that certain tasks be RII when performed by a fatigued worker. This recommendation would help manage fatigue risk but would not limit a company

or a worker from extended hours. Making the item an RII to manage fatigue hazards represents an approach to fatigue risk management that focuses on managing maintenance tasks rather than the individual.

As our industry moves forward to better fatigue risk management, we need to consider alternative fatigue risk management strategies that go beyond scheduling and the individual. Our rule of thumb should be: Change the job, the procedure, or the worker when fatigue is a safety or efficiency risk.

HAZARD ALERT

Change the...

- JOB
- PROCEDURE
- WORKER



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Log-in to the FAASTeam website at:

<http://www.faasafety.gov/AMT/pub/mh.aspx>

Proposed Interpretation of Duty and Rest Provisions for Maintenance Personnel

Send your comments on or before June 14, 2011.

<http://edocket.access.gpo.gov/2011/2011-9236.htm>





Safety, Economic and Health Consequences of Sleep Loss and Fatigue in Shift Work

By David J. Foy and Hans P. A. Van Dongen, Ph.D.

About the Authors: David Foy is a biochemistry student at the University of Surrey in England. He is currently on placement at the Sleep and Performance Research Center at Washington State University, Spokane. 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.

Fatigue in Shift Work

A key problem in shift work operations is difficulty obtaining adequate sleep while off duty, especially during the daytime¹. Indeed, it has been estimated that 75% of night shift workers experience fatigue every night, with 20% of them reporting they fall asleep on the job².



In a study of the aviation maintenance work environment, maintenance personnel were found to obtain an average of about 5 hours of sleep per day³. Laboratory research has revealed that this level of sleep restriction leads to cumulative declines in cognitive performance, equivalent to what is seen after *not sleeping at all* for a day or more^{4, 5}.

Performance and Safety

Fatigue increases the risk of errors, incidents and accidents⁶. The operational relevance has been illustrated in a sleep deprivation study of an airport bag screening task, which showed that threat detection accuracy decreased while false alarm rates increased following sleep loss⁷. In aviation maintenance operations, the circadian rhythm (i.e., 24-hour rhythm of the biological clock) in fatigue has been found to be associated with a nighttime peak in skill-based errors⁸.



Risks from fatigue are not only encountered during work hours, but also when off duty, with time spent on the road (e.g., while commuting) being particularly risky. Fatigue is believed to be a contributing factor in many road accidents, for example, in 30%–40% of accidents involving heavy trucks⁹. In many cases, this is an issue of not getting enough sleep rather than how long the driver has been on duty. There is also a distinct effect of the circadian rhythm on the risk of road accidents¹⁰. In other words, time awake and time of day



affect a person's fatigue risk.

These findings emphasize the importance of accounting for sleep loss in interaction with time of day when managing fatigue^{10–13}. This has been recognized in time-of-day-dependent provisions in notices of proposed rulemaking (NPRMs) recently issued for commercial vehicle drivers and for flight crews^{14, 15}.

Economic Consequences

Sleep loss is causing U.S. employers approximately \$136 billion per year or more in lost productivity due to do-overs, unproductive work time and absenteeism¹⁶. To get a sense of magnitude, compare this to the economic burden of drug abuse (\$124 billion) or cancer (\$69 billion)^{17, 18}. Such numbers have a significant effect on the corporate bottom line.



The economic impact of fatigue-related incidents and accidents is not precisely known, but believed to be substantial. A large-scale study conducted by the Federal Railroad Administration¹⁹ exposed that at least \$46 million worth of property damage in railroad accidents, per year, is caused by human factor errors likely to be related to fatigue. No comparable statistic is currently available for aviation.

Health Hazards

Other than through accidents, fatigue also affects personal safety and health in more subtle ways. Repeatedly not getting enough sleep is believed to increase the risk of a variety of chronic medical problems^{20, 21}. Sleep loss disrupts the balance between the hormone ghrelin, which stimulates appetite, and the hormone leptin, which dampens hunger²². This disruption leads to craving of unhealthy (fatty) foods when awake at night, and dysregulates glucose metabolism²⁰. This can lead to



obesity²³, which in turn increases the risk of sleep apnea²⁴, a sleep-related breathing disorder causing fragmented sleep and further sleep loss²⁵. The result is a vicious circle of abnormal metabolic, hormonal, cardiovascular and nervous system functioning known as metabolic syndrome²⁶, which tends to produce various other negative health outcomes such as cardiovascular disease²⁷ and diabetes²⁸. See Figure 1.



A variety of health issues are reported by personnel working shifts²⁹. Symptoms

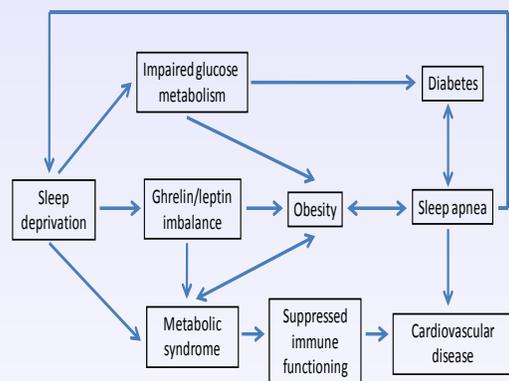


Figure 1: Simplified diagram displaying associations between chronic sleep loss and adverse health outcomes.

include depression, gastrointestinal problems, compromised immune function, substance abuse, and cardiovascular disease³⁰. Healthy lifestyles focusing on diet and exercise (without giving up sleep to make time for exercise) help to counteract the adverse health consequences of fatigue³¹, as does transferring to daytime work¹.

Take-Home Message

Fatigue has a critical impact on safety, productivity, health and well-being – and this comes with significant economic and societal costs. As a technician or an executive, the return on investment for implementing fatigue risk management strategies is expected to be high³².

[Click here for references.](#)