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Maintenance Fatigue Advisory Circular Has Arrived

Dr. Bill Johnson

* Information herein is also covered in AMT Magazine for Nov-Dec 2016 and Jan–Feb 2017.

Summary

Finally, there is a Maintenance Fatigue Risk Management Advisory Circular (AC 120-115, 2016). It is not written as a precursor to new regulations. It merely is one stop shopping for maintenance fatigue risk management resources. It will help you identify and address the fatigue–based hazards that may exist within your organization or your life. While the AC provides detailed scientific references this summary provides overview information.

Take it or Leave it.

"You don't need a weatherman to tell you which way the blows" (Bob Dylan). And, you don't need the government to control every aspect of your wakeful and sleeping hours. All segments of the industry know that worker fatigue is a potential hazard.

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It can contribute to risk and ultimate negative events like rework, delays, and to worker injury. It can impact flight safety. Fatigue impacts our thinking and our actions. This new AC, a one-stop collection of FAA maintenance fatigue information, is designed to provide education, advice, and accesses to other fatigue sources. Readers are likely to appreciate this information as a way to address issues that emerge from their safety management system (SMS). If you don't yet have a formal SMS, you likely have a reasonable idea if fatigue is a hazard in your organization. The information in the AC can help you. With no rule, current or planned, you can "take this AC or leave it."

What's in the AC?

ACs all have a similar format with headings like Purpose, Related Documents, Background, Critical Issues, Definitions, and More. This AC also has sections titled "How to Reduce Fatigue-Related Error" and "How to Minimize the Impact of Fatigue Related Error." The stated purposes are:

1. Describe basic concepts of fatigue and Fatigue Risk Management (FRM)
2. Describe benefits and how to implement FRM

The AC is more like a fatigue information source than a specific step-by-step means to comply with a rule. The authors tried to keep it straight-forward, although the scientific facts are sources are in the document.

Specific information

The Definitions section of the AC has a lot of details including the Signs of Fatigue (see AC, page 8, Figure 1) to include physical, emotional, and mental signs.

A few operational results of fatigue include:

- Impaired judgment and decision making
- Impaired Communication skills
- Decreased attention span and memory
- Irritability
- Slower reaction times
- Increased risk taking

Chronic (i.e., long term) fatigue not only affects performance at work but also can impact personal health to include:

- Heart disease and high blood pressure
- Depression, anxiety, and stress
- Gastrointestinal disorders (peptic ulcers, indigestion, heartburn, upset stomach, etc)
- Overeating
- Risk for higher alcohol consumption and drug use, and
- A lower sense of well being

A Shared Responsibility

There is not a grave need for government regulations for you to acknowledge what you already know. Individuals and companies can cooperate to address fatigue hazard, at little or no cost. In many cases companies and individuals know when they are creating fatigue-related risk, but are very good at rationalizing the actions/inactions. This AC does not suggest radical changes. Small changes can add up to significant improvements. Here are individual and company actions that affect fatigue hazards.

Factors primarily under control of the individual include:

- Amount of sleep over the past 3 days (Average of 8 hours/day?)
- Quality of sleep conditions (See FAA site at www.mxfatigue.com)
- Continuous hours awake (Over 16 risk increases)
- Medical or personal issues that affect restorative sleep (Make-up time for extended hours awake)
- Not taking advantage of all opportunities to sleep (Like 20 minute naps)

Factors primarily under control of the company include:

- Start time and shift duration
- Acknowledging work and life schedule changes (like, new born baby and family situations)
- Sub-optimal shift rotations (Rotate in direction of clock)
- Routine schedules
- Adjusting for mid-night shift work
- Adjusting for travel and radical time-zone change (aka, jet lag)
- Repetitive and routine tasks
- Continuous sub-optimal conditions like staffing levels; insufficient breaks (including proper nutritional options), lighting, sound levels, extreme temperatures, and more.

"Small changes can add up to significant improvements."

Benefits of Managing Fatigue

The author has reported, repeatedly, in FAA reports and AMT articles (See (October 2012), (July 2013), and (September 2014)),that worker fatigue is always identified in the top 3 maintenance human factors risks. When companies apply proper root cause analysis to negative events fatigue is often a significant contributing factor. For example, the night shift taxied an aircraft off the runway into the mud. It was a poor decision, they were not adhering to the procedures, and they were complacent. Oh, by the way, they had been on duty for 13 hours and worked all night. That is fatigue! Such fatigue-related behavior and consequence can be managed. The benefits are high.

Proven FRM benefits include:

- Reduced number and severity of worker injuries
- Reduce worker illness
- Improved morale
- Reduced ground damage and rework
- Increased sleep quantity and quality

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- Improved quality of life (As reported by flight crews after Part 117 Crew Fatigue rule enactment)

The Bottom Line – How to Manage Fatigue Risk

While the AC is full of facts and figures the document begs the question, What can we do about it? The personal and corporate lists above provide guidance but here is more.

Fatigue Alertness Training – This solution is listed first because it has been repeatedly proven to be of high value. There are a lot of fatigue awareness training products on the market. FAA's Web-based fatigue awareness training is the best and most widely used. An estimated 100,000 aviators have taken the 2 –hour course and passed the end-of-course test, since 2011. It is available at www.faasafety.gov. It is complemented by FAA's award wining video on maintenance fatigue. The 20 minute video is available from the FAA websites previously listed.

When workers and managers have knowledge about fatigue it can foster communication and peer cooperation to identify and mitigate fatigue-related challenges.

Hours of Service (HOS) Limits – FAA has an HOS regulation in CFR 14, 121.377. For all practical purposes it is without practical value for safety. The AC does not specify maximum daily hours or continuous days. It does suggest "progress restrictions (page 17). For example, after a worker has been on duty for 12 hours (Day shift), or 8 hours (Night shift), or has already more than 60 hours in a 7 day period, then they should be considered at fatigue risk. That could limit the kind of tasks they perform without double inspection. They should not be allowed to conduct critical tasks, like rigging of flight controls, etc. There are as many variables in conditions and tasks. Organizations must decide what works best for them. Organizations and individuals should establish and follow their own rules. That is FRM!

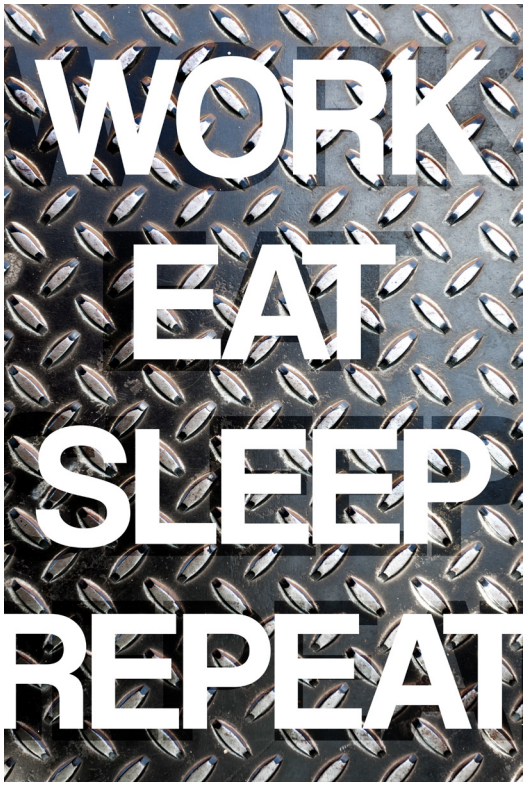
Scientific Scheduling – There are plenty of scheduling software packages available. There is a considerable learning curve to master the scheduling software. It is usually well worth the investment to assign an internal individual or small group to this task. Get them properly trained in order to maximize the effectiveness of the product. If you make the decision to hire a scheduling consultant be aware that such commitments are often longer and more expensive than originally expected. Besides, your own internal experts know the subtitles of the organization, thus increasing the fit between the solution and the company.

Napping Strategies – Naps have been proven help for pilots, air traffic controllers, truck drivers and many other occupations. This author is unaware of formal scientific napping studies in the aviation maintenance environment. However, it is certainly reasonable to generalize among humans. At a minimum, consider creating an environment that is conducive to a nap. That might be a quiet, room with low light and comfortable chairs. Workers could take 20-30 minute naps, during breaks or lunch. Start small and see if there is an impact on workers. Again, that is another step in managing fatigue.

Excused Absences – Working fatigued is like working sick. Calling in fatigued should be considered like any other sick leave. Extensive sick leave should trigger a required visit to a sleep specialist. Seep apnea is one example of a common medical condition that can be corrected.

Event Investigations - When something goes wrong be sure to conduct sufficient root cause analysis to see if fatigue was a contributing factor. For starters, look at previous sleep duration/quality, time awake, and time of day.

Modifying job demands – Aircraft fly during the day and are commonly maintained at night. The mid-night shift is a reality of a 7x24 industry. Fatigue is one of the hazards of night work. Task scheduling, workplace design, supervision, inspection practices



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are all partial remedies to address the risk of fatigue. That is fatigue management.

Read the AC - This article merely summarized the 25 page Advisory Circular. The author suggests that all companies make the AC required reading for managers. Talk about the recommendations. Celebrate that this merely advisory material and not a rule. Set up reasonable policies that start your Fatigue Risk Management System.

For further information go to www.humanfactorsinfo.com. Sleep well.

If you like checklists then use these.

Here are 3 checklists. Do as many of these suggestions as reasonably possible. Add to the checklist to checklists to customize them to your organization and/or your personal habits and work schedule.

Corporate Actions

- ❒ Acknowledge corporate fiduciary responsibility to provide safe air transportation
- ❒ Identify and empower a fatigue risk manager in appropriate departments
- ❒ Send managers to Fatigue Risk training
- ❒ Establish and promote a Fatigue Risk Management System(FRMS)
- ❒ Insure organizational buy-in to reduce fatigue-related risk
- ❒ Provide fatigue awareness training to everyone in the organization
- ❒ Ensure that the SMS investigates worker fatigue as a root cause factor in every event
- ❒ Assign values to losses and production inefficiency caused by fatigue
- ❒ Document fatigue issues in all worker injury reports and use for corrective action
- ❒ Set reasonable schedules for maximum hours per day for work
- ❒ Set reasonable schedules to accommodate 8 hours/day of worker sleep
- ❒ Establish a reasonable plan where a worker can call in "too fatigued to work."
- ❒ Address the risk associated with extended days for road trips or AOG situations
- ❒ Automatically flag time records with frequent extends hours/day and continuous days/ week/ month
- ❒ Recognize that continuous excessive overtime threatens safe product and worker safety.
- ❒ Provide loaner sleep monitor technology to help workers understand their sleep schedules
- ❒ Provide screen for sleep apnea

Worker Actions

- ❒ Recognize that fatigue risk management is a shared personal-organizational responsibility
- ❒ Recognize that long work hours and night time schedules have trade-offs with normal life activities
- ❒ Train family/friends to accommodate your commitment to be fit for duty
- ❒ Commit to 8 hours of daily sleep
- ❒ Factor commute time into your fitness for duty plans
- ❒ Keep a 2-week sleep diary using technology (like Fitbit) or paper
- ❒ Learn from the employer-provided fatigue awareness training
- ❒ Ensure that you have a comfortable, quiet, and dark area for optimal sleep
- ❒ Avoid caffeine or excessive alcohol before sleeping
- ❒ Consider fatigue issues when reporting any hazards
- ❒ Discuss fatigue issues with co-workers
- ❒ Commit to 8 hours of daily sleep (repeated on purpose)

Government Actions

- ❒ Acknowledge that flight/worker safety and commercial/legal factors should drive FRMSs.
- ❒ Ask for fatigue data from SMS.
- ❒ Provide hours of duty guidelines for those without FRMS programs
- ❒ Create educational and other FRMS support materials
- ❒ Conduct applied research and development to improve and validate FRMS interventions.

Comments – Send comments to Dr. Bill Johnson at Bill-dr.johnson@faa.gov.

Do Clusters of Cancer Indicate Exposures in the Workplace?

By Dr. Jim Allen

Fueling is common operation performed by individual mechanics at small airports and specialist at busy airports. Regardless of who performs the fueling operation, skin contact with liquid fuel and inhalation of fumes is a common exposure. Does these exposures cause cancer?

An FBO at a busy airport in the Midwest had a chance to discuss cancer risk with their local Occupational Safety and Health Administration (OSHA) inspectors. A disgruntle former employee reported the FBO to OSHA claiming excessive exposures to fuel. While the accuser did not have cancer, his complaint alleged poor environmental controls caused the cancers in co-workers.

At first the executive at the FBO was furious at the former employee's seemingly baseless claim. After his fury came remorse. Similar to most FBOs the executive knows his mechanics and the local community. Asking employees to fuel aircraft in a manner that could cause cancer would disrupt the camaraderie of the workgroup. The executive were baffled on how to investigate a cancer risk.

Fortunately, in the early 1990s scientists at the National Institute of Occupational Safety and Health (NIOSH) investigated a similar claim at the Newark International Airport (EWR). Employees of the fueling service observed that two past employees died of lung cancer, and three current employees have lymphoma, throat and prostate cancers. Like the disgruntle former employee these EWR employees assumed that exposures to jet fuel caused a cluster of cancers. NIOSH scientists investigated their assumption.

The first step in any hazard evaluation is to clearly understand the work process. The refueling operation required three different types of jobs.

- Fuel line mechanics repaired fuel lines and drained water from refueling hydrants. Their job frequently required entry into underground chambers known as "isolation pits" to drain the fuel lines.
- The job of the fuelers was to fuel aircraft from trucks. These employees were constantly exposed to exhaust gases from fuel trucks and aircraft.
- Tank farmers worked on the large fuel distribution tanks.

Although each job type performed different work processes, any of these employees might receive a "fuel bath" from a spray of fuel (meaning the clothes have become saturated with fuel). Company policy permitted employees to shower and change clothes, but when observing work operations, the NIOSH investigators noted that employees frequently had fuel drips on parts of their clothes, such as their sleeves. With just one part of their clothing wet, workers seldom changed into a clean uniform.

Another step in the investigation is the confidential medical interview with employees. None of those interviewed had symptoms of eye irritation, nausea or confusion. These symptoms are consistent with exposures to fuels and other solvents.

NIOSH scientists collected air sample to determine environmental exposures. Fuelers wore small air pumps to collect personal breathing zone samples. Larger pumps placed around the airport collected air samples upwind of the fueling operations. This step permitted the investigators to analyze the chemical vapors contained in the air samples. Results of this environmental sampling showed chemical vapors below the Permissible Exposure Limit (PEL) for OSHA. In other words, the fueling operation was in compliance with federal statutes for airborne contaminants.

After completing the background study necessary for hazard recognition, the scientists initiated an evaluation of the chemical vapor obtained by the air samples. An obvious hypothesis was that Jet A was entering the body through inhalation and through many small but prolonged contacts with the skin from saturated parts of clothing. However, the NIOSH investigators found that studies linking jet fuel to cancer were inconclusive. A requirement to confirm a cluster of disease is to show that the alleged exposures have a biological reasonable epidemiologic association between the exposure and cancer type (2).

Additional evidence against the hypothesis was that the cancers in the fuelers were of different cell types and sire of origin. Cancers of the lung, throat, and prostate which fuelers did have are common in the general population. The more likely explanation is that several workers had a common cancer at the same time.

Consider some statistics. Cardiovascular disease is responsible for 1 out of every 3 deaths in the US. Approximately 39.0 percent of men and women in the US

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will be diagnosed with cancer of any site at some point during their lifetime (3). Individuals in a workplace can have these conditions. Radom occurrence of common cancers gives the impression of a workplace exposure.

For the EWR report, the NIOSH scientists concluded, "The evidence is insufficient to associate exposure to petroleum naphtha with the development of cancers in humans." Unfortunately for the executive at the FBO, the local OSHA office did not accept this conclusion and required local air sampling. After spending $3,000 for this sampling, the conclusion from the FBO's exposure was the same as that reached by the NIOSH scientists from the EWR exposure.

Failure to demonstrate a cancer cluster does not exempt fueling services from implementing good workplace practices. For the fueling services at EWR, the NIOSH scientists outlined these practices (table). They include personal hygiene for the individual fuelers, training they should receive, and regulatory procedures that must be followed.

FBO who follow these recommendations have a strong defense against a claim of cancer cluster from fueling exposures.

Reference:
1. Malkin R, Zimmer A, "Investigation HETA 92-0288-2454 of Ogden Aviation, Newark Airport, New Jersey", National Institutes of Occupational Safety and Health, September 1994

2. Kawamoto M, Hanley K, Burr, G "Investigation HETA 92-0415-2502 of Everyready Battery Company, Marietta, OH", National Institutes of Occupational Safety and Health, April 1995

3. Surveillance, Epidemiology and End Results Program, National Cancer Institute 2011 to 2013 data

Comments - Send comments to Dr. James W. Allen at jwallen748@gmail.com.

SIDEBAR

Errors in fueling, such as putting the wrong fuel in an airplane, is a tragic failure in Human Factors. Practitioners of human factors have expended much effort to prevent such failures. Fueling also has a medical component. Fuelers commonly have questions about the occurrence of certain types of cancers. The purpose of this newsletter article is to assist fueling services who may have to respond to these questions.

The study of HF also has medical component. We've asked Dr. Allen to continue to illustrate how an understanding of public health contributes to the practice of HF. He is currently writing a book on public health and human factors.

Personal Hygiene	Training	Regulatory
Wear long gauntlet chemical-resistant gloves to reduce skin contact with small spills	Increase worker awareness of potential exposures to vehicle exhaust	Fit-test individuals entering isolation pits, as required by OSHA standards
Designated smoking areas should not allow second-hand smoke to enter the general work area	Maintain vehicles to minimize carbon monoxide (CO) as an exhaust gas	Periodically conduct personal air sampling while working in the isolation pits

Table 1. Recommendations to prevent exposures when fueling aircraft (from Reference 2)

From "Dirty Dozen" to "Filthy Fifteen" Professionalism in Aircraft Maintenance

About the Authors: Maggie Ma is a Certified Human Factors Professional (CHFP) who specializes in maintenance human factors, and a Boeing Designated Expert. Maggie received her Ph.D. in Industrial Engineering/Human Factors Engineering from State University of New York at Buffalo. Her primary Boeing responsibilities include providing implementation support to customer airlines and other maintenance organizations on a wide array of safety processes/programs, e.g., the Maintenance Error Decision Aid (MEDA) process, the Ramp Error Decision Aid process, Maintenance Human Factors training, a Safety Management System, Maintenance Line Operations Safety Assessment (LOSA), and Ramp LOSA. She has worked closely with airlines, manufacturers, maintenance organizations, ground service providers, and regulatory agencies around the world.

Jay Grower has worked for Hawker Pacific Aerospace for nearly 40 years. His aerospace experience as an inspector, auditor, and trainer have given him a unique opportunity to view and understand both the direct causes and underlying causes of maintenance error. Based on his understanding of the impact of human factors on performance and quality, he has worked with Hawker managers to ensure their responses to corrective actions, include both human factor causes and technical causes.

My job allows me to support customers and maintenance organizations all over the world. Learning about different operations, meeting expert practitioners, and experiencing new cultures continue to fascinate me. What I love about my job even more is having the opportunity to embrace best practices from different organizations and then share them with others in the industry.

A couple of months ago, I worked with colleagues from Hawker Pacific Aerospace (HPA), a member of Lufthansa Technik Group. HPA has a number of tools for promoting safety. For example, the *"Filthy Fifteen"* posters are HPA's expansion of the *"Dirty Dozen"* list, and are applicable to the Maintenance, Repair, and Overhaul (MRO) industry. HPA's *"4-C Professionalism"* poster highlights key characteristics for an aviation professional. The poster also lists the important job responsibilities. These tools are HPA's original creations or modifications, and are integrated into its human factors program.

Dirty Dozen

Due to a spate of maintenance-related aviation incidents and accidents in the late 1980s and early 1990s, Transport Canada, together with the aviation industry identified 12 human factors issues, christened the *"dirty dozen."* [The list can be presented as a sidebar]

- Lack of communication
- Distraction
- Lack of resources
- Stress
- Complacency
- Lack of teamwork
- Pressure
- Lack of awareness
- Lack of knowledge
- Fatigue
- Lack of assertiveness
- Norms

The 12 elements impact human ability to perform effectively and safely and are common human error preconditions to accidents or incidents. Of course, these 12 preconditions are not a comprehensive list. In 1994, the Dirty Dozen posters were developed to provide guidance to maintenance personnel around the world. Safety nets for the 12 human factors issues were also introduced so that the appropriate mechanisms can be put into place to capture, reduce, and prevent human errors. The safety nets listed are not comprehensive. There is an infinite amount of possible safety nets an organization can put into place because there is always the possibility to do things better. The Dirty Dozen concept has since become a cornerstone of Maintenance Human Factors training worldwide. Over the years, different areas of aviation have found that the Dirty Dozen offers a useful introduction to open discussions into human errors in the workplaces and organizations. The list has been adopted for pilots, ramp workers, air traffic controllers and cabin crews (See http://www.system-safety.com/trainingvideos/Training_Aids/Safety%20Posters.htm).

Boeing's Addition to Dirty Dozen – The Pledge

Boeing has customized the Dirty Dozen for the aircraft production environment in 2014. *"The Aviation Professional's Pledge"* was first launched in the 737 NG production line in October 2014. The pledge is composed of 10 action items and states:

"I know the lives and safety of others depend on my skill and judgment as an aerospace professional. I will not be persuaded or influenced by personal gain

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to approve aircraft or pass questionable workmanship as airworthy."

HPA's Expanded Dirty Dozen – The Filthy Fifteen

In its human factors training, HPA expanded the *"Dirty Dozen"* to the *"Filthy Fifteen"* by introducing three more human performance issues: not admitting limitations, lack of operational integrity, and lack of professionalism. The three precursors precisely capture some additional common reasons why aircraft maintenance technicians make errors and deviate from company policies, processes, and procedures, i.e., commit violations. In fact, all 15 precursors may lead to human errors or violations or both. In its Filthy Fifteen posters, HPA illustrates scenarios that pertain to its MRO operations.

Aircraft maintenance technicians are known for their *"Can Do"* mentality, which motivates them to do exceptional work despite all the challenges. However, this mentality can backfire at times. *"I have not been properly trained on this, but I have so much experience, I can figure out how to do the task without formal training. How hard can it be? I have an A & P license after all. That proves I can do it. Sure, I can take care of those as well!" "I'm tough! I can work 14 hours every day, month after month without much sleep. I'll sleep when I die!"* Not Admitting Limitations highlights that everyone has their limits. To be precise, the study/analysis of human performance limitations is a vital part of human factors training. We must understand, thus be honest, transparent, and assertive by admitting our limitations in order to perform our tasks effectively and safely. Exceeding our limitations decreases performance, increases risk to the individual and co-workers, and may lead to aircraft and equipment damage. The counter measures to *"not admitting limitations"* include:

- Be aware of your physical, cognitive, and technical limitations
- Listen to your body's warning signs
- Get over your ego
- Admit lack of knowledge
- Always follow the correct procedures
- Seek answers and ask for help
- Take breaks and live a healthy lifestyle

Integrity refers to a firm adherence to a code of moral values and its application is through continuous observance by the company and employees to regulatory requirements and approved maintenance procedures. Lack of Operational Integrity can result in risk taking behaviors, such as both routine violations (ineffective workplace norms) and situational violations (cutting corners due to certain circumstances in the work environment, such as time pressure, unavailability of equipment/ tools). *"It was a little out of tolerance last time and it worked! It is a little out again, what is the big deal?"* Integrity is steadfast adherence to a strict moral or ethical code. It means doing the right thing every time, no matter if you are seen by others or not. Deviation from the procedures may not result in immediate negative impact on safety. As a result, people may become complacent and grow to believe it is low risk to deviate. This makes *"lack of operational integrity"* particularly insidious. Some safety nets for this human error precursor include the following actions:

- The organization must communicate its commitment to integrity to the workforce
- Know the characteristics of integrity and apply them
- Make your actions consistent with your words
- Speak up immediately if you know you have made an error
- Always consider the safety of others (traveling public, coworkers)
- Always follow the correct procedures

The third item that HPA includes in its *"Filthy Fifteen"* is Lack of Professionalism. This addition and HPA's "Professionalism" poster could not be timelier for the aircraft maintenance industry. Lack of professionalism and lack of integrity have been known to contribute to accidents such as American Airlines Flight 191 in 1979 and Continental Express Flight 2574 in 1991 (Baron, 2011). In recent years, it has been a common complaint from maintenance organizations that technicians, particularly of younger generations, do not exhibit a passion of professional pride, which was once there.

Doctors in many Western countries take the Hippocratic Oath upon entering the profession, as a symbol of their commitment to upholding a number of ethical and moral standards. In the aircraft maintenance world, technicians live by the technician's creed, which was originally written by Jerome Lederer in 1941. The creed appeared on the back cover of the first issues of Flight Safety Foundation's Aviation Technicians Bulletin in 1953 and proved to be extremely popular. Technicians around the world, "*from Tokyo to Frankfurt, from Canada to Puerto Rico,*" wrote to request copies of the creed to hang in their offices and shops. And that was certainly evidence of a passion of professional pride.

A professional is a member of a profession. *"Professionalism"* refers to the skill, good judgment, polite and respectful behavior that is expected from a person who is trained to do a job well. The term also describes the standards of education and training that prepare members of the profession with the particular knowledge and skills necessary to perform the role of that profession. In aircraft maintenance, *"Professionalism"* can be interpreted as the willingness to take responsibility for placing the safety and airworthiness needs of the traveling public above individual self-interest. The above is evidence of Integrity. So, Professionalism and Integrity go hand-in-hand, and Integrity is the cornerstone of Professionalism. Professionalism can be further explained from the following aspects (CASAA, 2013):

- **Discipline**—following approved procedures to perform a given task
- **Communication**—keeping their team members informed of progress and developments
- **Teamwork**—working together well to resolve problems and maintain control
- **Knowledge**—having a deep understanding of aircraft systems and their operation
- **Expertise**—retaining and transferring knowledge and skills
- **Situational awareness**—knowing

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what is happening around them
- **Experience**—calling upon prior training and knowledge to assess new situations
- **Decision making**—taking the correct decisive actions
- **Resource management**—allocating resources to ensure control of the larger situation is maintained while specific problems are being addressed
- **Goal prioritization**—prioritizing safety above personal concerns

"Professionalism" also emphasizes self-control or self-regulation to exercise personal integrity in order to resist at-risk behaviors. Professionalism is central to the integrity of the work process, quality of the production, and consequently, a safe and successful operation. HPA teaches the four core characteristics – the 4 C's for the aviation professional:

- Competence in knowledge and skills in their field
- Commitment to a higher purpose
- Control of their own work
- Communication (written, verbal, and nonverbal other than written)

HPA emphasizes that it is vital to internalize and practice the above core competencies, and has offered their technicians the following safety nets to guard against *"lack of professionalism"*:

- Work with passion
- Share your knowledge
- Use approved parts, materials, and technical data
- Use proper tools
- Be a diligent judge of quality
- Always follow the correct procedures

To practice professionalism, an aircraft technician must apply all counter measures from the entire list of *"Filthy Fifteen"* items. For example, one must not hesitate to be assertive or practice distraction and complacency avoidance and at the same time manage stress effectively. An employee must not treat any task as trivial, and takes equal care doing basic tasks as those which are complex. At HPA, the following is emphasized frequently: *"that most accidents are not caused by very complex technical issues, but by simple and avoidable errors, such as failing to finish the torqueing of a nut."*

Technicians who are professionals readily admit errors. Those technicians have the discipline and assertiveness to ensure they are trained and certified for the task. HPA continually emphasizes *"Raise Your Hand"* in new hire orientation and recurrent training. That is, when a technician has any doubt whether he/she can perform a task effectively and safely, the technician must raise his/her hand and notify the management that an issue needs correction. Then management that is made aware can ensure the technician get the help and training he/she needs. Simultaneously, each technician is encouraged to always strive to be the best he/she can be through continuous learning and professional development.

In the past couple of years, several maintenance organizations I work with have launched professionalism campaigns to promote product quality and safety. Those professionalism campaigns were also designed to inspire/re-kindle the pride for the aircraft maintenance profession. The organizations have observed some significant positive improvements.

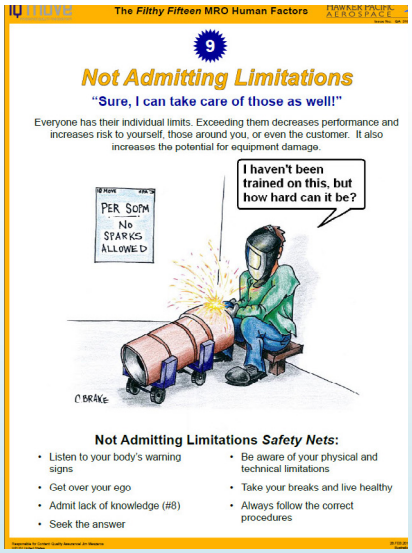
In conclusion, professionalism and integrity should be an important topic in any human factors curriculum for aircraft maintenance technicians. However, the application in the workplace largely remains the responsibility of each individual. Technicians need to buy into these values, and are proud to practice professionalism and integrity. This is a process that begins in the heart and is instilled into the mind, then put into practice by the hands that touch and work on the aircraft or components.

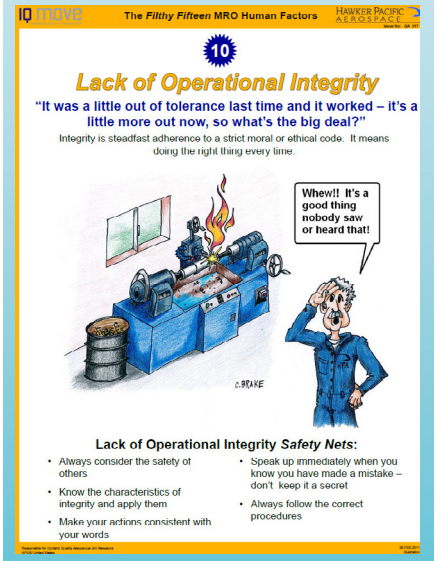
References:

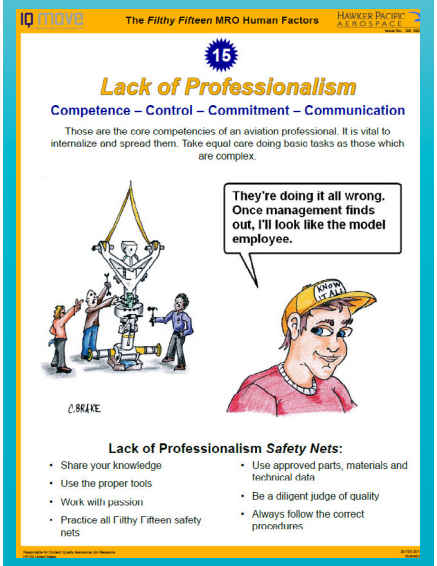
Baron, Robert I. (2011). Do the Right Thing. Flight Safety Foundation AeroSafety World (February 2011 issue).

Civil Aviation Safety Authority of Australia (2013). Human Factors – Resource Guide, Chapter 11: Professionalism.

Comments - Send comments to Dr. Maggie Ma at maggie.j.ma@boeing.com or Mr. Jay Grower at jay.grower@hawker.com.







LETTERS FROM OUR READERS

My name is Kirbie Rovolis, and I'm a Quality Auditor in the aviation industry. I'm contacting you today to express my thoughts on recurrent Human Factors training in aircraft maintenance.

I never really grasped the relevance of HF until I began the safety specialization of my master's degree about 1.5 years ago. At that time I had been working for a defense contractor in NC for about four years. HF was understood to be of extreme importance at that company, and we were required to take annual training on the Dirty Dozen; however, it was easy to tell that many folks became complacent with the same ten-slide presentation that we saw each year. As I worked through my degree program, I was amazed to see how much HF plays into the incidents/accidents in our industry, especially those events that capture the world's attention due to their devastating circumstances.

What really hit home - my 'ah-ha' moment - was realizing that HF could impact my family in a tremendous way. My husband is an AMTC in the U.S. Coast Guard, and he's flown on aircraft overhauled and maintained by contractors for 20 years. While I don't know what those contracts require in regards to annual training, I do know that there are so many other wives and children out there who rely on able-bodied, clear-minded, focused mechanics to maintain the aircraft their husbands and fathers fly on, many of those mechanics being held under the requirements of your organization.

Important to note, too, is how our industry is changing in regards to quality standards. For instance, AS9110C - just released Nov 2016 - requires MRO organizations to "establish and maintain the competence of persons with the skills and knowledge through assessment and training programs (initial and recurrent training) to ensure that persons performing, as applicable, continuing airworthiness management or maintenance activities, including certifying staff, remain current in terms of procedures, human factors, technical knowledge, on-the-job training, and applicable competent authority requirements" (7.2f). HF is now considered as important and relevant as the technical knowledge required to perform maintenance tasks.

The aviation industry in our country is known for being reactive (that whole "regulations written in blood" thing), and as a Quality professional and wife of an aviator, I believe that we have enough evidence to show how important it is for aviation professionals - from the CEO to the Service Attendant washing aircraft - to be thoroughly trained on an annual basis on HF's potential impacts, recognizable signs, and mitigation techniques. I do hope that you and your team will consider this in the near future.

Sincerely,
Kirbie

SEE SOMETHING MISSING?

Are you a regular reader of our Mx HF Newsletter? Do you see something we're missing? As always, please let us know! If you have ideas for future articles or would like to contribute, please contact our newsletter staff at:

crystal.rowley@faa.gov

MAINTENANCE HUMAN FACTORS RECENT AND UPCOMING EVENTS

Transportation Safety Institute: Maintenance Human Factors Course Dr. Bill Johnson	January 31-February 2, 2017 MMAC, OK
IA Renewal Seminar Dr. Michelle Bryant	March 10, 2017 Wichita, KS
Human Factors Training Dr. Michelle Bryant	March 11. 2017 Enid, OK
International Conference on Managing Fatigue Dr. Tom Nesthus & Dr. Michelle Bryant	March 20-23, 2017 San Diego, CA