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HUMAN FACTORS

QUARTERLY

A HUMAN FACTORS PROGRAM HEALTH CHECK LIST

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About the Author: Dr. William Johnson is the FAA Chief Scientific and Technical Advisor for Human Factors in Aircraft Maintenance Systems. His comments are based on nearly 50 years of combined experience as a pilot, mechanic, airline engineering and MRO consultant, professor, and FAA scientific executive.



Dr. Bill Johnson offers checklist ideas to assess the health of your human factors programs. His ideas are mostly products from the past decade of publications and products from the FAA-funded projects at the Civil Aerospace Medical Institute (CAMI). A shorter version of this paper is published in the July 2015 Aviation Maintenance Technology (AMT) Magazine. For this check-up, there is no time wasted in waiting rooms and you don't have to complete health insurance forms. You are the doctor!

Why a Check-Up? Why a Checklist?

Writing this article we wondered while preparing if we were "plowing old ground." To quote the famous Yogi Berra, "It's like *déjà vu*, all over again." Johnson's list from his 2001 "Human Factors Programs: Fact or Fantasy?" offers guidance on how to conduct an internal review of a Human Factors program. Borrowing from Shakespeare's *Hamlet*, he asked "Is not this something more than fantasy?" Fast forward fifteen years and human factors programs are not fantasy.

Today "human factors" is a household word/phrase in maintenance organizations and schools. Maintenance human factors content has evolved from early fundamental psychology class (that some called psychobabble) into human-centered and action-oriented discussions of hazards, threats, errors, and the ways to manage them. Voluntary reporting, like the Aviation Safety Action Program (ASAP), has formalized how many people recognize and report human error. Schools, colleges, universities, governments, and industry have made attention to human factors a product and philosophy/organizational practice rather than something necessary to fulfill a requirement. A great deal of that effort is a result of the hard work of specialists, managers, labor, and researchers. They have built a case showing that human factors improves the lives of workers, the performance of organizations, and flight safety. This success continues to promote the cause of human factors in the workplace because it

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Written by maintenance human factors professionals dedicated to identifying and optimizing the factors that affect human performance in maintenance and inspection. Past newsletters @ humanfactorsinfo.com

HUMAN FACTORS TRAINING FOR FAA AIRWORTHINESS INSPECTORS (CONT...)

is in the best interest of all to ensure worker health/safety, flight safety, and organizational efficiency/profitability.

But with all the hype surrounding human factors, why should you care? Your engagement in human factors awareness and buy-in is so important because human factors errors occur at the human level. At the very core, human factors means, "What should be considered to make sure a behavior is successful?" This means that when you are asked, required, or otherwise perform an action you should be confident of success. But we're human. We make mistakes. It's inevitable. When we say human factors then, what we are calling attention to is our ability to predict human mistakes before they happen, and design out the error. The intention of human factors then, is to make life better, easier, and more successful. How can we know if we have taken the appropriate steps to ensuring these goals are met? One way is to evaluate existing human factors programs.

Just as we have annual wellness visits to our physicians, an HF program check-up permits you to take the vital signs, suggest where improvements might be made, and identify ways to maintain the

health of the human factors program. Just like a physician compares our current health to our past, we should examine where the HF program has been, how it may have changed, and if it is still on track for optimal well-being. Physicians use a check-list to ensure all areas are reviewed; this too would be beneficial in our programmatic well-visit. This article offers some sample questions that would guide such a well-visit ensuring optimal living for your human factors program.

Asking the General Questions

Human factors programs, from one organization to another, have considerable differences. One organization may have fewer than 50 employees, all of whom work on the same day shift. Another may be a very large US carrier. Some MROs have one location while others have 10+ locations spread around the globe. For those MROs working 24X7, safety hazards are different from other shift schedules and require different human factors programs. There are many standard means by which to measure HF program health. Go to the Acceptable Means of Compliance from

the European Aviation Safety Agency or to guidance material from Transport Canada and you will find such information. The international regulatory guidance specifies who should be trained as well as the minimum content areas that must be covered in a HF program. The FAA website,

www.humanfactorsinfo.com, likely has the most extensive HF information. These resources make it easy to check if you are meeting minimum guidelines. However, when safety is at stake, it's more important to examine harder questions that have less concrete answers. That's where the check-up is important. Table 1 offers broad general health questions for your HF program. The right answers depend on your organization.

The Psychoanalytic Questions

The Table 1 questions are high level and force a yes or no response. To drill down on some of those issues, a second series of similar questions may be likened to a psychological part of the well-visit. Here, the goal is to examine the "why" behind the response to the first set of questions.

Table 1: General Health Questions

age 3)

| Yes | No | General Human Factors Well-Visit Checklist |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Has everyone received initial HF training? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Is there a recurrent training program for everyone? |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Has initial HF training content evolved to address Safety and Risk Management Systems and Safety Culture? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Is every worker committed to safety? |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Can every worker define their role/contribution to organizational safety? |

HUMAN FACTORS TRAINING FOR FAA AIRWORTHINESS INSPECTORS (CONT...)

Table 2: The Invasive Questions

| Yes | No | General Human Factors Well-Visit Checklist 2 |
|-------------------------------------|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Do you assess the impact of the HF interventions? _____ |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Do you annually update HF program content? _____ |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Do you ensure currency of HF trainers and managers? _____ |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Do you assess the issues surrounding evolving safety culture? _____ |

There is no black or white answer to these tougher questions. "I don't know" is not an acceptable answer. Table 2 includes the harder questions.

About the Data

Following these questions, we can begin to bring the information together to understand exactly where the HF program stands. Is it healthy? Are there areas of concern? Is a prescription necessary? Do we move forward with general suggestions for

improvement without need for serious intervention? All of these questions require a look at the big picture and must address the following question: If our program were to continue as it is, would we have a serious illness with few options for treatment, or would we have some tweaks but overall a clean bill of health?

Part of ascertaining that the big picture reflects the daily activity of the program is to ensure synergy between

those responsible for HF and those responsible of the Safety Management System (SMS). The combined force must not only review and benefit from post-event reactive data but also help identify and apply data from the SMS proactive and predictive data. Integrating HF interventions and SMS activities within the company helps Engineering to ask the right questions and analyze the data accordingly. One example of collecting predictive data is the FAA-A4A Maintenance Line

Operations Safety Assessment (MxLOSA). It capitalizes on peer-to-peer assessments during normal operations. Such systems make everyone a safety auditor.

A health checkup of your HF programs and your safety culture would not be complete without a serious, introspective review of your voluntary reporting system and Just Culture policies. To fully understand

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Table 3: It is About the Data.

| General Human Factors Well-Visit Checklist 3 |
|---|
| When have you last reviewed and recommitted to your voluntary reporting and just culture policy? _____ |
| What proof do you have that employees really believe that they can report errors without punishment? Give more than one positive/negative example. _____ |
| What is the growth rate of your voluntary reports over the past 3-5 years? _____ |
| Are enough resources committed to analyzing and using data from voluntary reports? _____ |
| Do you merely throw the data "over the fence" to ASRS or ASIAs, or do you crunch it yourself? _____ |
| How do you know that you conduct sufficient root cause analyses on events? _____ |
| How do you formally disseminate "lessons learned" from voluntary reports on event investigations? _____ |
| Tell 3 success stories from voluntary reporting. _____ |

HUMAN FACTORS TRAINING FOR FAA AIR WORTHINESS INSPECTORS (CONT...)

Table 4: Show me the Money-Safety

| Yes | No | Show me the Money-Safety Checklist |
|-------------------------------------|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Does your event investigation and voluntary reporting data assign accurate \$\$ values to an event? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Are you sure that your root cause analysis is deep enough to identify valid and reliable contributing factors? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Does your HF program continuously evolve to address the deep root causes of events? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Do you know the real cost of an hour of training per student to include development, delivery, evaluation, and more? |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Do you use the FAA HF Return-on-Investment Model to decide whether to adopt a safety intervention? |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | How do you demonstrate that a specific human factors intervention impacts the number or the cost of an event? |

the many hazards inside of your organization you must ask the workers for their opinions. A good system will ensure constant worker involvement. To fix your hazards you must cooperate to identify, understand, and manage the hazard, threats, and errors. Table 3 has some questions for checking your HF data.

You do not have to be invested in the FAA Aviation Safety Action Program (ASAP) to have a high value employee voluntary reporting system. If you don't know how to do this, there are plenty of qualified consultants that can assist. Your FAA inspector can draw on FAA personnel to show you how to implement a formal or even an informal ASAP.

The Economic Questions

While the focus of the checkup, thus far, has been health-oriented you may also want to consider a financial checkup. That is, if your human factors program is doing what it should, workers will be more successful and therefore, produce a more lucrative organization. To more effectively connect costs to HF issues, you can ask some of the questions outlined in table 4.

Did you Pass the Check-up?

All companies want to ensure flight safety, protect their employees, and make money. HF interventions are an important means to achieve those goals. These checklists make it possible for you to take a cursory look at the program you currently have and find some areas that may need attention before an accident occurs. How did you do?

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



RECOLLECTIONS OF INSPECTION AUTHORIZATION RENEWAL SEMINARS

DR. BILL JOHNSON

Dr. Bill was pleasantly surprised to meet a former participant from an IA Renewal Seminar. They talked about recollections from the seminar, the value of IA Seminars., and how a seminar should be structured for best success. Johnson writes about the things people remember about their IA Seminars. It's funny what we recall. (Portions of this were published in the September issue of AMT Magazine. Readers are encouraged to go to www.aviationpros.com/magazine/amt/issue/2015/sep.)

Background:

During August 2015, I was "hanging out" at the local airport in Andrews, NC (Western Carolina Regional Airport). Actually, I was getting some overdue refresher training and a biannual flight review. My currency had a multi-year, multi-decade lapse. Thus, I felt a bit like a new student, especially around the Garmin GPS avionics. Yes, I did get the renewal and have resumed my monthly tithing to General Aviation. As you might expect, it did not take long to engage in hangar talk, especially about maintenance.

Conversations were classic GA. We talked about reciprocating engines, spectrographic oil analysis, density altitude, and annual inspections. We did not use words or phrases like hot section, blade clearance, or vibration monitoring. We were not very far into the conversation with Mark Edmonds, Assistant Airport Manager, commented that he had "seen me somewhere before." As soon as I mentioned IA Seminars and my FAA affiliation (my cover was blown) he recalled an IA Seminar held at Richard Childress Racing (RCR) facility in Lexington, NC. He was working for Compass Aviation, Shelby, NC at that time in 2012-13. We both recalled the event; I even had the picture below. Mark Edmonds and I proceeded with a few stories and laughs. I asked him what he recalled about the class. Most of the discussion was serious.

Recollection 1: The Cars

We both recalled the presence of some tricked-out RCR NASCAR wining cars. The NASCAR precision, expertise, and attention to safety mirrored the attitude, skill, and behavior of the AMT/IAs in the room. Many of IAs were responsible for the safe air transportation of crews, drivers, and families to racing events across the country. NASCR team owners respected all of their maintenance team, at and track and at the hangar. You could feel the pride in the IAs who worked not only for NASCAT Teams but also for Tobacco Companies, Farming Conglomerates, FBOs, and other operators of aircraft large and small. I have come to expect that when with a gathering of

IAs.

Recollection 2: The Human Factors Woman

At the time of that IA renewal I was relying on the newly produced series of human factors videos. There are 11 short human factors topical videos, still available on the FAA website www.humanfactorsinfo.gov. They are part of the Maintenance Human Factors Training System. The videos are discussions between Bill Johnson and Dagmar Midcap. Dagmar Midcap, then with an Atlanta Television now with NBC in San Diego, was very memorable in her portrayal of a human factors expert. He recalled that the short snippets were educational and interesting. They were short enough to avoid boredom. The videos are easy to watch.

By the way, can't help but chuckle at a recent Freedom of Information Act (FOIA) recently submitted to FAA. The requester wanted access to the Maintenance Human Factors Presentation System. We were delighted to give him the website address and mention that it is used as the gold standard by training organizations worldwide. The request makes me wonder if the next FOIA request will be for this popular Quarterly Newsletter.

Recollection 3: Fatigue

Edmonds remembered the materials about fatigue. He remembered the fatigue video, *Grounded*, which is also on the FAA website and YouTube, of course. He recalled that *Grounded* was "not like most FAA training films." He was correct about that since most training productions do not win 18 international industrial video awards.

For those who have not yet seen "Grounded," it is a fictional film about an airline maintenance manager plagued by issues at home and at work. Most of his issues were a result of fatigue. As the packaging says, "This video is about sleep but it is not a sleeper" (Go to website or

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Figure 1: Dr. Bill at a past IA Renewal in NASCAR Country

R E C O L L E C T I O N S O F I N S P E C T I O N A U T H O R I Z A T I O N R E N E W A L S E M I N A R S (C O N T ...)

Figure 2: The PEAR Model



YouTube and type “Grounded by FAA”).

Recollection 4: Failure to use technical documentation:

Mark Edmonds had some recollection that I talked about the topic of technical documentation. He acknowledged that it is an important and relevant topic but did not recall that I delivered the “magic bullet” solution to the challenge. I do not recall that I offered a sure solution to this known industry hazard. I am uncertain of the best solution. However, that topic is a challenge that we continue to work on at FAA and throughout the industry. (See AMT Magazine, August, September, October ’14).

Recollection 5: The PEAR Test

I recalled the PEAR (See Figure 2). Since it was at least 4 years from the IA Seminar, I did not apply the Johnson PEAR Test (See AMT Magazine, February ’15). Many readers and Johnson presentation attendees recall my theme that human factors can be categorized into four topics including: 1) the People (P) that do the work, 2) the Environment (E) in which they work, 3) the Actions (A) that they perform, and 4) the Resources (R) necessary to complete the job. I will assume that Mark Edmonds remembers PEAR. After all, I have the pleasure and safety comfort of flying a Cessna of which he participates in its airworthiness. Thank you, sir.

Recollection 6: FAASafety.gov

Mark Edmonds made Bill Johnson’s day when he told me that the human factors presentation made him go to www.faasafety.gov and take human factors training from the Maintenance Hangar. He also found other courses of value and has since taken those as well. When IA Renewal Seminars motivate IAs to look at additional safety materials then it is a “mission accomplished” moment.

Recollection 7: What Makes a Good IA Seminar?

We talked about why the Lexington, NC seminar was a success. I believe that it has a lot to do with the experience and motivation of the organizers. The RCR IA Seminar was organized by FAA Inspector Tim Quain, from the Greensboro, NC Flight Standards District Office. His past life as Maintenance Director for NASCAR helped secure an excellent facility. Following in the tradition of his FAA colleague, Inspector Phil Randall, he knew that an IA Seminar needed a great program and a great networking environment. With

the utmost respect, he assembled the NC and SC “Good ol’ boys (and girls) of Aviation Maintenance.” That kind of gathering redefines aviation safety networking. It is equivalent to the Aviation Safety Action Program InfoShare, frequented by the 121 crowd.

The most important result of a great IA Renewal Seminar is hard to measure. It is intangible. Of course, there is new information presented and familiar information refreshed. Great seminars give IAs information to pass along to others at work. Great seminars recharge the spirit, remind IAs of the importance of their authority, and reinforce the safe attitude critical to their job.

Mark Edmonds commented that “A high value IA renewal seminar is about the quality of the speakers.” “The audience is not too good about sitting in a chair all day”, he said. It is important to have a variety of topics that mix technical issues, business issues, and even topics like human factors. Mark liked the broad mix of speakers covering reciprocating engines including diesels, light jets, tires, rotary wing, and more. Mark felt that on-time starts and ends were important. Breaks and a nice lunch are critical to keep the male-dominated participants happy. We both remembered the excellent NC barbeque and sweet tea.

Recollection 8: From the teacher

Anyone who has participated in an IA Renewal class learns something. They may learn from the presenters or from one another, at the coffee breaks. As a presenter I have always learned a lot. The Q&A sessions give me an applied perspective on the human factors topics. IAs are the most experienced of the entire Aviation Maintenance Technician Workforce. The quality of their public and private comments reinforces my awareness of the collective wisdom of a room full of at every IA Holders.

This year I plan to participate in some of the IA Renewals that are sponsored by the AMT Society and AMT Magazine. The organizer is Ron Donner, AMT Editor. His Atlanta meeting, in January, is always a good one. As described above, Ron puts together excellent IA Seminars. He finds a great convenient venue, lines up excellent speakers, has great vendor displays and door prizes, and good food as well.

Recollection 9: Not Relevant but Memorable

When the seminar ended many departed at the same time. Since I came early my rented Hertz car was near the front door. I was upgraded to a very fancy and new Kia, as I recall. After being near the NASCARs all day we had a “need for speed” and the aroma of burning rubber. A few of the IAs asked me if I could cut parking lot donuts with the rental car. It was front wheel drive, not ideal for drifting. I did not try. As a US Government employee in a rental vehicle, that’s my true story and I am sticking to it!

NEWSLETTER Q & A FOR THIS ISSUE

Q. Many newsletter articles are also published by AMT Magazine. Why both places?

A. We do whatever we can to get these easy-to-read articles to as many people as possible. *AMT Magazine* prints 40,000 hardcopies and has a very popular website and daily aviation maintenance information push. By publishing the same or similar articles we ensure that we get to our FAA Mx HF mail list and Newsletter readers. We also ensure that the documents are stored in our FAA website files. Our authors are appreciative of the association with AMT Magazine.

Q. What do you do to avoid too many acronyms in your Newsletter?

A. Thank you (THX) for the question. For your information (FYI), we always try to use the full word or phrase and then include the acronym.

Q. I want more graphics and pictures in the Newsletter. I am an Aviation Maintenance Technician who is very accustomed to using the photos and diagrams in the many excellent technical manuals that I follow daily.

A. Are you serious about the pictures or about following the manuals? Dr. Bill wanted a foldout of him, in maintenance coveralls. We could not figure out a way to fold out the computer screen.

Q. Is your Newsletter an experiment in seeing how fast we can fall asleep?

A. If we can be sure that the Newsletter will promote mechanic sleep then we will make it even longer.

Q. As an AMT how can I become even more famous?

A. Submit a short article to this Newsletter. Include your picture.

WWW.HUMANFACTORSINFO.COM



The FAA maintenance human factors site was launched in the late nineties. Its popularity grew tremendously over the years. Google hits reached in the hundreds of thousands yearly by 2010. Being over a decade since launched, the website was overdue for a “Heavy Check” to improve its search engine and public accessibility. Fortunately, the “Heavy Check” was not an “out with the old and in with the new.” It continues to serve as an important dynamic repository of reports, conference proceedings, and other important MX HF materials. The new HF in Aviation MX website can be found at the original address hfskyway.faa.gov or under a number of alias addresses like humanfactor-sinfo.com, and mxfatigue.com. Take a look today and please pass this information to your colleagues.



KEEP THE E-MAILS COMING

We don't receive many E-Mails to our Newsletter Team. One hundred percent of the mail is positive to this point. Your e-mails are poignant and reflect an operational knowledge of maintenance human factors. Thank you for that. We would like to publish a reader letter every issue but we need more feedback to do that. We can publish your name or not. The author of the letter below should add "writer" to his aviation credentials. He asked us to withhold his name and the employer name.

Editor

23 January, 2015

To whom it may concern:

I have a real concern about safety of flight and everyone's personal safety on the job and at home if the Human Factors Training at our company is discontinued. After attending the 3 day initial Human Factors Training, I feel the HF Toolbox should be issued to every employee from the Director level down to the lowest person. This training is just not for mechanics and inspectors, these tools are directly applicable to everyone; Stores (BA 5390), Cleaners / Painters (Aeroperu 603), Ramp (Alaska 536), even HR and Payroll. Here is the truth: Anyone that works at an aviation company has either a very direct or indirect effect on flight safety.

As you know, we attend many classes each year, such as FOD prevention, Hazmat, General Safety, and Ethics, just to name a few. All of this information is very important in helping each of us conduct business and do our respective jobs, but also this information is very important in conducting our daily lives. I feel that Human Factors Training goes hand in hand with the other classes we receive.

Many posters have been placed on the walls of the hangers as well as in offices to remind us daily of the information we have learned in classes that is essential for conducting our jobs safely. It is well known that disuse is one of the main factors in forgetting important information. These posters serve as a reminder of this information, but I feel without the fundamental and initial Human Factors Training these posters are only "just another poster" without true meaning.

True examples of FOD and safety issues are leaving a hammer in the tail boom of a helicopter, causing a flight control jam, resulting in an emergency landing. A mechanic having their hair pulled out while standing too close to a turning tail rotor driveshaft or even a person texting while driving and running off the road. Human Factors Training deepens the meaning of how distraction and lack of awareness can cause these accidents to occur. The "Maintenance Dirty Dozen" posters, now hanging on the walls, are posters without true meaning if we don't have background information.

In my thirty eight years of aviation as an Mechanic, Instructor Pilot (IP), and Maintenance Test Pilot (MTP), I have attended many classes. I feel the training I received in Human Factors is an essential tool needed by everyone within our industry.

I realize the expense of training is great, but the necessity is equally as great with benefits in producing a safe aircraft and a safe environment for our personnel. As it was once said "If you think training is expensive, try ignorance" No one gets up in the morning and says to the mirror – "Today is the day!" - "Today I'll make my big mistake" – Today I'll forget to install a cotter key (Sundance). It happens. It happens to all of us; we forget to stop at stop signs, we loose our SA, walk in front of a turning engine and go home in a box. If we use the tools and Safety Nets we learned in Human Factors, we have a significant chance of arriving home to the people that need us.

It is apparent to me there are many people that share this sentiment. At the bottom of each Dirty Dozen poster there are over 40 large, well known, corporations that supports Human Factors training. I contacted one of these corporations and spoke with the senior personnel training manager. He told me that not only does his company teach initial training, they do recurrent training each year. They too feel the training is worth the cost.

In quoting the maintenance dirty dozen posters "The best safety net for all the dirty dozen is human factors training on how to avoid the error you never intend to make". As I said, this holds true for our jobs as well as our daily lives.

Thank you sincerely for your time and consideration.

Respectfully

If you have a story to tell that will help enhance aviation safety, please email michelle.bryant@faa.gov or bill-dr.johnson@faa.gov.
The editorial staff will help writers with layout and graphics.

If you would like to be added to our quarterly distribution list, please email gena.drechsler@faa.gov.