



# wats2023

ORLANDO

## Maintenance/Airworthiness Stream

### 18-20 APRIL 2023

ROSEN SHINGLE CREEK RESORT

ORLANDO, FLORIDA, USA



# Day 1 – Panel Discussions

**Maintenance Human Factors Evolution**

**Competency-Based Training & Assessment**

# Day 2 - Presentations

**Virtual Reality**

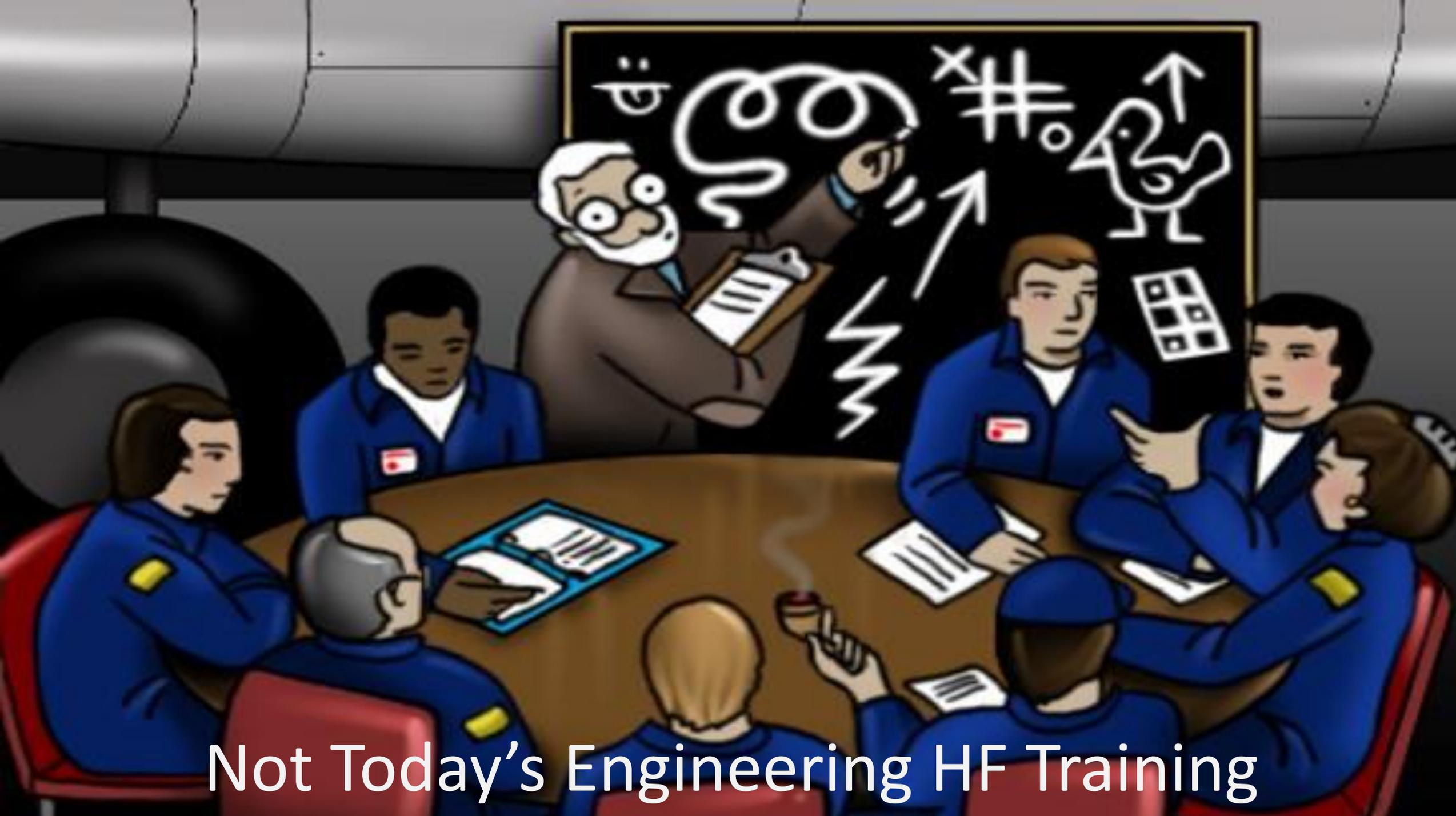
**Training Methods for Next Generations**

**Beyond Technical Training**



# Maintenance Human Factors Evolution – A Discussion





Not Today's Engineering HF Training

Occupation: FAA Airworthiness Safety Inspectors

Average Age: 50 years

Average Aviation Experience: 36 years



# Objectives 1 of 2



**Strengthen/renew your ability & spirit to communicate today's Mx HF fundamentals**

**Revisit today's HF-SMS challenges and discuss solutions**

**Identify characteristics of a good MX Safety Culture**

# Objectives

2 of 2

**Empower you to deliver modern HF presentations**

**Consider the human factors that make things go right/wrong**

**Add value to the HF programs that you oversee**

**Provide science-based application!**



Human Factors in Maintenance  
Transportation Safety Institute  
Oklahoma City, OK  
(January 2023)

# Overall Learning Goal for Engineering Human Factors

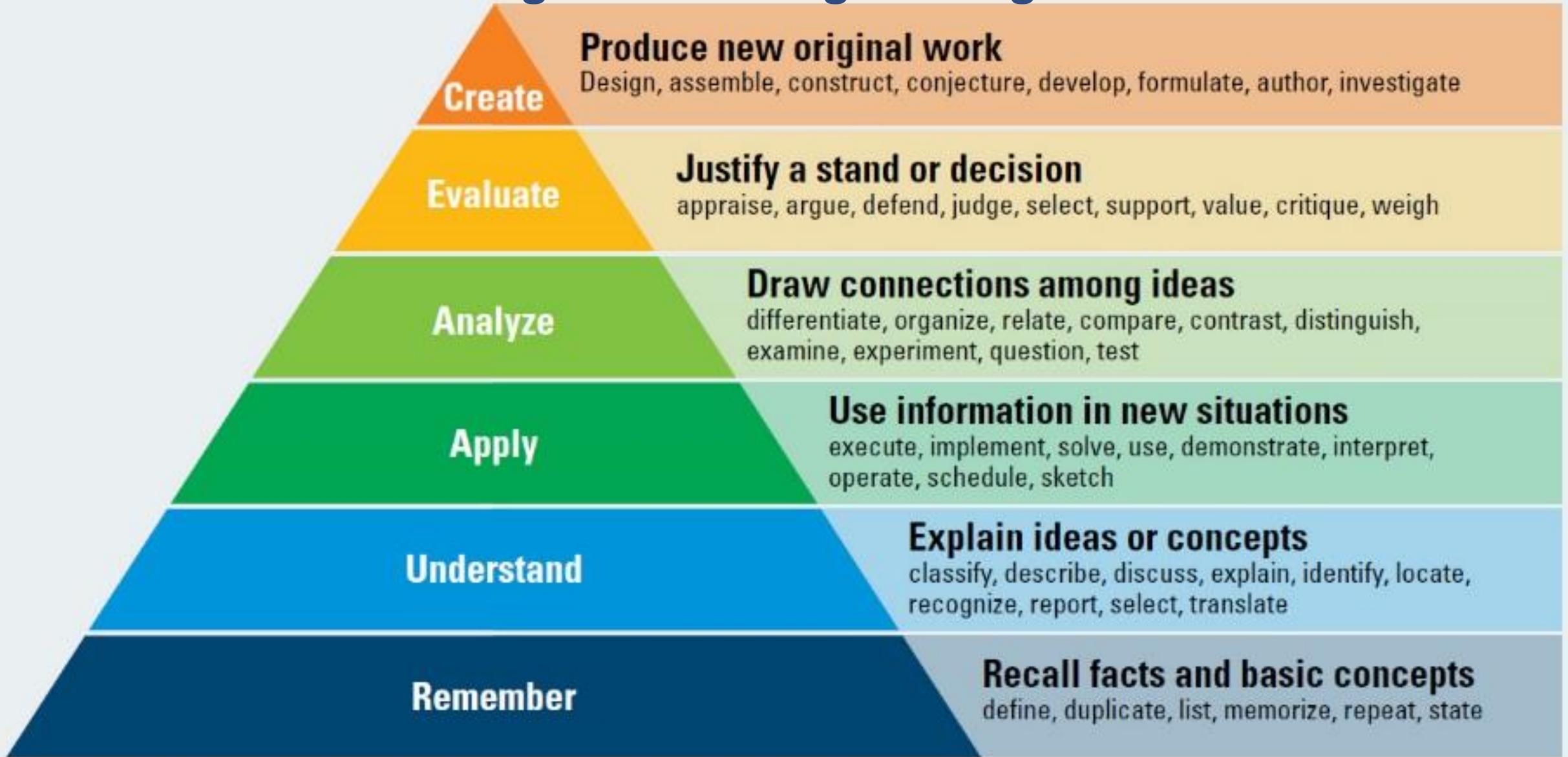


Figure 1: Bloom's (2001) revised taxonomy (Vanderbilt University Center for Teaching CC BY 2.0)

# Agenda (for FAA Airworthiness Inspectors)

## The Live HF Class

**Day 1 0800 – 1600 CST**

Introductions/Discussion **(Team Activity)**

Identifying HF Challenges **(Team Activity)**

PEAR to understand and recall HF

**Day 2 0800 – 1600 CST**

Generic HF Event Analysis **(Team Activity)**

Communication in Maintenance

Fatigue **(Team Activity)**

**Day 3 0800 – 1600 CST**

Procedural Compliance **(Team Activity)**

Safety Culture Assessment

Assessing Maintenance Safety Culture **(Team Activity)**

HF Investigations and Other Group Discussions **(Team Activity)**

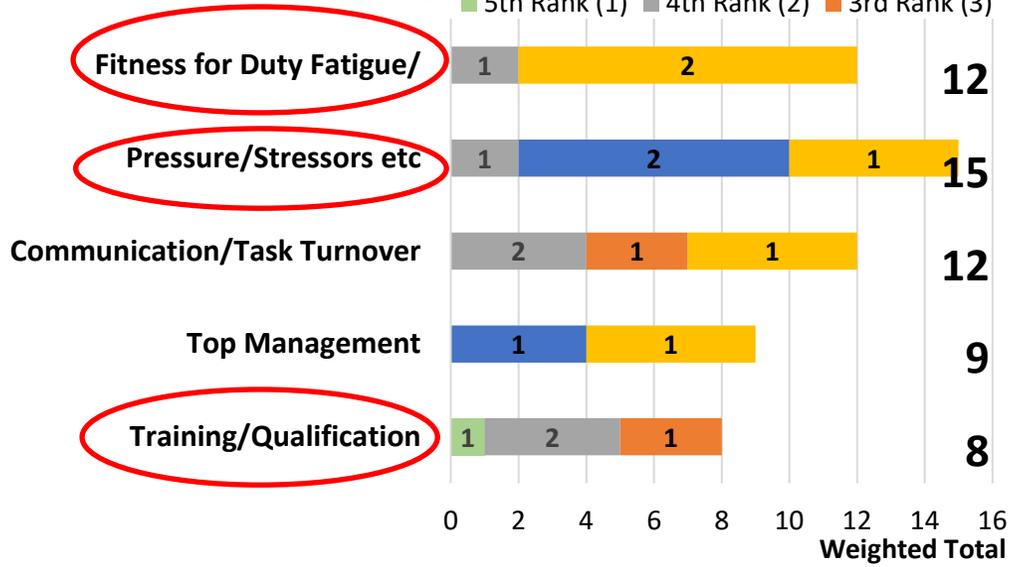


Over 75 Events Mentioned

# Identified Challenges from FAA ASI Classes

## Top 5 Human Factors 12.2020

5th Rank (1) 4th Rank (2) 3rd Rank (3)



## Top 5 Human Factors

5th Rank (1) 4th Rank (2) 3rd Rank (3) 2nd Rank (4) 1st Rank (5)

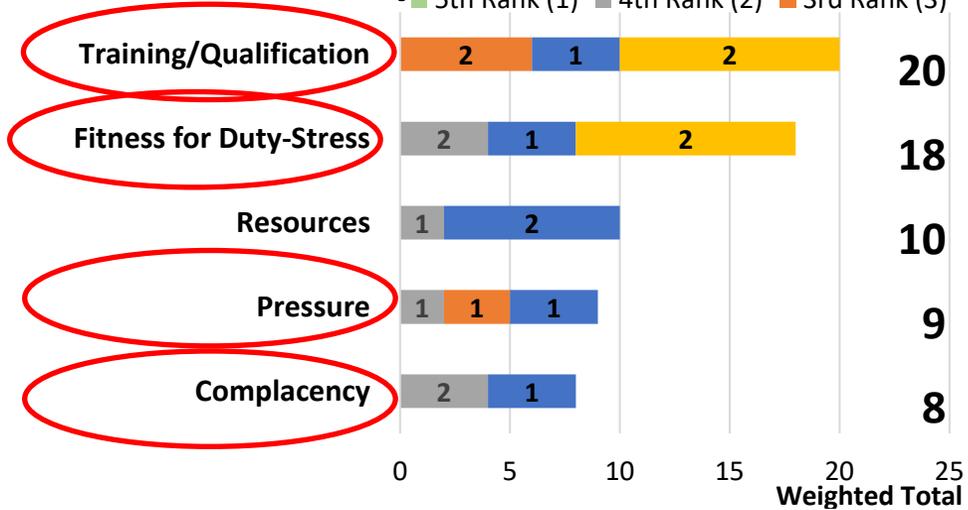
05.2021

Sum



## Top 5 Human Factors 2.2021

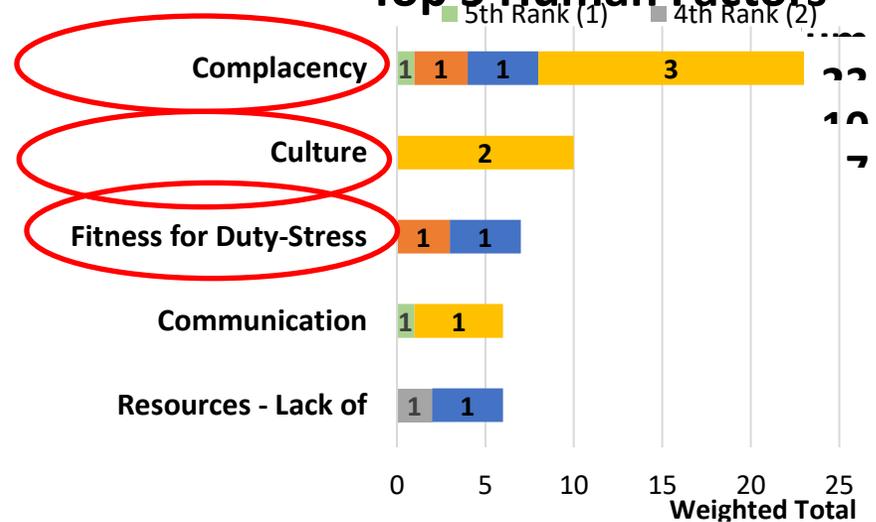
5th Rank (1) 4th Rank (2) 3rd Rank (3)



## Top 5 Human Factors

5th Rank (1) 4th Rank (2)

07.2021



# Top 5 Human Factors from April 22, 2022

From 5 Classes 2020-2022

5th Rank (1) 4th Rank (2) 3rd Rank (3) 2nd Rank (4) 1st Rank (5)

Fitness for Duty-Stress



Training/Qualification



Communication



Complacency



Distraction



0 2 4 6 8 10 12 14 16

**Fitness for Duty**

**Training/Quals**

**Complacency**

**Communication**

Others

**Culture**

**Management/leadership**

**Pressure**

**Lack of Resources**

# 2014 Top 10 Challenges - Compared

North America	EU/Other
Culture/Leadership	Culture/Leadership
Tech Pubs	Tech Pubs
Fatigue	Oversight & Regs
HF Training	Fatigue
Pressure/Stress	ROI
ROI	Voluntary Reporting
Voluntary Reporting	HF Data Analysis
New Workforce Issues	Pressure/Stress
Oversight & Regs	HF Training
Professionalism	Situation Awareness

80% Overlap

# An International Perspective on Human Factors Challenges

A 2014 FAA survey indicates the top human factors challenges for the aircraft maintenance industry in the European Union and the United States are culture/leadership, using technical publications, and worker fatigue

By Dr. Bill Johnson

The author revisits the top maintenance human factors challenges comparing a 2010 ranking with one in 2014. U.S. and international aviation maintenance human factors specialists indicate that the major issues have not changed substantially. The No. 1 challenge, not mentioned in past studies, was a combination of two factors that combined to say that industry leadership is not demonstrating sufficient attention to the corporate safety culture.

## The 2010 international rankings

In 2010, the FAA assembled a panel of maintenance human factors (Mx HF) subject matter experts to identify and rank the top human factors challenges. Participants included representatives from airlines, MROs, manufacturers, and government. The European Human Factors Advisory Group did the same drill in Europe. There was a 60 percent overlap in the top five challenges as shown in Table 1. The match-

ing challenges were worker fatigue, safety culture, and measuring impact of maintenance HF programs. This ranking reinforces the fact that humans are humans and have the same challenges no matter where they are working. One significant difference is that Europeans have

a selected sample of the maintenance industry, most of whom were involved in the 2010 ranking activity. Twenty-five percent were from Europe, the rest from the United States. Seventy-five percent of the Europeans and 60 percent of the U.S. sample responded within the allot-

**The challenges are complex and ingrained in aviation maintenance. The challenges are part of the culture and “culture” takes a long time to build and a long time to change.**

the challenge of 28 national regulatory authorities and many others, including the United States, with whom they have bilateral agreements (meaning that local Aviation Safety Inspectors enforce the EASA regulations).

## The 2014 international rankings

A single web-based questionnaire provided the data in 2014. It was sent to

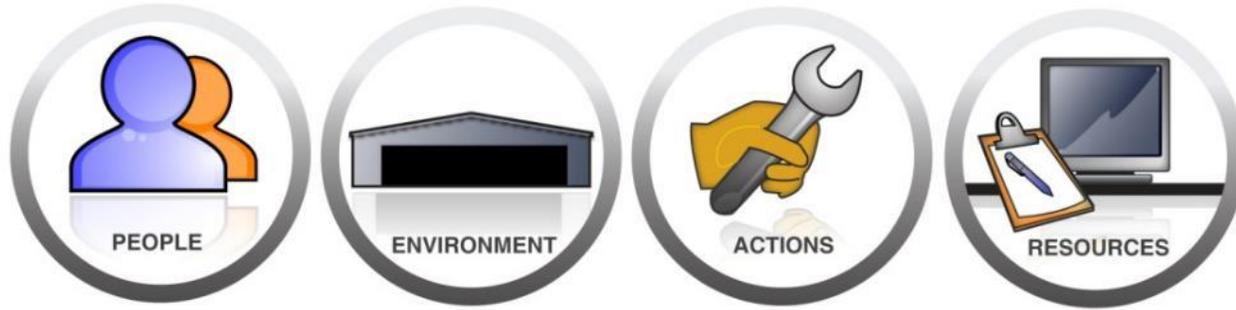
ted time frame. The end result was that 75 percent of the responses were from the States. The U.S. has a larger aviation industry so this representation is acceptable. The questionnaire was open-ended. The respondents did not pick from a list but merely wrote their own short description of the challenges.

Sixty-three percent (51 responses) maintenance human factors questionnaires were returned. That is a very respectable response rate to an open-ended survey with a short response window. Some respondents later told us that they queried their work force and managers before responding. We are certain that this sample size and number of responses yielded valid and reliable information.

The top five challenges represented 67 percent of the combined EU and U.S. responses. Table 2 shows the list of the top challenges that combines all respon-

Table 1: Top 5 EU-US Maintenance Human Factors Challenges in 2010

North America-US	Europe
Using Technical Publications	Measuring Impact of Mx HF Programs
Worker Fatigue	Expanding Mx HF across all European Countries
Safety Culture	Worker Fatigue
Voluntary Reporting	Safety Culture
Measuring Impact of HF Programs	Standardizing Regulatory Oversight



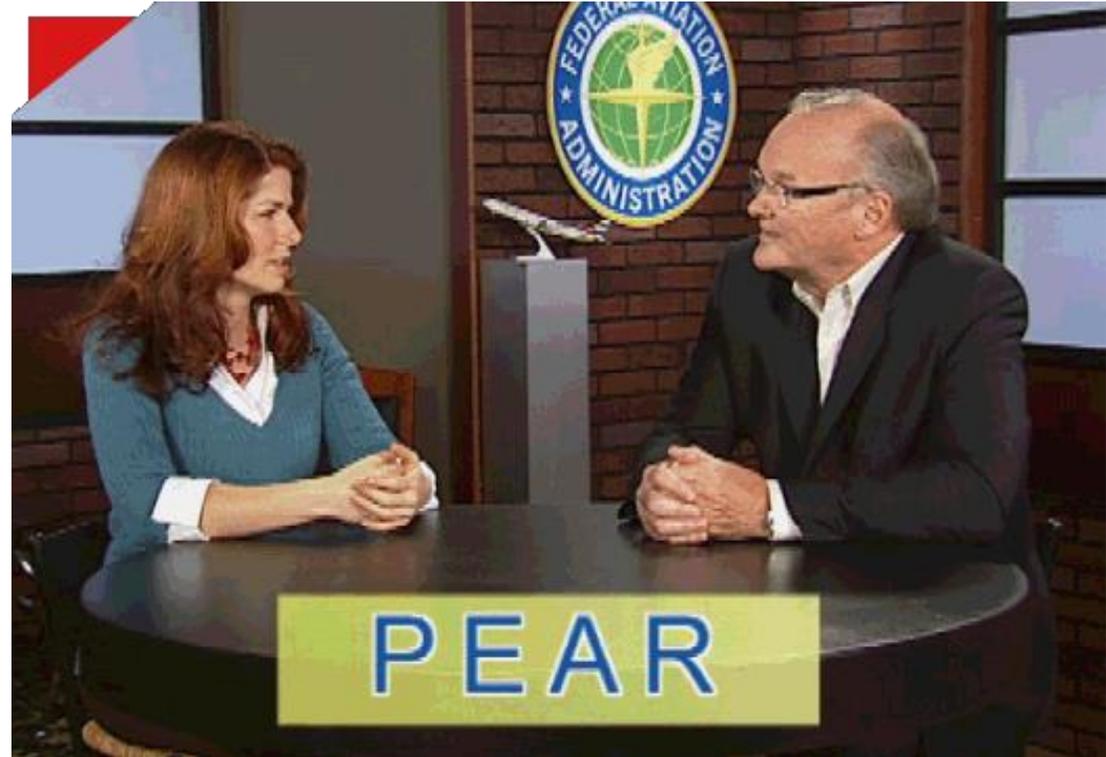
**People who perform the job**

**Environment for work - Organizational and physical**

**Actions (tasks) performed as part of the job**

**Resources like equipment, tools, procedures, and more**

# A Way to Recall Human Factors



**Go to [www.humanfactorsinfo.com](http://www.humanfactorsinfo.com)  
Maintenance Human Factors Presentation System**



# Human Factors in Aviation Maintenance

## What We Do

The overall goal of Aviation Maintenance human factors research is to identify and optimize the factors that affect human performance in maintenance and inspection.

Our research areas include:

- Qualification
- Training
- Motivation
- Worker safety
- Health
- Return on investment
- Professionalism
- Human capabilities and limitations

**See [www.humanfactorsinfo.com](http://www.humanfactorsinfo.com)**

Human Factors in Aviation Maintenance

Library and Current Research

Videos

Fatigue Risk Management >

Line Operations Safety Assessments (LOSA) >

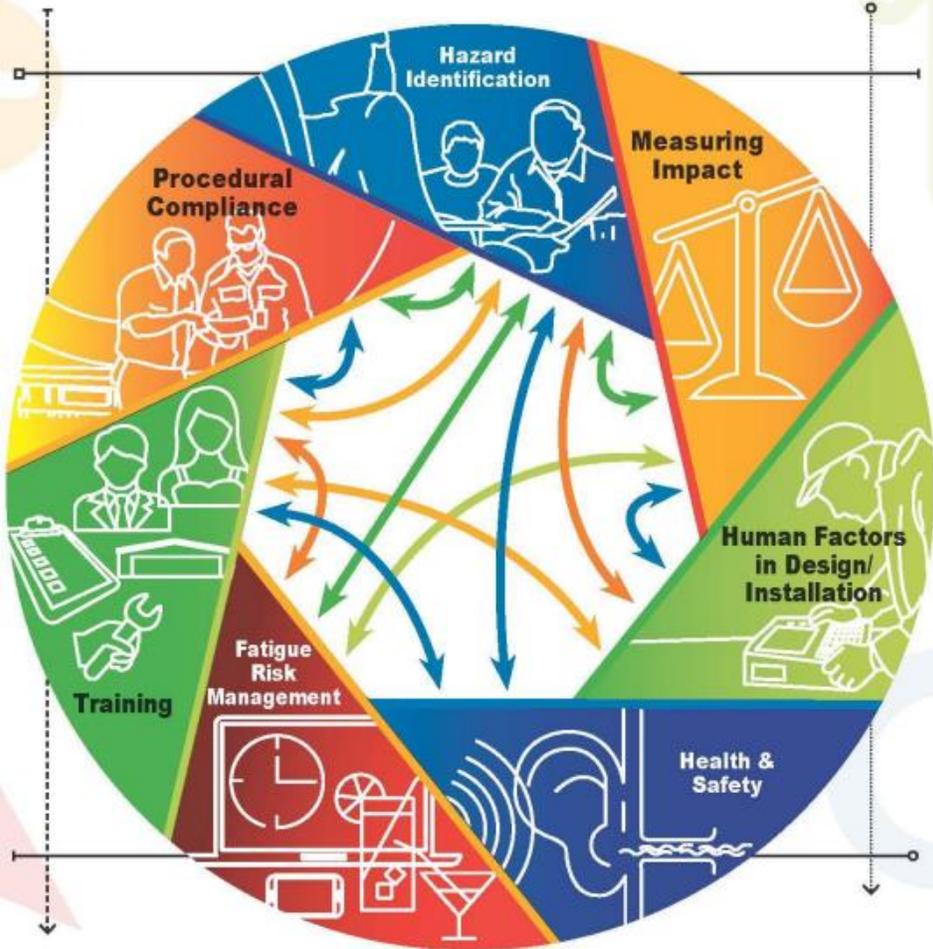
Training and Tools



September 2014

# Operator's Manual

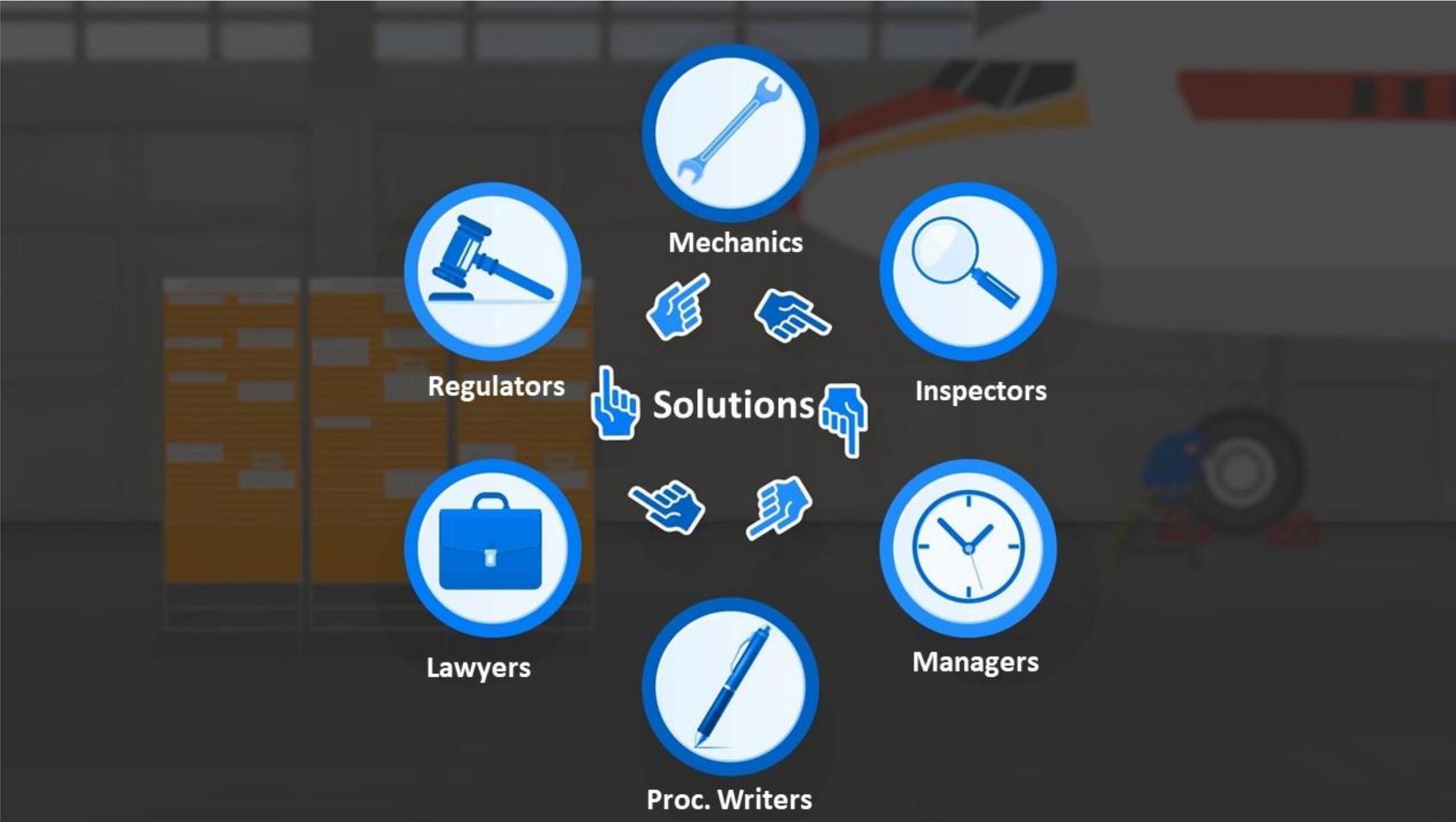
## Human Factors in Aviation Maintenance



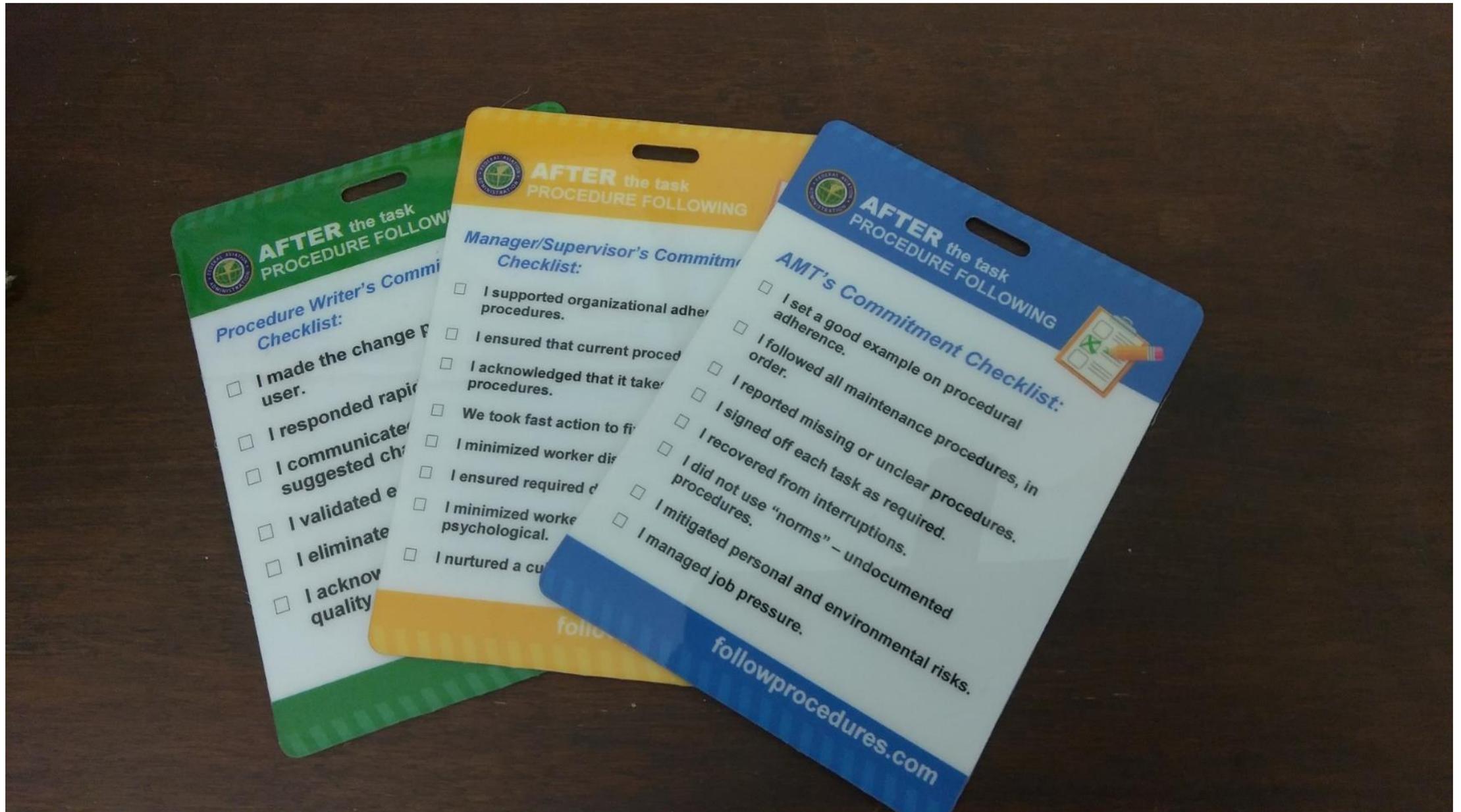
See [www.humanfactorsinfo.com](http://www.humanfactorsinfo.com)



# On-line Procedural Compliance Attitude Appreciation



# Cards for Mechanics, Managers, and Procedure Writers



# Summary

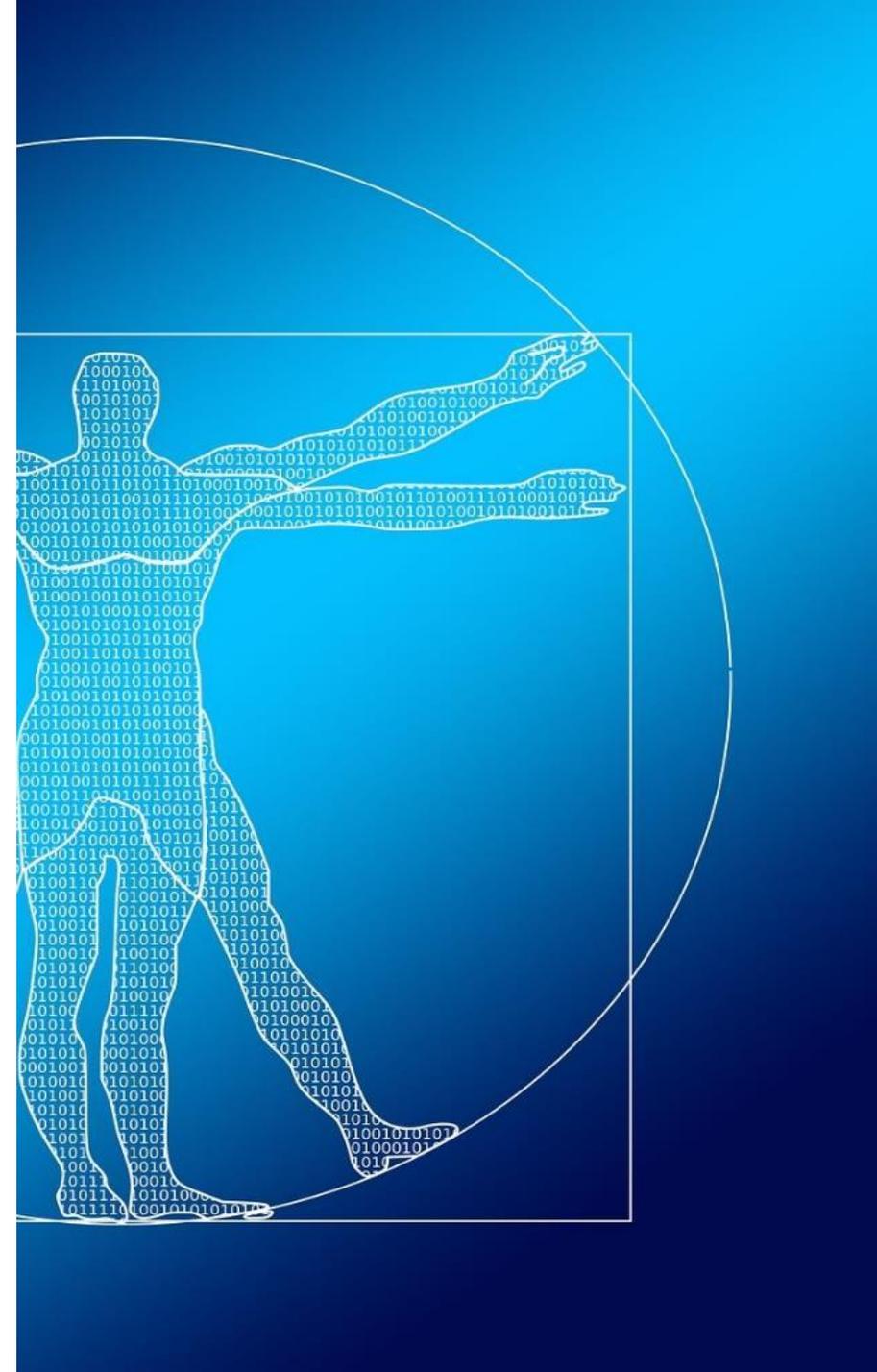
Include relevant Mx HF topics

Address safety culture mindfulness

Mental & physical fitness for duty

Resilience

**“Keep it Real”**





*Thank you,  
Bill Johnson*

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**drbillj.com**  
human-centered safety solutions

# Questions – Comments - Discussion



# Hazard Identification Approaches



Maintenance Event Decision Aid (MEDA)  
Ramp Event Decision Aid (REDA)

Aviation Safety Action Program (ASAP)  
Safety, Quality Assurance Audit

Maintenance Line Operations Safety Assessment (M-LOSA)  
Ramp LOSA

