Human Factors For Aviation Distributors

ASA 2016 ANNUAL CONFERENCE
LAS VEGAS, NV

G. RINGGER CONSULTING, INC.

Celebrating 38+ years in the aerospace/aviation industry!

Providing Engineering, Quality System, Training, Airworthiness, and Business Development Services to the aviation industry

office 954-655-6509
fax 954-680-5326
George.Ringger@gmail.com
www.georgeringger.com

G. Ringger Consulting, Inc.

Business Consulting Services

Business Services	Engineering	Quality Systems	Airworthiness
• Crisis Mitigation • Expert Testimony • Corporate training • Root Cause Analysis • Corrective Action • Internal audits • Supplier audits • FOD Awareness	• FAA-DER • Structural Design • Analysis • Repair & Alteration • FAA-PMAs • Interior Mods • Flammability Test Plans	• FAA- AC0056 • ISO 9001 • AS-9100 • AS9110 • AS9120 • ASA-100 • CASE 3A • FAR-145 • FAA-PMA • FAA-TSOA	• FAA-DAR Mfg. • FAA-DAR Maint. • FAA Airworthiness Approvals • FAA Part Conformity • FAA installation Conformity

G. Ringger Consulting, Inc.

Corporate Training

Business Development	Quality Systems	Airworthiness
• Better Decision Making • How to Gain a Competitive Edge • Human Factors • Making the numbers in a tough economy • Management Tools for Decision Makers • Risk Management • SMART² Goal Setting • Supplier Performance • Supply-Chain Auditing • SWOT Analysis for success	• AC 0056 • AS-9120 /AS9110/AS9100 • ASA-100 / CASE 3A • ISO 9001 • FAA - Repair Station • FAA-PMA • Corrective Action • FOD Awareness & Prevention • Internal Auditing • Preventive Action • Process vs Procedure Audits • Receiving Inspection • Root Cause Analysis • QA Manager Training	• FAA-PMA Systems - *SAE Approved* • Accident Related Aircraft Parts • FAA SUPs • Counterfeit Parts • Documentation & Acceptable Traceability • FAA-CFRs • Human Factors for Repair Stations – *FAA IA Approved* • OEM versus PAH parts • Safety Management Systems (SMS) - *FAA IA Approved* • User-Centric Design

Human Factors - Introduction

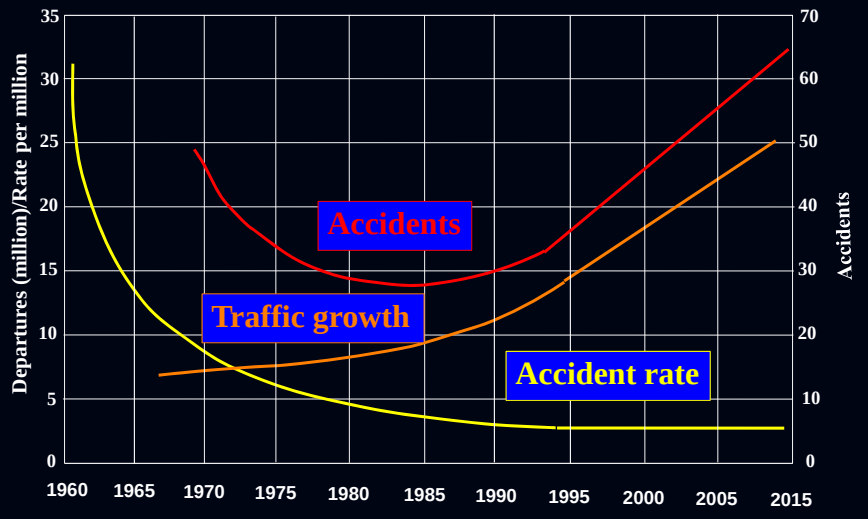
Block #1

Human Factors Awareness – Why is it Important?

HF addresses many issues that contribute to aviation events.

Reduces costs associated with human performance issues.

Commercial Aircraft Accidents



9120:2016 and Human Factors

7. Support

7.1 Resources
- 7.1.1 General
- **7.1.2 People**
- **7.1.3 Infrastructure**
- **7.1.4 Environment for the operation of processes**
- 7.1.5 Monitoring and measuring resources
- 7.1.6 Organizational knowledge

7.2 Competence

7.3 Awareness

7.4 Communication

7.5 Documented information
- 7.5.1 General
- 7.5.2 Creating and updating
- 7.5.3 Control of documented Information

7.1.2 People

The organization shall determine and provide the persons necessary for the effective implementation of its quality management system and for the operation and control of its processes.

7.1.3 Infrastructure

The organization shall determine, provide, and maintain the infrastructure necessary for the operation of its processes and to achieve conformity of products and services.

NOTE: Infrastructure can include:

a. buildings and associated utilities;
b. equipment, including hardware and software;
c. Transportation resources;
d. Information and communication technology.

7.1.4 Environment for the Operation of Processes

The organization shall determine, provide, and maintain the environment necessary for the operation of its processes and to achieve conformity of products and services.

NOTE: A suitable environment can be a combination of human and physical factors, such as:

- social (e.g.,non-discriminatory, calm ,non-confrontational);
- psychological(e.g.,stress-reducing, burnout prevention, emotionally protective);
- physical (e.g., temperature, heat, humidity, light, airflow, hygiene, noise).

7.1.6 Organizational Knowledge

The organization shall determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services.

This knowledge shall be maintained and be made available to the extent necessary.

When addressing changing needs and trends, the organization shall consider its current knowledge and determine how to acquire or access any necessary additional knowledge and required updates.

7.3 Awareness

The organization shall ensure that persons doing work under the organization's control are aware of:

a. The quality policy;

b. Relevant quality objectives;

c. their contribution to the effectiveness of the quality management system, including the benefits of improved performance;

d. The implications of not conforming with the quality management system requirements***;***

7.3 Awareness

e. Relevant quality management system documented information and changes thereto;

f. their contribution to product or service conformity;

g. Their contribution to product safety;

h. the importance of ethical behavior.

3.6 Product Safety:

The state in which a product is able to perform to its designed or intended purpose without causing unacceptable risk of harm to persons or damage to property.

7.4 Communication

The organization shall determine the internal and external communications relevant to the quality management system, including:

On what it will communicate;

When to communicate;

With whom to communicate;

How to communicate;

Who communicates.

8.5.1 and 10.2.1

8.5.1 Control of Production and Service Provision the implementation of actions to prevent human error;

10.2.1 When a nonconformity occurs, including any arising from complaints, the organization shall:…

b. Evaluate the need for action to eliminate the cause(s) of the nonconformity, in order that it does not recur or occur elsewhere, by:

1. Reviewing and analyzing the nonconformity;

2. Determining the causes of the nonconformity ,including those related to human factors;

Defining Human Factors

Block #2

HUMAN FACTORS

To paraphrase the FAA's definition,…

Human Factors is the application of knowledge related to how a person sees, hears, thinks, and physically functions in relation to the tools, products, and systems they maintain that are conducive to human task performance. (FAA Order 9550.8).

Identifies intrinsic weaknesses in your organization.

Human Factors – The Goal

"Maximize human performance

and

Minimize errors"

Human Factors Models

- SHELL MODEL
- Heinrich's Domino Theory
- Reason's Swiss Cheese Model
- MEDA Error Model

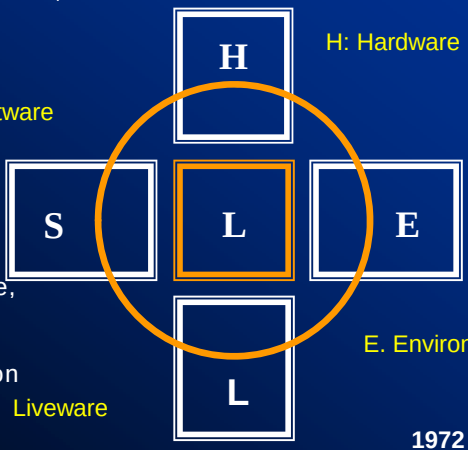
SHELL MODEL

Manuals, Procedures, WI's, Computer programs

S : Software

Tools, equipment, vehicles

H: Hardware



Health, knowledge, attitude, stress, culture, Teamwork, leadership, communication

L: Liveware

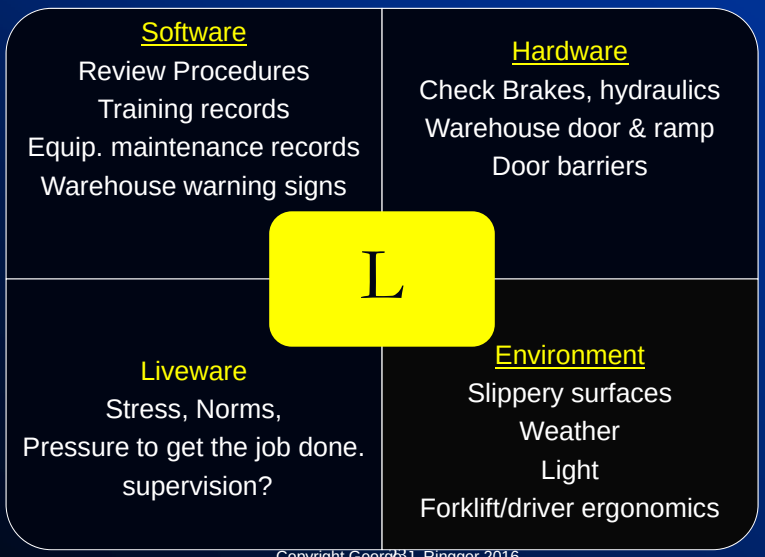
E. Environment

Temp, humidity, Noise, light

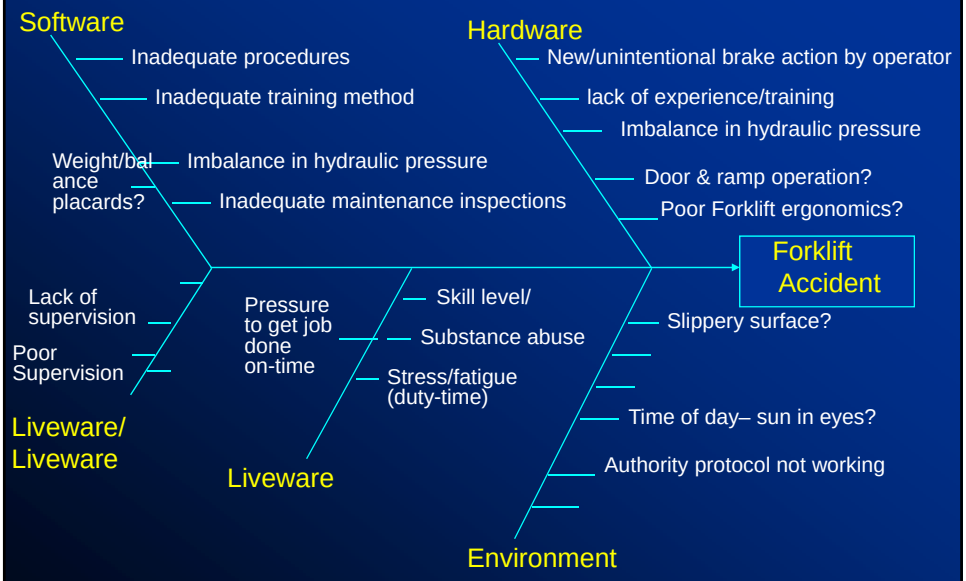
1972 Elwyn Edward
1987 Hawkins (modified)

Human Error

SHELL - Forklift Example



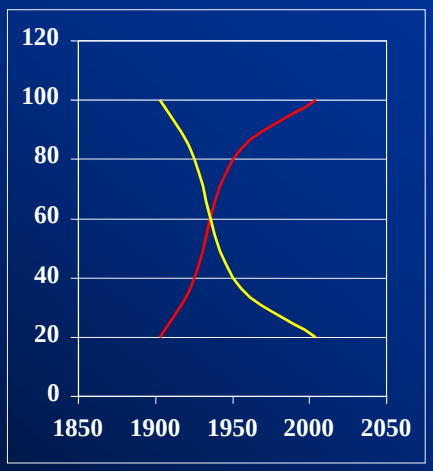
7a. Cause and Effect Diagram Example



Machine/Human Causes for Accidents.

- Human error defined by red line.
- Machine error defined by yellow line.

Machines get better…we stay the same!



Human Errors

- Human errors can be *minimized*, not eliminated.
- Errors must be:
  - *detected* and *corrected*, or
  - at least *managed*.

Human Error Estimates

System	% Due to Human Error
Airlines	70-80%
Air Traffic Control	
Ships	
Process Control	70%
Nuclear Power	70%
Road Transportation	85%

Here are some common errors that detected during inspection

- 8130-3's not signed
- Missing material cert.
- Serialized unit listed as 'NSN' on material cert.
- Missing PPW

- Part damaged from stock
- Incorrect QTY shipped
- No mfg pkg/no part markings

Here are some common errors that occur with Contracts

- Customer's RFQ not reviewed for risks
- Sales contract not signed
- Contract revisions not documented
- Over-commitment to customer
- Failure to specify shipping methods
- Failure to flow down cust. requirements to Purchasing & QC

Human Error
&
Top-Down vs Bottom-Up Recognition

Block # 6

(Ref: Evin Stump P.E.SCEA Conference 2002

Learning and Top-Down vs Bottom-Up Recognition

TOP-DOWN

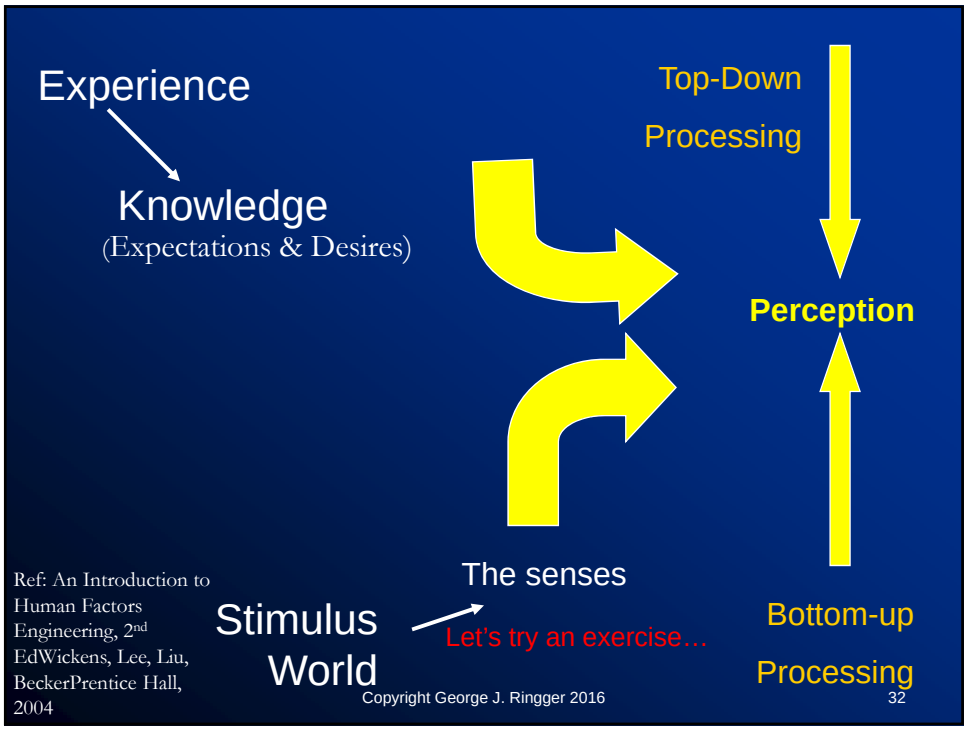
- Begins with a pre-existing knowledge of expectation (*schemata*)
- Leads you to search for information to satisfy pre-existing knowledge.

BOTTOM-UP

- Begins with isolated facts
- As isolated facts are gathered, they *eventually* describe a *schemata*.

Schemata: An understanding based on experience & knowledge

Ref: Computers, Graphics, & Learning
Copyright 2000 Lloyd P. Rieber, Chapter 4
Psychological Foundations of Instructional Graphics



Ref: An Introduction to Human Factors Engineering, 2nd EdWickens, Lee, Liu, BeckerPrentice Hall, 2004

Learning & Top Down vs Bottom Up Recognition Exercise #1

Try to recognize the object…

Learning & Top Down vs Bottom Up Recognition Exercise #1

Try to recognize the object…

Learning & Top Down vs Bottom Up Recognition Exercise #1

How quickly do You recognize it now?…

Exercise #2

As the following 8 numbers appear on the screen to the right,

add them ***in you head*** and jot down the sum.

What answer did you get?

1000
40
1000
30
1000
20
1000
10

Why do Busses come in Threes? The Hidden Mathematics of Everyday Life, Eastway, Wyndham Barnes & Nobel, Inc. John Whiley & Sons, Inc.1998

Exercise #2

Most adults make the same mistake.

After reaching 4,090 the brain anticipates the answer will be rounded up. It assumes from previous experience that the rounded number will be an easy one – 5,000.

1000
40
1000
30
1000
20
1000
10

How does Top-Down apply to aviation distributors?

- Skipping inspection steps because parts were purchased from OEM's or PAH's.
- "Reading in" contract requirements that simply just aren't there.
- Glancing through documents and drawing a premature conclusion.
- Assuming the part you're selling is an aircraft part.

Just checking! Can you still spot it?

How quickly do You recognize it now?…

Just checking… Exercise #2

As the following 8 numbers appear on the screen to the right,

add them *in you head* and jot down the sum.

What answer did you get?

5,000?

4,100

2000
40
1000
30
1000
20
1000
10
5,100

Why do Busses come in Threes? The Hidden Mathematics of Everyday Life, Eastway, Wyndham Barnes & Nobel, Inc. John Whiley & Sons, Inc.1998

Dupont's "Dirty Dozen" of Human Factors

The Civilian Airline Industry has unofficially adopted "Dupont's Dirty Dozen" to categorize human factor errors. Dr. Dupont has worked for Transport Canada since 1993 and was previously with the Canadian Air Safety Board. (Dupont, 1997)

Block # 7

HF "Dirty Dozen"

1. Complacency
2. Distraction
3. Pressure
4. Lack of Resources
5. Lack of Knowledge
6. Lack of Awareness
7. Stress
8. Fatigue
9. Lack of Communication
10. Lack of Assertiveness
11. Lack of Teamwork
12. Norms

1)COMPLACENCY

Overconfidence from repeated experience on a specific task.

"I've checked them 1,000 times and never found anything wrong!"

Block # 7a

COMPLACENCY

"I've done this a thousand times!

I don't need to wear eye protection."

and the safety nets are ....

- Expect to find errors
- Always follow the checklist or work cards
- Don't sign it if you didn't do it
- Never work from memory
- Be sure to vary your routine periodically
- Be aware of the dangers of complacency.

2)DISTRACTION

Events/conditions that interrupt one's ability to focus on a specific task.

Block # 7b

The safety nets ...

- Use a detailed check list
- Always finish the job
- Double inspect the work
- Record or tag uncompleted work
- When you go back to the job, always go back three (3) steps.

Beware of Too Much Multitasking

3) PRESSURE

External or internal forces demanding high-level job performance.

Can be real or perceived.
(e.g. deadlines)

Block # 7c

The safety nets . . .

- **STOP!** assess the situation.
- **LOOK!** at the situation rationally.
  - Can I safely do the job on time?
  - Have I voiced my concerns clearly?
  - What is the worst thing that can happen to me?
- **LISTEN!** to your rational mind!
  - Has this happened before?
- **ACT!** Speak up, ask for help or time.

4) RESOURCES

Lack of people, equipment, time, documentation, parts, etc. to complete a task.

Block # 7d

Lack of Resources Safety Nets

"We don't have the right HAZMAT container, so I guess we'd better wrap it in plastic just to be safe."

- Check all areas at the beginning of all tasks
- Order & stock parts before they're required
- Know your sources, arrange for pooling &/or loaning
- Maintain work stations to the highest Std.

Lack of Resources includes a safe and efficient work place

5) LACK OF KNOWLEDGE

Failure to have training, information, &/or ability to conduct a task.

Block # 7e

Lack of knowledge … Lack of Safety Nets

- **Ask when you don't know**
- **Obtain training on type, and model**
- **Get supervised OJT**
- **Use current manuals,**
  (old data doesn't cut it!)

6) LACK OF AWARENESS

Failure to see a condition, understand what it is, and predict the possible results.

Block # 7f

AWARENESS SAFETY NETS

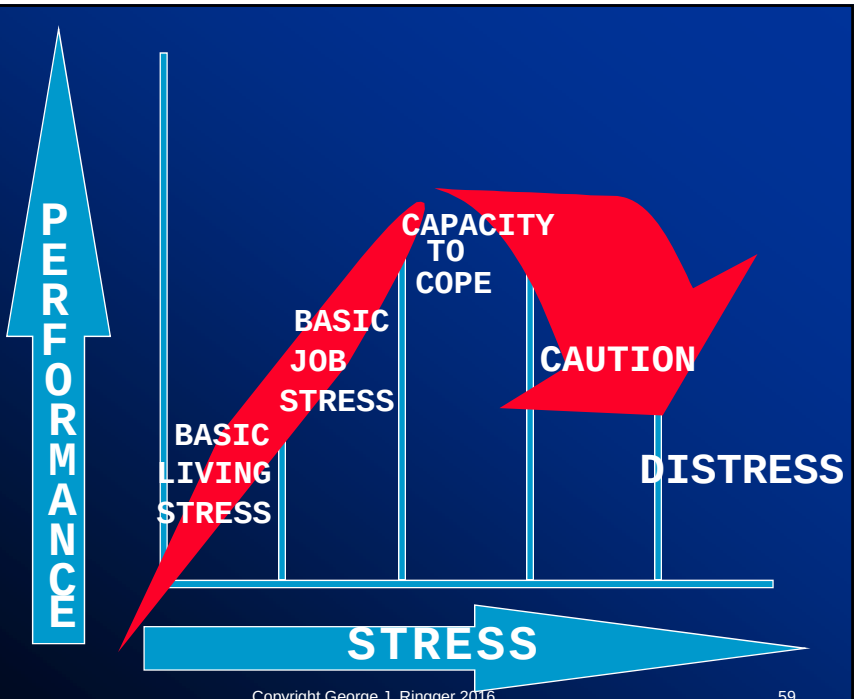
- **THINK ...** what could occur in the event of an accident
- **CHECK ...** will your work conflict with a previous or existing task, repair, a/o modification
- **ASK ...** see if anyone else can spot a problem you overlooked.

7) STRESS

Physical or mental condition resulting from external forces.

It may affect health as well as quality of work performed.

Block # 7g

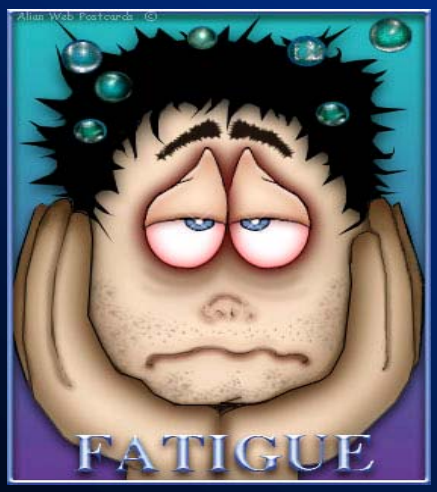


HOW TO MANAGE STRESS

If you don't manage stress, it will manage YOU!

- STOP… burning up emotional energy
- LOOK… rationally at the problem
- LISTEN… to your rational *not* emotional mind
- ACT… once you have a plan!

8) FATIGUE



Physical or mental exhaustion threatening work performance.

You want to…

- Have others check your work.
- Watch for symptoms…

Block # 7h

WHAT IS FATIGUE ?

- Is the body's normal reaction to a physical or mental stress of a prolonged duration.
- There are TWO types of fatigue:
  - ACUTE ... short duration, cured with good nights sleep.
  - CHRONIC ... occurs over a period long period of time, long recovery!

CAUSES OF FATIGUE

- Long hours of labor (any type).
- Stress of high intensity.
- Large temperature variations.
- Noise ... above 80 db for long durations.
- Vibration for long periods and sufficient intensity.
- STRONG lighting.

SYMPTOMS OF FATIGUE

- Enhanced stimulus required in order to respond
- Attention is reduced
- Memory is diminished
- Mood becomes withdrawn
- Circadian Rhythms are disturbed (time of day effect).

9) LACK OF COMMUNICATION

Failure to transmit, receive, or provide sufficient feedback in order to complete a task.

Block # 7i

How do you fit in this conversation?

Customer or Supervisor

You

THE SECRET TO GOOD COMMUNICATION…

You have
2 Ears
2 Eyes
1 Mouth
Use them in that order!

Are these instructions confusing to you?…

"Full trace required…"

or

"I need full trace!"

"FAA 8130-3 required with part…"

"Turn-times to be less than 25 days."

For Procedures and contracts

Use clear, precise writing style - Use simple, common words…

Instead of	Try
Approximately	About
Attempt	Try
Cognizant	Aware
Utilize	Use
Erroneous	Wrong
In order to	To
In the event of	If
On the grounds that	Because
Disseminate	Distribute

10) LACK OF ASSERTIVENESS

Failure to speak up or otherwise document concerns about instructions/orders or actions of others.

Block # 7j

What is it anyhow ?

- "Being disposed to or characterized by bold or confident assertions"
- Record all the work you do, but only sign for that which is serviceable
- Refuse to compromise your standards.

11) LACK OF TEAMWORK

Failure to work together to complete a shared goal.

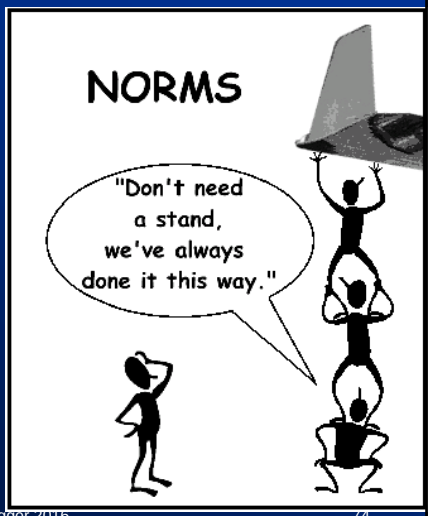
Block # 7k

Teamwork Safety Nets ....

- Always discuss and plan the WHO, WHAT, WHEN, WHERE, and HOW the job to be done.
- Make sure everyone understands and agrees!

12) NORMS

Standard practices, usually undocumented, adopted by an organization or group.



Block # 7L

So, what are NORMS?

- It's a way of doing business that's not approved but it's been done locally for so long…
  it's now a NORM.
- ALWAYS work I/A/W the Process or have the process changed.
- Be aware that "NORMS" don't make it right !

Some Ineffective Norms We Have Seen

- Memorizing tasks instead of using manuals/procedures/work instructions
- Troubleshooting through "finger-pointing", instead of using Root Cause Investigation
- Deviating from documented procedures
- Accepting customer POs without understanding their requirements.
- Providing minimum information in shift handover logs.

Starting Your HF Program

A 6-Step Approach

Block # 8

- **Step 1:** Conduct HF training with your employees. **(**Topics based on ICAO Annex III; EASA CAPS 716 & EASA GM 145.A.30 (e))
- **Step 2: Review company's operational processes and procedures from a HF perspective. (remember the "SHELL" Model)**
- **Step 3: Identify risks and potential issues related to the employee/work task interface.**

- **Step 4:** **Present to Top Management HF Projects to be addressed.**
- **Step 5:** **Document HF projects accomplished.**
  - (for ISO 9001 & AS9120 companies, this counts as either PA or CI)
- **Step 6:** **Implement your HF Program.**

Questions?

Thanks for attending!

and remember…

"To stop learning…. is to stop living."

George J. Ringger

G. RINGGER CONSULTING, INC.

Celebrating 38+ years in the aerospace/aviation industry!

Providing Engineering, Quality System, Training, Airworthiness, and Business Development Services to the aviation industry

office 954-655-6509
fax 954-680-5326
George.Ringger@gmail.com
www.georgeringger.com