Human Factors For Aviation Distributors

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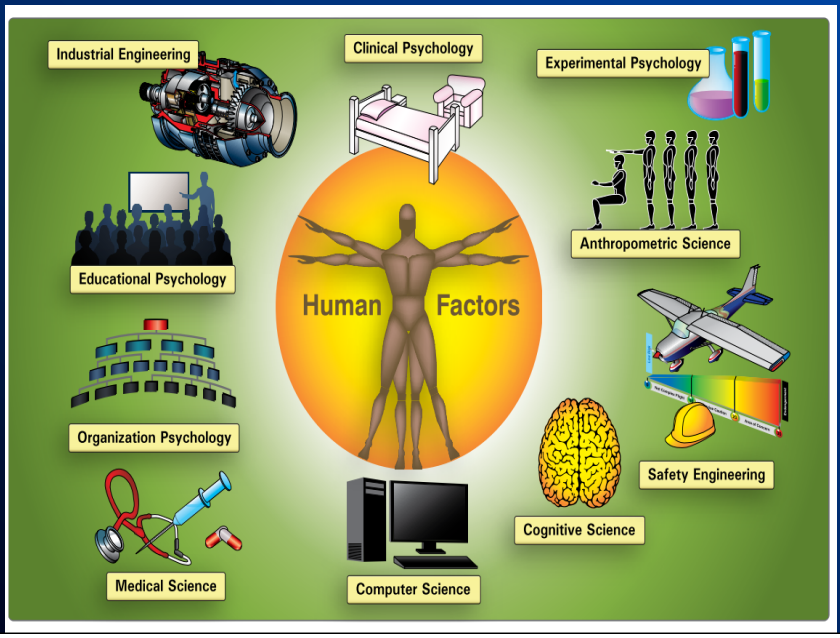
Elements of Human Factors



Human Factors – The Goal

Maximize human performance

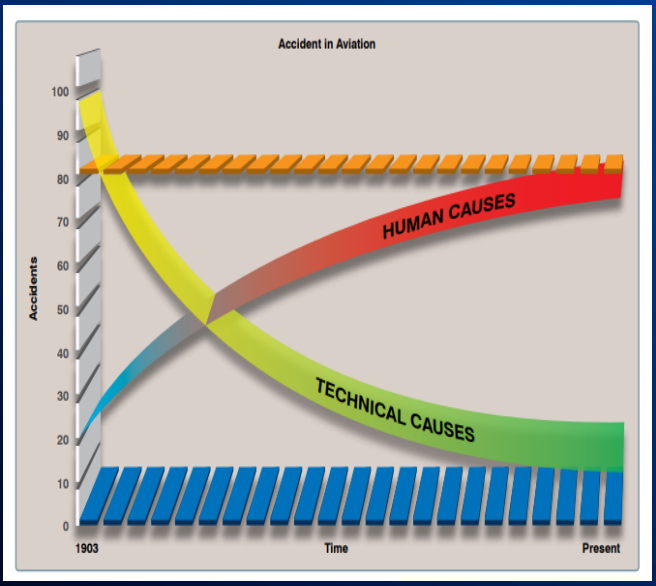
and

Minimize errors

Human Errors

- Human errors can be minimized, but they cannot be eliminated.
- Errors that are made must be detected and corrected (or at least managed).

Machine/Human Causes for Accidents



Source
FAA Handbook Addendum
Human Factors

Human Error Estimates

System	% Due to Human Error
Airlines	[illegible]
Air Traffic Control	[illegible]
Ships	[illegible]
Process Control	[illegible]%
Nuclear Power	70%
Road Transportation	85%

Definitions

- An **error** is a human action (behavior) that unintentionally departs from the expected action (behavior).
  - Slips
  - Mistakes
- A **violation** is a human action (behavior) that intentionally departs from the expected action (behavior).

Here are some common errors that occur during inspection

- 8130-3's not signed
- Missing material cert.
- Serialized unit listed as 'NSN' on material cert.
- Missing PPW
- Missing non-accident/ military statement
- Incorrect QTY shipped
- No mfg pkg/no P/N on part

Here are some common errors that occur when reviewing Contracts

- Sales contract not reviewed for risks
- Sales contract not signed
- Contract revisions not documented
- Over-commitment to customer
- Failure to formalize shipping methods
- Failure to flow down cust. requirement to Purchasing & QC

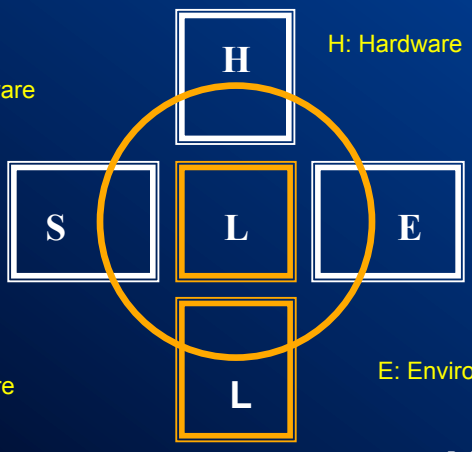
Human Factor Models

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

SHELL MODEL

Manuals, Procedures, WI's, Computer programs

Tools, equipment, vehicles



H: Hardware

S : Software

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

L: Liveware

E: Environment

Temp, humidity,

Noise, light

Ref: 1972 Elwyn Edward

Human Error

SHELL - Forklift Example

Software Review Procedures Training records Equip. maintenance records Warehouse warning signs	Hardware Check Brakes, hydraulics Warehouse door & ramp Door barriers
Liveware Stress, Norms, Pressure to get the job done. supervision?	Environment Slippery surfaces Weather Light Forklift/driver ergonomics

L

Human Error
&
Top-Down vs Bottom-Up Recognition

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

Learning and Top-Down vs Bottom-Up Recognition

TOP-DOWN

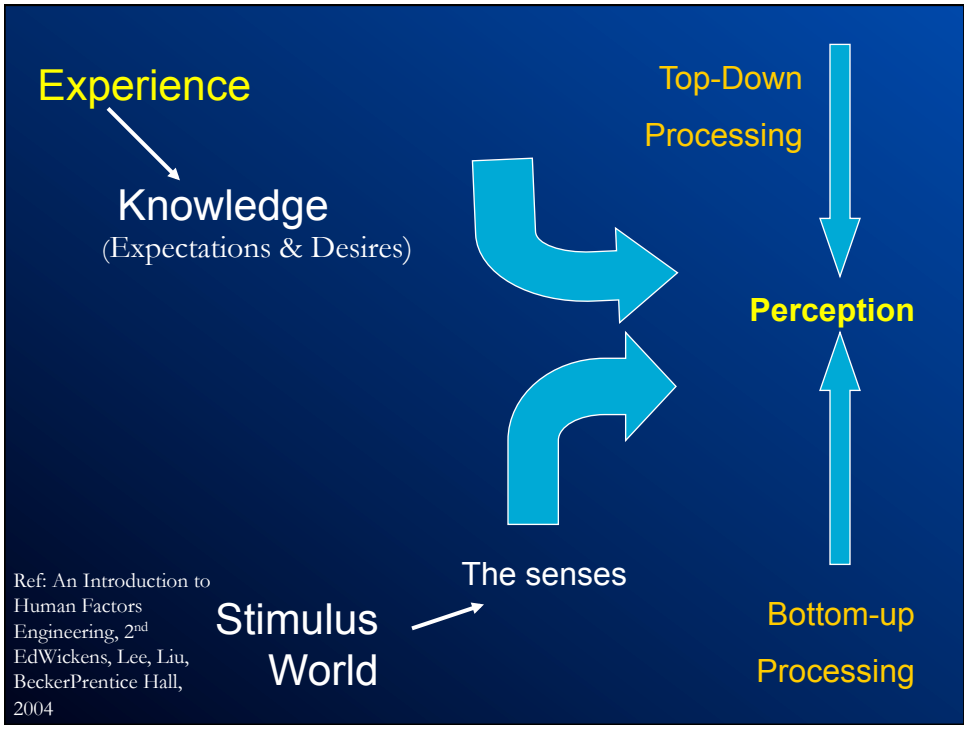
- Begins with a pre-existing knowledge of expectation (*schemata*)
- It leads a person to search for appropriate information to satisfy the pre-existing knowledge.

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



Exercise

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

6,000

1000
40
1000
30
1000
20
1000
10

Exercise

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
4,100

How does Top-Down apply to aviation distributors?

- Skipping inspection steps because parts were purchased from PAH or OEM
- “Reading in” contract requirements that simply just are not there.
- Glancing through documents and drawing a premature conclusion.

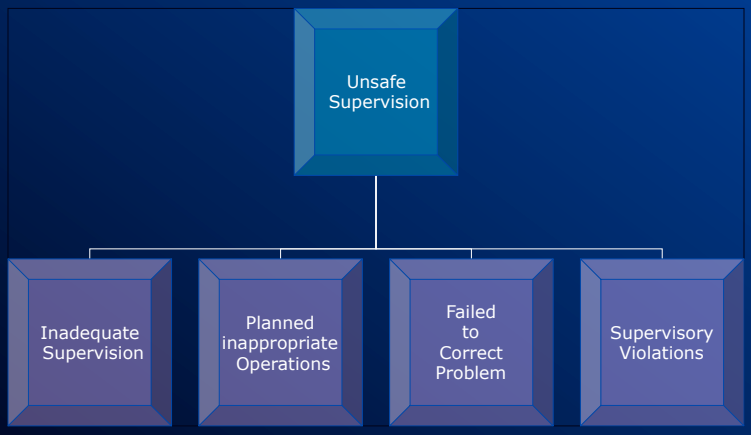
Unsafe Supervision

Ref: Reason (1990)

DEFINING THE BORDERS OF "BAD BEHAVIOR"

Unsafe Supervision

Reason (1990) traced human error causes back up the supervisory chain of command



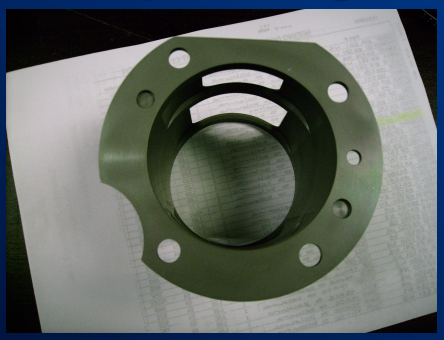
Supervisory Violations

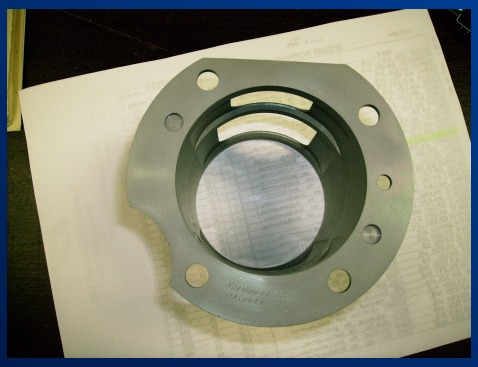
Disassembly w/o

CMMs, IPCs, & improper storage !

The Employee Work Environment

Adequate Lighting is a MUST!!!





"Is that a telephone in all of that mess?! That's so 1980s!!

Dupont's "Dirty Dozen" of Human Factors

FAA AIRWORTHINESS SAFETY SEMINARS; SEATTLE FSDO

HF "Dirty Dozen"

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

COMPLACENCY

Overconfidence from repeated experience on a specific task.

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

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

DISTRACTION

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

The safety nets ...

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

Beware of Too Much Multitasking

PRESSURE

External or internal forces demanding high-level job performance.

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

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.

RESOURCES

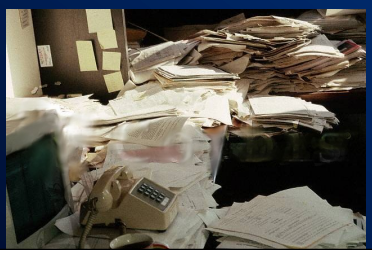
Lack of people, equipment, time, documentation, parts, etc. to complete a task.

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 inspections 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



LACK OF KNOWLEDGE

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

Lack of knowledge .. Safety Nets

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

LACK OF AWARENESS

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

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.

STRESS

Physical or mental condition resulting from external forces.

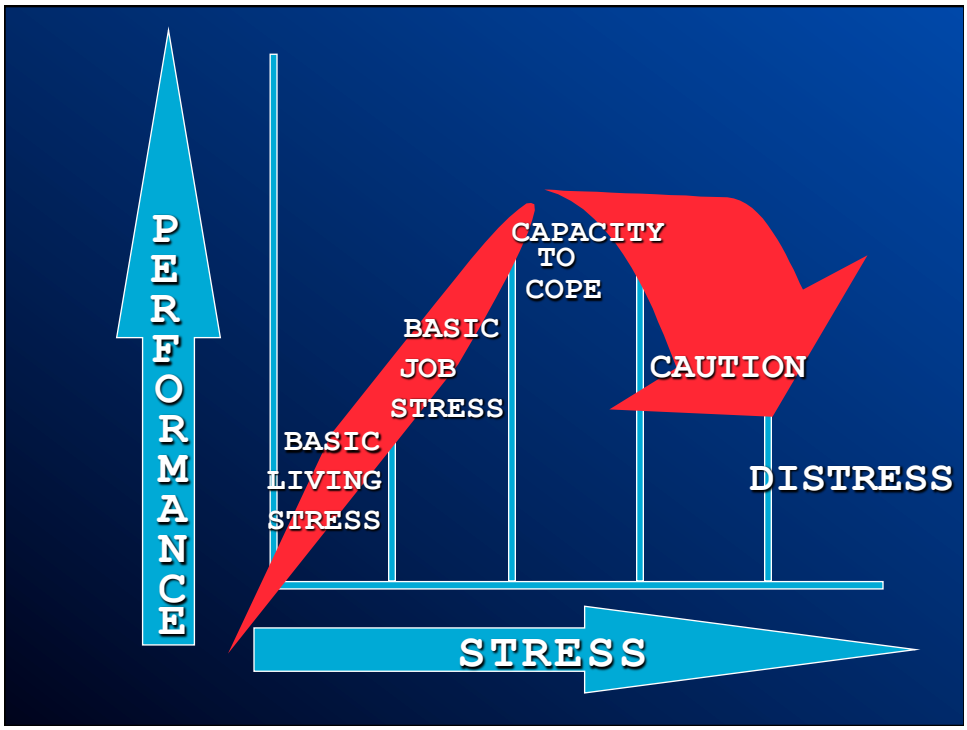
It may affect health as well as quality of work performed.

STRESS AND HUMAN PERFORMANCE

Ref: LTJG YNIGUEZ
MCAS CHERRY POINT
AVIATION SURVIVAL TRAINING CENTER

INCREASES:
- HYPERTENSION
- SMOKING
- DRINKING
- IRRITABILITY
- DEPRESSION
- SLEEP PROBLEMS
- CHOLESTEROL

DECREASES:
- RESISTANCE TO ILLNESS
- MORALE
- EFFECTIVENESS AT WORK



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!

OTHER DE-STRESSORS

- Be sure the solution starts with "I"
- Be realistic and practical.
- TAKE a BREAK !!
- Talk to someone who is not emotionally involved with the problem.
- Don't expect miracles.....just keep trying.

FATIGUE

Physical or mental exhaustion threatening work performance.

You want to…

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

WHAT IS FATIGUE ?

- 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 perio 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 duration.
- Vibration for long periods and sufficient intensity.
- STRONG lighting.

SYMPTOMS OF FATIGUE

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

LACK OF COMMUNICATION

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

How do you fit into this conversation?

THE SECRET TO GOOD COMMUNICATION…

You have

2 Ears

2 Eyes

1 Mouth

Use them in that order!

To Improve Communication

"Learn to Listen"

Don't:

1) Debate
2) Detour
3) Pre-plan
4) Tune-out

Do:

1) Ask Questions:
   (to learn more; not to always challenge)
2) Paraphrase
3) Make eye contact
4) Use positive body language

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."

LACK OF ASSERTIVENESS

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

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.

LACK OF TEAMWORK

Failure to work together to complete a shared goal.

Teamwork Safety Nets ....

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

Shift / Task Handover

Practicing principles of good shift/task handover using:

- verbal and written information exchange
- built in redundancy;
- Clear & thorough communication

EMB-120RT, In-Flight Breakup

"Departures from approved procedures included failures to solicit and give proper shift-change turnover reports, failures to use maintenance work cards as approved, failures to complete required maintenance/inspection shift/turnover forms, and a breach in the integrity of the quality control."

NTSB /AAR-92/04
Eagle Lake

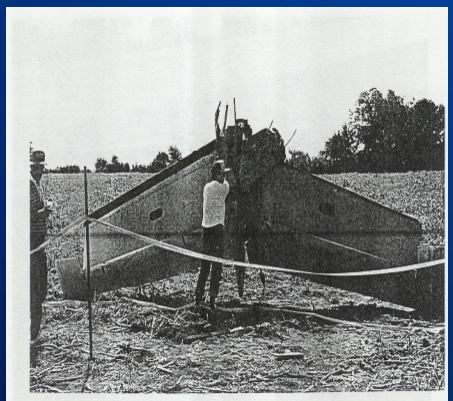


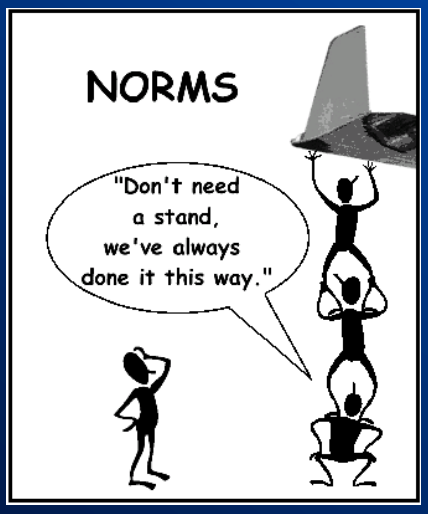
Figure 1a.--View of horizontal stabilizer from underside.

B737-200, On-Landing #1 Eng. Tailpipe/Thrust Reverser Departed the Aircraft

- No verbal or written task turnover took place between shifts.
- 2nd shift decided they could fix the oil leak rather than removing and replacing the engine.
- 2nd shift AMT's repaired the leak. They did not know or recognize only 4 of the 42 bolts holding the tail pipe assembly were tight.

NORMS

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



So, what are NORMS?

It's a way of doing business that's not approved but it has been done locally for so long.... It is now a NORM.

- **ALWAYS work I/A/W the Process or have the process changed.**
- **Be aware that "NORMS" do <u>not</u> 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 Analysis
- Deviating from documented procedures
- Accepting customer POs without understanding their requirements.
- Providing minimum information in shift handover logs.

Starting Your HF Program

So, how do we develop a HF program?

1) Define topics to be considered
2) Develop a step-by-step strategy
3) Identify obstacles to overcome

(1) Define topics to be considered for HF training program

Topics based on:

- ICAO Annex III,
- EASA CAPS716, and
- EASA GM 145.A.30 (e)

(2) Develop step-by-step strategy

- Step 1: Designate a key person within company
- Step 2: Review company's operational processes and procedures
- Step 3: Describe types of users within the organization.
- Step 4: Identify user tasks.

(2) Develop step-by-step strategy

- Step 5: Identify risks and potential issues related to the employee/work task interface.
- Step 6: Present a summary of HF Program tasks to be addressed.
- Step 7: Document the program
- Step 8: Implement the HF Program.

2 Key Obstacles to overcome

- First, top management commitment is crucial.
- Second, efficient and effective communication throughout the organization is essential in instilling a “Safety culture”.

Questions?

Thanks for attending!

and remember…

"To stop learning…. is to stop living."
George J. Ringger

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