



**Simple Ways to Recall the Fundamentals of Human Factors in Maintenance**

**Federal Aviation Administration**

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Little Rock Repair Station Human Factors Seminar  
Little Rock, AK  
April 12, 2007

**Agenda – Easy to Recall Information**

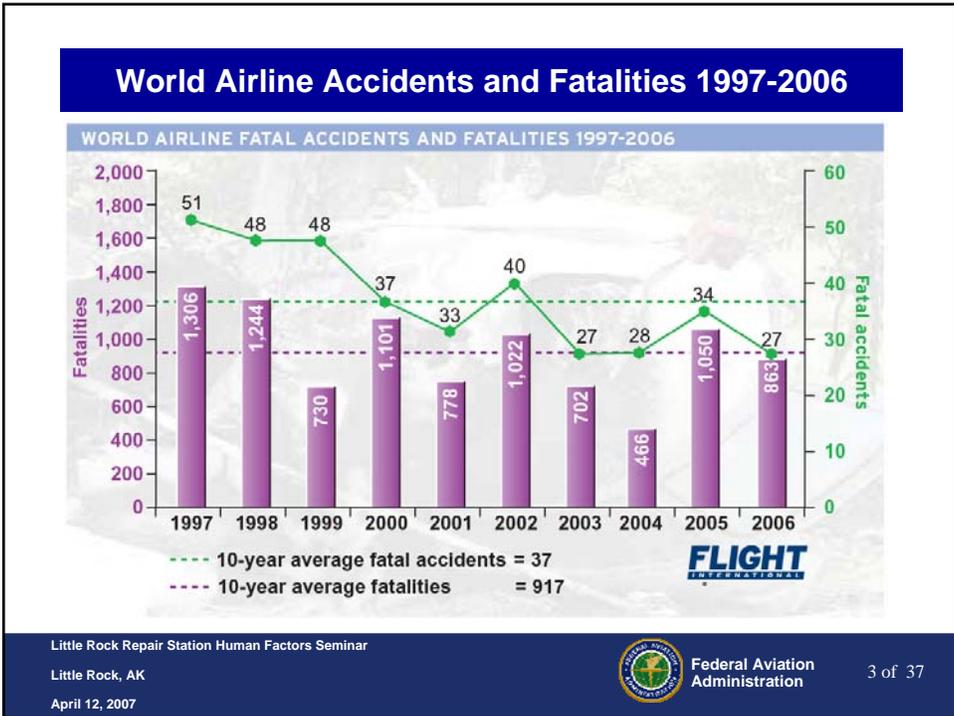
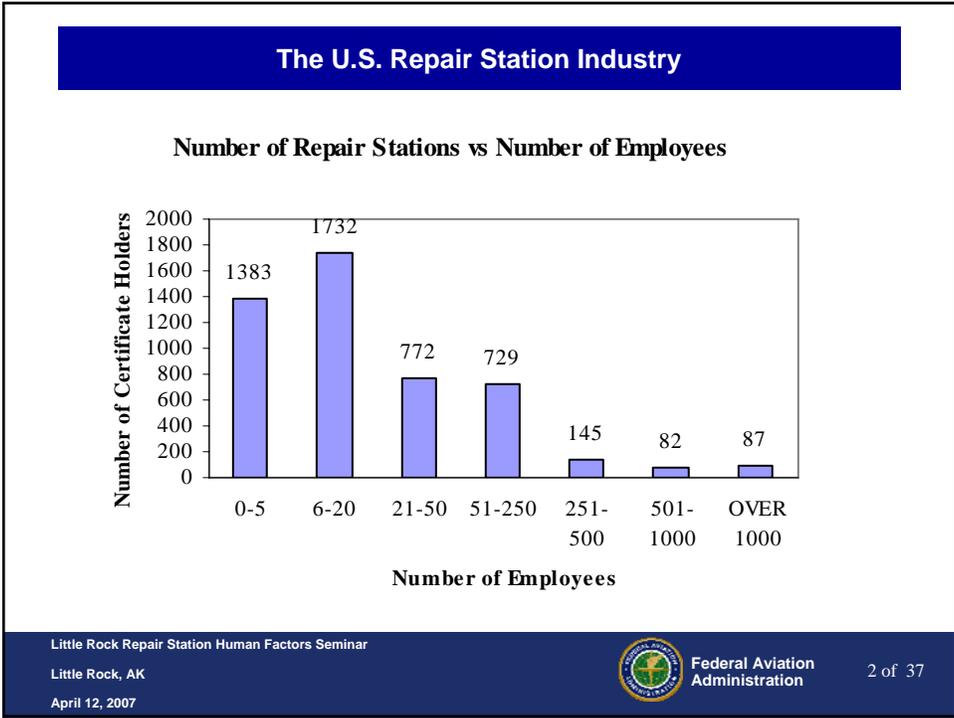
- Why bother with Human Factors: Data Review
- Put on your HF Spectacles
- PEAR: People-Environment-Action-Resources
- Discussion as time permits

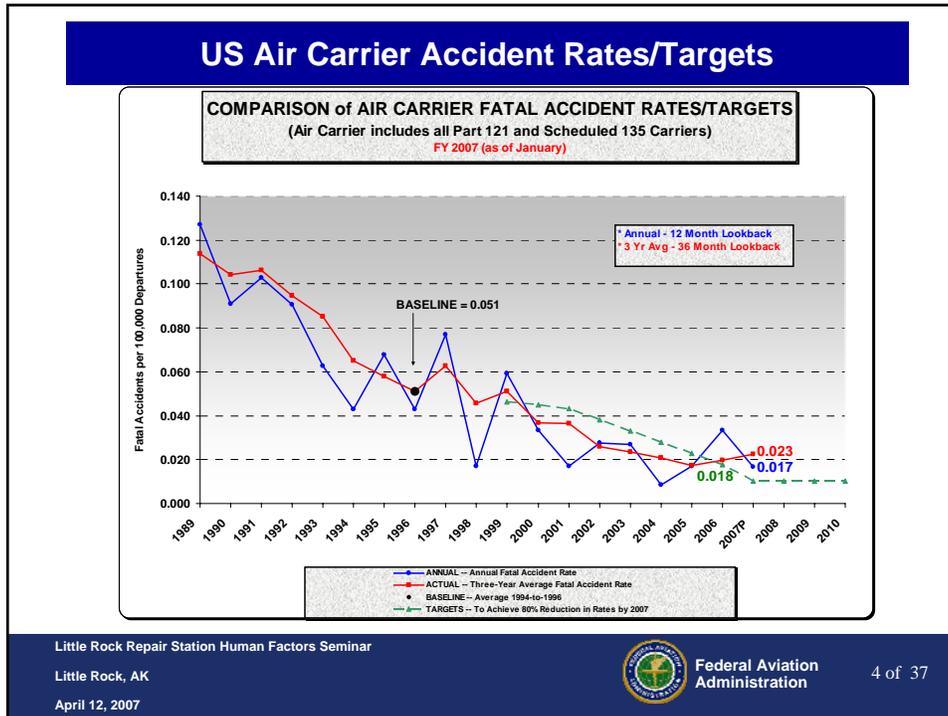
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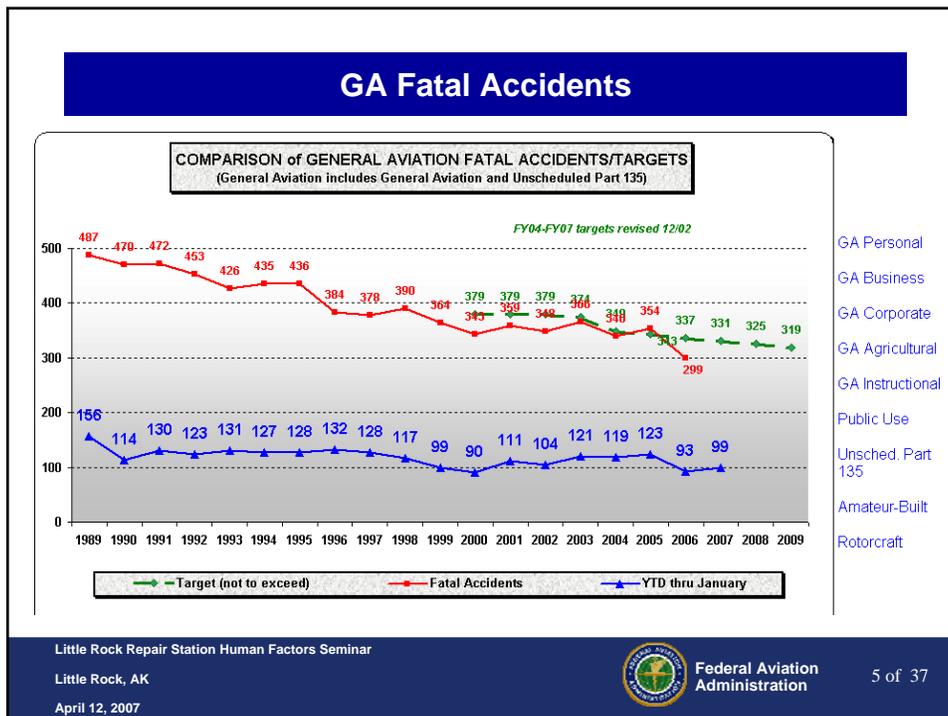




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- GA Personal
- GA Business
- GA Corporate
- GA Agricultural
- GA Instructional
- Public Use
- Unsched. Part 135
- Amateur-Built
- Rotorcraft

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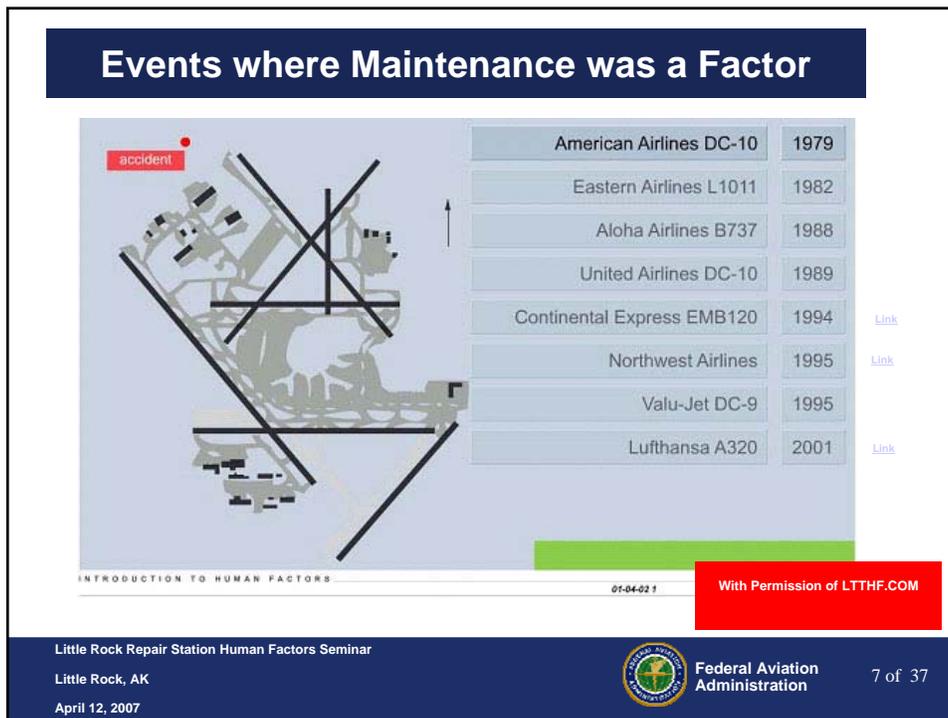
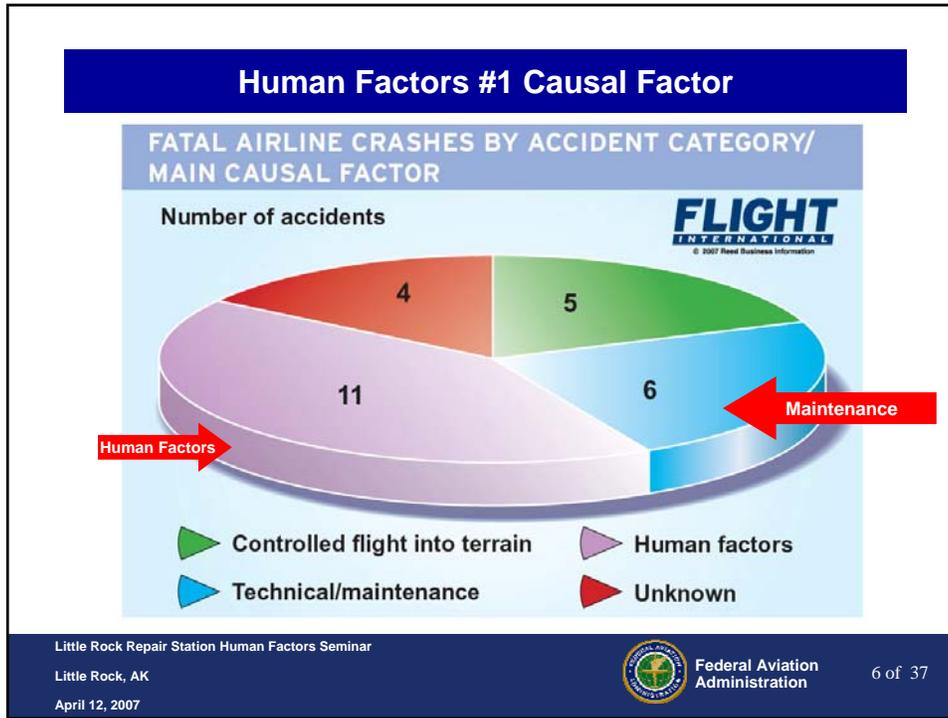


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## Example Maintenance Error

Jan 2000	Alaska Airlines	Boeing MD-80	Jackscrew for Elevator Control
Mar 2001	Lufthansa Airbus	A320	Mis-wired side stick
Apr 2001	Emery Worldwide	DC-8	Reversed hyd. check-valve
Aug 2001	Air Transat	A310	Fuel exhaustion over Atlantic
May 2002	China Airlines	B747-200	In flight break-up at 35K Ft.
Jan 2003	Air Midwest	Beech1900D	Trim Rigging
Aug 2003	Colgan Air	Beech 1900D	Trim Rigging
Jan 2006	Continental	B737-500	Engine Run-up
July 2006	Spectrum Aircraft	Spectrum 33	Mis-Rigging

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## Implications of the 2005-2006 Safety Stats for Mx HF

- There are “opportunities for improvement”
- Maintenance and technical issues are areas of concern
- Technical manuals!!
- Human factors challenges are ever present

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## Human Factors Goal – Simply Stated

Ensure continuing safety and efficiency by paying attention to issues that affect human performance.

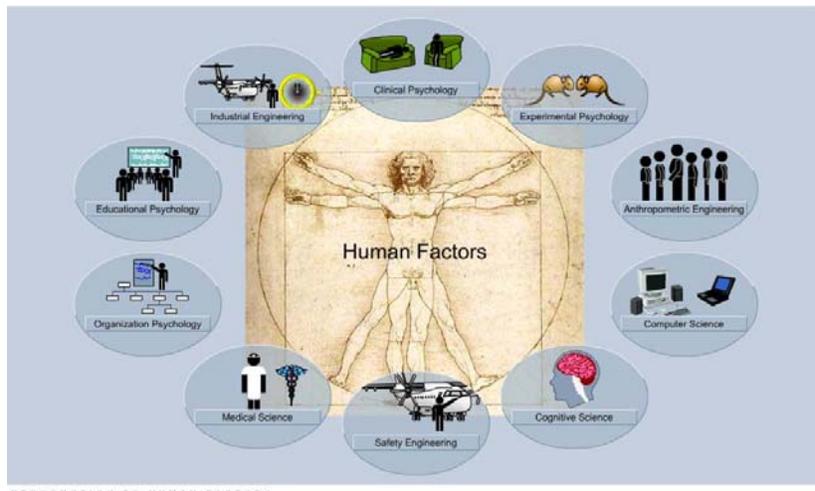
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## The Disciplines of Human Factors



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## Put on your "Human Factors Spectacles"



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## The Dirty Dozen

Lack of Communication  
Lack of Teamwork  
Norms  
Pressure  
Complacency  
Lack of Knowledge  
Lack of Awareness  
Lack of Resources  
Distraction  
Assertiveness  
Fatigue  
Stress

HUMAN ERROR

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## But first, look at the "Person in the mirror"

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## The PEAR MODEL

People  
Environment  
Actions  
Resources



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Maddox & Johnson, 1996

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 **PEOPLE**



<b>Physical</b> Size Gender Age Strength Sensory Limitations	<b>Psychological</b> Experience Knowledge Training Attitude Emotional State
<b>Physiological</b> Health Nutrition Lifestyle Alertness/fatigue Chemical Dependency	<b>Psychosocial</b> Interpersonal relations Ability to communicate Empathy Leadership

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 **PEOPLE**



<b>Physical Factors</b> Physical size Gender Age Strength Sensory limitations	<b>Psychological Factors</b> Workload Experience Knowledge Training Attitude Mental or emotional state
<b>Physiological Factors</b> Nutritional factors Health Lifestyle Fatigue Chemical dependency	<b>Psychosocial Factors</b> Interpersonal conflicts Personal loss Financial hardships Recent divorce



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### What does this mean?

7 days per week X 24 hours per day X 365 days

FACTORS AFFECTING PERFORMANCE AND WORK ACTIVITY

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### Timing is Everything?

**Presentation Time!!**

Alertness Level (Y-axis: 0, 5, 10, 15, 20)

Time of day (X-axis: 9, 12, 15, 18, 21, 24, 3, 6, 9)

01:00 am 03:00 am

- Peak alertness
- Slightly impaired
- Reduced alertness
- Dangerously drowsy

Nuclear powerplants of Chernobyl in Russia  
Three-Mile Island in the U.S.

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## Types of Fatigue

### Acute Fatigue

- Intense
- Short Duration
- Cured with a good night's sleep

```
graph TD; Fatigue --> Acute_fatigue; Fatigue --> Chronic_fatigue;
```

### Chronic Fatigue (harder to fix)

- Frequent recurrence
- Long duration
- Slow recovery
- Often a physical sickness or mental stress causing chronic fatigue.

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## An Excellent Website about Sleep

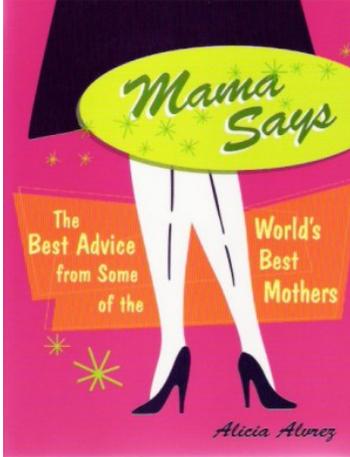
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**Regarding sleep: Do what your mama told you.**



[www.nationalsleepfoundation.org](http://www.nationalsleepfoundation.org)

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**Environment**



<b>Physical – the easy one</b>	<b>Organizational</b>
Weather extremes	Personnel
Location (in/out)	Supervision
Workspace	Labor - Management
Lighting	Size of company
Sound levels	Profitability
Housekeeping	Job security
Physical safety issues	Morale
	Corporate culture
	Safety culture

[Eagle](#)

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## Actions



ACTIONS

What do you need to know?

What skills are necessary?

Steps to perform a task Valujet

Sequence of actions

Communication requirements

Information requirements

Inspection requirements Aloha

Certification requirements

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## Actions - What can you do today?

**How do you communicate error events?**

**Are there enough people to do the job?**

**Do personnel understand the cost of A/C damage?**

**How can you motivate one another to care more?**

**Are you responsible for the things that others do?**

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## Resources



- Technical documentation systems
- Test equipment
- Enough time
- Enough people
- Lifts, ladders, stands, seats
- Materials
- Portable lighting, heating, cooling
- Training

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## Please Offer your Example of Resources

- Are resources ever a problem?
- What are the solutions?
- Give an example?
- What advice can you offer?

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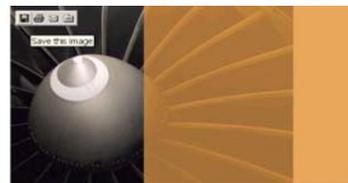
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## Spectacles & PEAR & HF Manual



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*Thank You*

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