

## Simple Ways to Recall Human Factors in Maintenance

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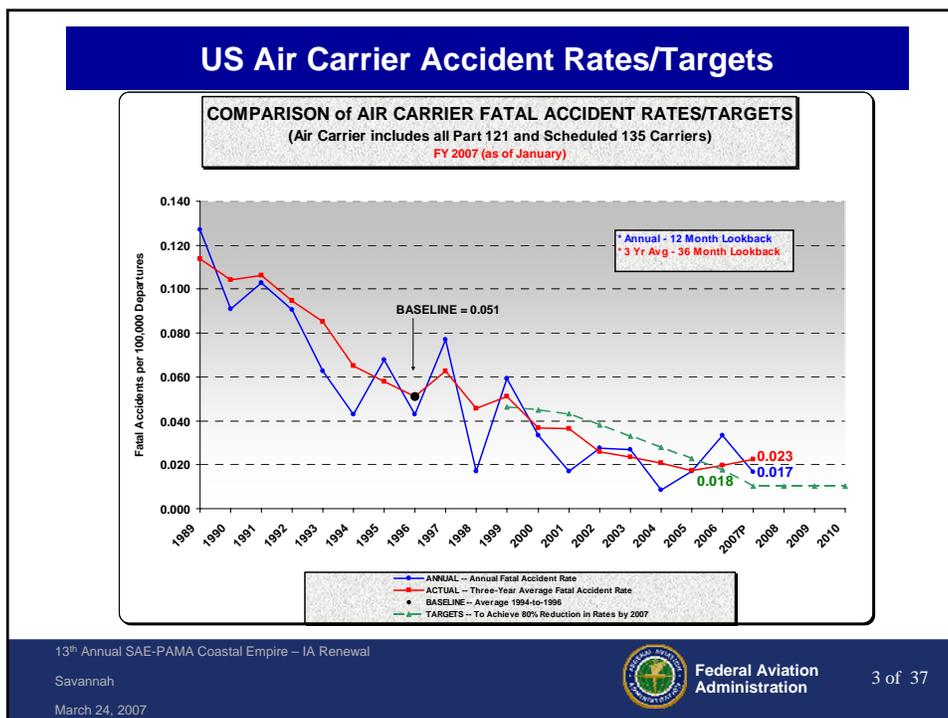
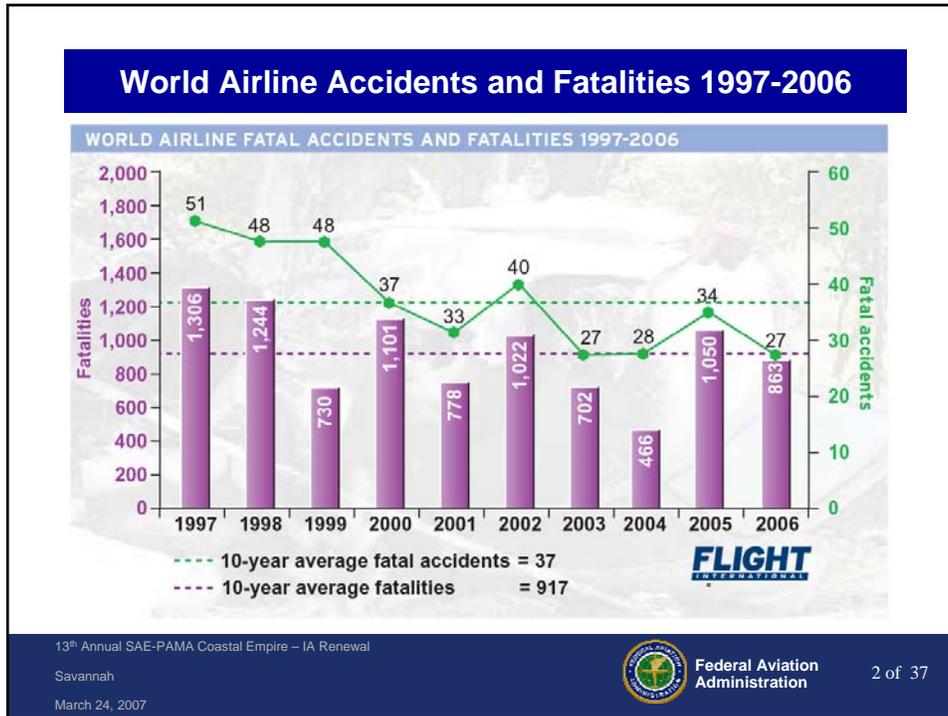
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### Agenda – Easy to Recall Information

- Why bother with Human Factors: Data Review
- Put on your HF Spectacles
- PEAR: People-Environment-Action-Resources
- The Operator’s Manual for Human Factors
- Discussion as time permits

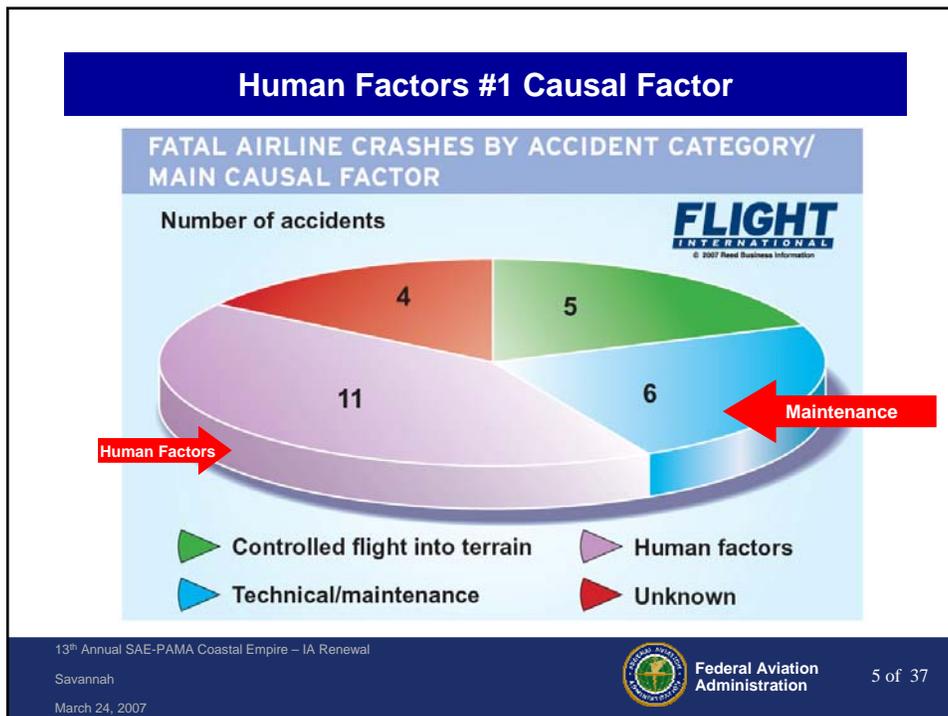
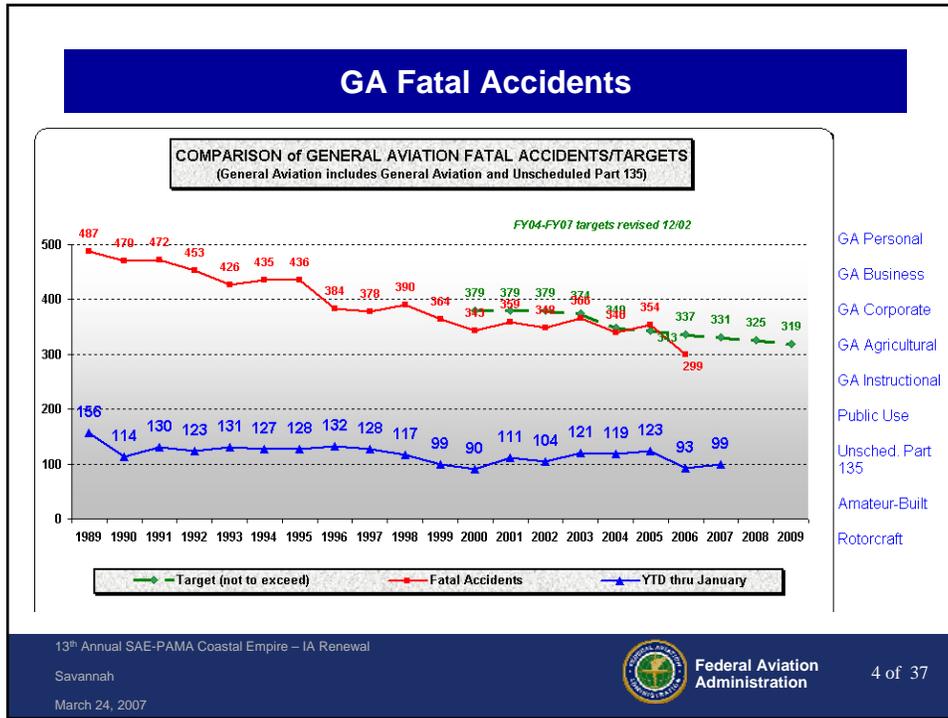
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## Events where Maintenance was a Factor

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INTRODUCTION TO HUMAN FACTORS 01-04-02 1

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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 12 Common Human Errors



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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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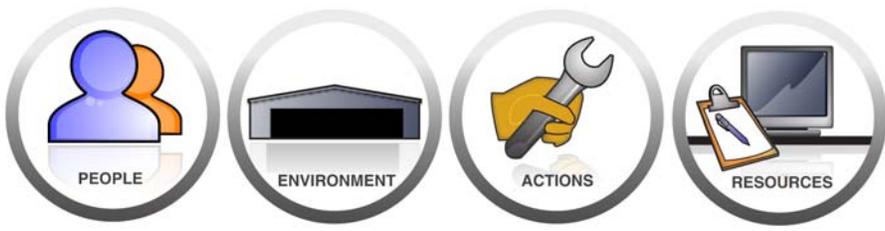


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## PEAR



**PEOPLE**      **ENVIRONMENT**      **ACTIONS**      **RESOURCES**

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## PEOPLE

**PEOPLE**

**Physical Factors**

- Physical size
- Gender
- Age
- Strength
- Sensory limitations

**Physiological Factors**

- Nutritional factors
- Health
- Lifestyle
- Fatigue
- Chemical dependency

**Psychological Factors**

- Workload
- Experience
- Knowledge
- Training
- Attitude
- Mental or emotional state

**Psychosocial Factors**

- Interpersonal conflicts
- Personal loss
- Financial hardships
- Recent divorce

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## What does this mean?

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

ACTORS AFFECTING PERFORMANCE AND WORK ACTIVITY

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### Timing is Everything?

**Presentation Time!!**

Alertness Level (MSL)

01:00 am 03:00 am

- Peak alertness
- Slightly impaired
- Reduced alertness
- Dangerously

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FACTORS AFFECTING PERFORMANCE AND WORK ACTIVITY

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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

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## Environment

**ENVIRONMENT**

**Physical**

- Weather
- Location inside/outside
- Workspace
- Shift
- Lighting
- Sound level
- Safety

**Organizational**

- Personnel
- Supervision
- Labor-management relations
- Pressures
- Crew structure
- Size of company
- Profitability
- Morale
- Corporate culture

[Eagle](#)

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## Actions

**ACTIONS**

**Steps to perform a task**

- Sequence of activity
- Number of people involved
- Communication requirements
- Information control requirements

**Knowledge requirements**

- Skill requirements
- Attitude requirements
- Certification requirements
- Inspection 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**

 **RESOURCES**

Procedures/work cards	Ground handling equipment
Technical manuals	Work stands and lifts
Other people	Fixtures
Test equipment	Materials
Tools	Task lighting
Computers/ software	Training
Paperwork/ signoffs	Quality systems

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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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The Spectacles

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Discussion as time permits

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## Spectacles & PEAR





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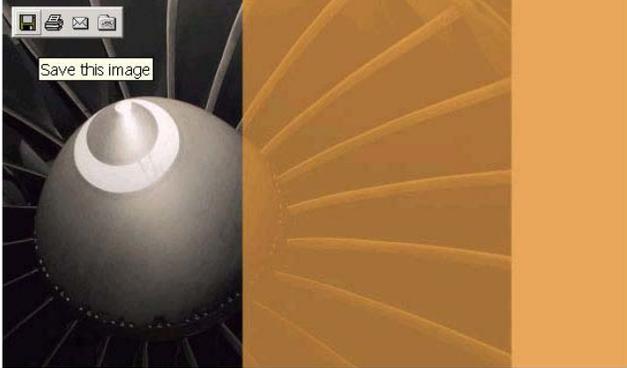
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**Introduction**

1.0 Event Investigation

2.0 Documentation

3.0 Human Factors

4.0 Shift/Task Turnover

5.0 Fatigue Management

6.0 Sustaining & Justifying an HF Program



**Introduction**

This manual is in response to the industry's requests for a simple and manageable list of actions to implement a Maintenance Human Factors (MHF) program. A panel of experts selected the following six topics for such a program to be successful:

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*"Jack screw assembly failure caused by excessive wear resulting from insufficient lubrication... contributing factors included extended lubrication and end-play check intervals, lack of available parts, organizational norms, regulatory oversight issues, etc."*

NTSB AAR-03-03 FINAL REPORT

**EVENT INVESTIGATION**  
Chapter 1

<< < Page 1 of 5 > >



*"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-03-03 FINAL REPORT

**Shift / Task Turnover**  
Chapter 4

<< < Page 1 of 5 > >



*"Mechanics would benefit from using Airliner Maintenance Manuals with more specific instructions for critical flight system procedures."*

NTSB AAR-03-03

**DOCUMENTATION**  
Chapter 2

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*"A combination of 16 hours of straight work compounded by influenza contributed to fatigue and falling asleep at the wheel..."*

AIRPORT INTENSIVE REPORT

**FATIGUE MANAGEMENT**  
Chapter 5

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*"The Safety Issues raised in this report include: The Human Factors aspects of air carrier maintenance and inspection for the continuing airworthiness of transport category airplanes, to include repair procedures and the training, certification and qualification of mechanics and inspectors."*

NTSB AAR-89-03 FINAL REPORT

**HUMAN FACTORS TRAINING**  
Chapter 3

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*"...various initiatives come and go sometimes based on corporate whims... a sustainable maintenance human factors program must have shared support from senior management and all levels of company personnel... the program must show value in continuing safety, worker job satisfaction, and cost control..."*

W. B. JOHNSON, FAA

**SUSTAINING & JUSTIFYING AN HF PROGRAM**  
Chapter 6

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## Key References for Each Chapter



### 6.0 Sustaining & Justifying an HF Program

**6.6 Key References**

- A. Sustaining & Justifying an HF Program presentation ([Download Document](#)).
- B. Stelly, J. and Poehlman, K. 2000. Investing in Human Factors Training: Assessing the Bottom Line. Presented at the 14 th Annual Human Factors in Aviation Symposium, Vancouver, Canada. ([Download Document](#)).
- C. Patankar, M.S., and Taylor, J.C. (2004). *Risk management and error reduction in aviation maintenance*. Aldershot, U.K: Ashgate Publishing ([Amazon.com](#)).
- D. Johnson W.B., Sian, I.B., and Watson, J. (2000). Measuring the impact of human factors interventions. SAE Meeting on Advances in Aviation Safety, Daytona Beach, Florida, April 11-13, 2000. ([Download Document](#)).

**3 key references plus slides** 

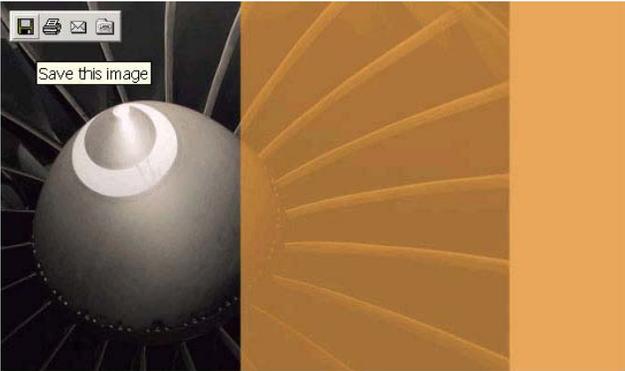
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- Acknowledgements

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[www.hfskyway.com](http://www.hfskyway.com)

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## Spectacles & PEAR





PEOPLE



ENVIRONMENT



ACTIONS



RESOURCES



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2.0 Aviation Maintenance Leadership - 2/2006

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Thank You

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