Challenges and Solutions for Maintenance Human Factors: 2007 Status Report

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NACA MAINTENANCE COUNCIL MEETING
Arlington, VA
October 25, 2006
Agenda

Human Factors?

Considerations & Topics for FAA HF Attention

Selected 2005-2006 Accomplishments

Future Challenges and Plans
Human Factors Spectacles
Human Factors Goal – Simply Stated

Ensure continuing safety and efficiency by paying attention to issues surrounding human performance.
Proprietary graphic used with expressed permission of Lufthansa Technical Training (www.ltthf.com)
Agenda

Human Factors?

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Selected 2005-2006 Accomplishments

Future Challenges and Plans
How to define topics for Mx HF Attention

• Apply resources to high payoff opportunities

• Ensure that R&D can be applied, but do not ignore good science

• Attack present challenges with an eye to the future

• Communicate in plain language
How to Accomplish the Human Factors Goals

Attention to:

• people,
• the environment in which they work,
• the actions they perform,
• and the resources necessary to perform the work.
PEAR Details: People

- Physical Factors
  - Physical size
  - Sex
  - Age
  - Physical characteristics
- Strength
- Sensory limitations
- Physiological Factors
- Nutrition
- Health
- Lifestyle

- Fitness for Duty
  - Alertness
  - Chemical Dependence
- Workload
- Experience
- Knowledge
- Training/Certification
- Attitude
- Mental or emotional state
- Interpersonal conflicts
- Personal loss
Agenda

- Human Factors?
- Considerations & Topics for FAA HF Attention
- Selected 2005-2006 Accomplishments
- Future Challenges and Plans
Selected 2005 Activity

- The Operator’s Manual for Human Factors in Aviation Maintenance (www.hf.faa.gov/opsmanual)
  - Plain Language Award
  - Published in 3 Languages
  - Widely – adopted by industry
  - Many website hits with document downloads 3000+

- Support of FAR 145 Rule with Guidance Material

- Study of language-related error in maintenance
FAA HF Guidance for Part 145

- FAA AC 145-10, Ch. 3, §301(c)

- The FAA concurs with European Authorities in that human factors training related to maintenance practices would provide an additional margin of safety to the repair industry;

- A human factors training program should be related to maintenance practices where possible;

- At this time it is recommended. It is not an FAA regulation.

- EASA Certificate holder’s must follow EASA rules
Language Error Study

1000 participants: Asia, Latin America, Europe and US.

Main Findings
• Language errors exist but typically found early
• High Accuracy everywhere: Non-native English speakers typically go slower but maintain accuracy

Main Recommendations
• Deliver more specialized language training.
• Provide and translation (full & partial).
Selected 2006 Activity

- International Conference (ATA)

- Unmanned Aerial Systems (NASA)

- International Survey on HF in Maintenance (CAMI)
Survey Goals and Methods

- **Purpose**: Assess status of maintenance HF
- **Focus**: program support and motivation, organizational policies, fatigue management, error management, and training.
- **Distribution**: Online survey (80 items) 630 addresses.
- **Returns**: 414 respondents (66%) from 54 countries.
- **Experience**: 65% > 20 yrs. maintenance experience.
Respondent Representation

54 Countries
414 Total Respondents
Where do you work?

- Air Maint: 27.3%
- Repair Stn: 8.9%
- Manufacturer: 10.1%
- Mil/Govt: 8.2%
- School/Trn: 5.6%
- Other: 4.8%
Regulatory Compliance

Which is the primary regulatory authority your maintenance operations are designed to be in compliance with?  \( N=404 \)

<table>
<thead>
<tr>
<th>Authority</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Civil Aviation Safety Authority (CASA) N=19</td>
<td>4.7%</td>
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<tr>
<td>European Aviation Safety Agency (EASA) N=95</td>
<td>23.5%</td>
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<td>Federal Aviation Administration (FAA) N=182</td>
<td>45%</td>
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<tr>
<td>Transport Canada N=36</td>
<td>8.9%</td>
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<td>Other National Aviation Authority N=72</td>
<td>17.8%</td>
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## FAA has the fewest Human Factors requirements

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<thead>
<tr>
<th>Topic</th>
<th>ICAO</th>
<th>EASA</th>
<th>TC</th>
<th>FAA</th>
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<tbody>
<tr>
<td>HF for Initial Certification</td>
<td>Annex 1</td>
<td>145.A.30(e) incl AMC&amp;GM 145.A.30(l)</td>
<td>CAR 573.06</td>
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<td>Continuation Training for HF</td>
<td>Annex 6</td>
<td>145.A.35 (d)</td>
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<td>CAR 1</td>
<td>Rec, 145.211</td>
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<td>Fatigue Management System</td>
<td>Guidance</td>
<td>145.A.30(d) incl. AMC</td>
<td>Proposed, now awaiting consul</td>
<td>Guidance in Tech Pubs 121.377</td>
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<td>Accountable Executive</td>
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<td>145.A.30</td>
<td>CAR 106</td>
<td>145</td>
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<td>Published HF Guidance Materials</td>
<td>Doc 9683-AN/950</td>
<td>GM145.A.30 (e) &amp;Part 66 Appendix I M9</td>
<td>TP 13459</td>
<td>AC120-72, Ops Manual, FAA Website</td>
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<td>Documentation Reporting Requirement</td>
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<td>CAR 573.08</td>
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<td>Procedural Non-compliance</td>
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<td>Shift and task handover</td>
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<td>145.A.47</td>
<td>CAR 573.08</td>
<td>121.369 (b) 9 135.427(b) 9</td>
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<td>CAR 571.10</td>
<td>121.371</td>
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Regulatory Support and Close Work

![Bar chart showing the percentage agreement for support and work closely across different regulatory bodies. The bars are color-coded for CASA, EASA, FAA, Transport Canada, and Other NAA.]
Fatigue is “Important” but few programs

- Impact of fatigue was recognized by 82.1%.

- Fatigue Management System
  - Overall, 25% have a fatigue management system.

- Training on Fatigue Management
  - 35.9% provide training on fatigue management.
Transport Canada and EASA have HF Training

![Bar chart showing the percentage of respondents from different organizations for different training scenarios.]

- **Overall**
- **CASA**
- **EASA**
- **FAA**
- **Transport Canada**
- **Other NAA**

% Respondents:

<table>
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<tr>
<th>Scenario</th>
<th>Overall</th>
<th>CASA</th>
<th>EASA</th>
<th>FAA</th>
<th>Transport Canada</th>
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<td>No Course</td>
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Additional Selected 2006 Activity

• Web-Based Surveillance and Auditing Tool (WebSAT)

• Revised Training Course for FAA Inspectors

2 Days → 3 Days
Highly Revised!
Additional Selected 2006 Activity

- Rewrite of “Human Factors Guide for Maintenance and Inspection.”

- Revive “hfskyway.faa.gov”

- AFS Mx Human Factors Plan
Agenda

Describe an ideal HF Mx & Ramp Safety Conference

Considerations & Topics for FAA HF Attention

Selected 2005-2006 Accomplishments

Future Challenges and Plans
Challenges

• Maintenance HF Regulations: 65, 121, 135, 145, 147.

• Fatigue R&D? Guidance? Regulation?

• Advanced Technologies, VLJs, Rotorcraft, UAVs, Avionics, Commercial Space travel, Aging Aircraft, …..

• Ensuring Quality & Safety in all Maintenance Organizations

• General Aviation Maintenance HF

• SMS in Maintenance
Plans (“On the books”)

- *The Human Factors Guide for Aviation Maintenance and Inspection*
- Maintenance of Unmanned Aerial Systems
- Maintenance Implications of Advanced Technologies
- Website: hfskyway.faa.gov
More Plans (“On the books”)

- Future of the aviation mechanic/engineer
- Defining qualifications for Aviation HF personnel
- Survey of Human Factors Issues for US FAA Inspectors
- Evolve Flight Standards MX HF Plan to Office of Aviation Safety Plan
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Q&A (Time permitting)

Thank you