Widespread Fatigue Damage
Public Meeting

Draft Final Rule & Regulatory Evaluation

December 11, 2008
Why are we here?

The purpose of this meeting is to allow public comment on the information contained in the technical document posted to the WFD rulemaking docket.
Agenda

• Opening Remarks

• Introduction of FAA Panel

• FAA Presentations
  – Overview of Draft Final Rule
  – Overview of Draft Regulatory Evaluation
  – Questions and Answers

• Audience Presentations or Comments

• Questions and Answers

• Closing Remarks
Meeting Ground Rules

• When speaking, please identify yourself and your industry association or affiliation

• We cannot discuss whether or how the draft final rule will be modified to address the comments received today

• We can address requests for clarification of the points being made, but cannot address requests to revise the draft final rule

• When asking questions, please wait until the end of the presentations
Widespread fatigue damage (WFD) is age-related structural fatigue cracking

- Damage can appear at multiple sites
- Cracking cannot be reliably detected
- Undetectable cracks “link up” and grow rapidly together

WFD is inevitable
Overview of WFD Rulemaking Initiative

- Recommendations of the 2001 and 2003 Aviation Rulemaking Advisory Committee
- Notice of proposed rulemaking (NPRM) for WFD
- Changes made since WFD NPRM
- Current draft final rule
2001 ARAC Recommendation

• FAA should issue an operational rule requiring operators to incorporate:
  – A “structural maintenance program” into their maintenance programs with a “limit of validity” (LOV) for the structural maintenance program
  – If extended service is needed, a revised structural maintenance program with a revised LOV in order to continue safe operation
  – A program to address existing and new repairs and alterations
2003 ARAC Recommendation

- FAA should issue a revision to § 25.571 and Appendix H of Part 25 requiring applicants to:
  - Show that the airplane will be free from WFD up to the “limit of validity” (LOV) of the maintenance program
  - Incorporate the LOV into the Airworthiness Limitations section of the Instructions for Continued Airworthiness (ICA)
The WFD NPRM was published on April 18, 2006. Its purpose was to preclude catastrophic failure due to WFD.

- **DAH requirements**
  - Establish an initial operational limit, stated as a number of total accumulated flight cycles or flight hours or both, by 12/18/07
  - Evaluate certain existing and future repairs and alterations for WFD
  - Develop guidelines for repairs and alterations
  - Establish an extended operational limit (optional)

- **Operator requirements**
  - Incorporate initial operational limit into maintenance program by 6/18/08
  - Incorporate extended operational limit into maintenance program (optional)
Changes Since WFD NPRM

• Term “initial operational limit” replaced with “limit of validity of the engineering data that supports the maintenance program” (LOV)

• Applicability revised
  – Draft final rule applies to transport category, turbine powered airplanes with a maximum takeoff gross weight greater than 75,000 lbs. and a type certificate issued after 1/1/1958
  – Airplanes have been added to the exclusion list

• Requirements for repairs and alterations eliminated
Changes Since NPRM (cont.)

• Requirement for establishing LOV and LOV extensions clarified
  – NPRM: Determine when WFD is likely to occur
  – Final rule: Show freedom from WFD up to LOV

• Design approval holder and operator compliance dates extended
  – Dates based on age/risk (oldest first)

• Default LOVs added
Draft WFD Final Rule

• Requires design approval holders and applicants to establish a limit of validity (LOV), stated as a number of total accumulated flight cycles or flight hours or both:
  – For existing airplanes: applies to transport category airplanes with a maximum takeoff gross weight over 75,000 lbs. (part 26)
  – For future airplanes: applies to all transport category airplanes (part 25)

• Requires operators to incorporate LOVs into their maintenance programs
  – For existing airplanes: applies to parts 121 and 129
  – For future airplanes: applies to all transport category airplanes

• Permits extension of LOV
Overview of Draft Final Regulatory Evaluation

• Industry comments about the NPRM resulted in significant rule changes

• Since the NPRM regulatory evaluation, industry has aggressively retired older airplanes, thus reducing the size of affected fleet

• Design approval holders now are in voluntary compliance

The above changes result in substantially lower operator costs and the draft final regulatory evaluation reflects these changes. Note this analysis is based on flight cycles, not flight hours.
# Changes to Regulatory Evaluation

Costs and benefits declined from NPRM to draft final rule (benefits > costs)

<table>
<thead>
<tr>
<th>NPRM</th>
<th>Draft Final Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed Initial Operational Limit = Design Service Goal (DSG)</td>
<td>Assumed Limit of Validity = 30% - 180% over DSG</td>
</tr>
<tr>
<td>Included repairs and alterations</td>
<td>Eliminates repairs and alterations requirements</td>
</tr>
<tr>
<td>Required compliance within 18 months</td>
<td>Extends compliance time</td>
</tr>
<tr>
<td>Assumed 27 airplanes retired in 1st year</td>
<td>Assumes 1 airplane retired in 1st year</td>
</tr>
<tr>
<td>Assumed 1,016 airplanes affected in 20-year analysis interval</td>
<td>Assumes 2 airplanes retired in 20-year analysis interval</td>
</tr>
</tbody>
</table>
## DSGs and Anticipated LOVs

<table>
<thead>
<tr>
<th>Airplane Type</th>
<th>Fleet Leader</th>
<th>DSG</th>
<th>LOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airbus A300 (B4-100)</td>
<td>40,000 Flt cycles</td>
<td>40,000 Flt cycles</td>
<td>57,000 Flt cycles</td>
</tr>
<tr>
<td>Airbus A310-200</td>
<td>29,000 Flt cycles</td>
<td>40,000 Flt cycles</td>
<td>45,000 Flt cycles</td>
</tr>
<tr>
<td>Airbus A310-200</td>
<td>79,000 Flt hours</td>
<td>60,000 Flt hours</td>
<td>105,000 Flt hours</td>
</tr>
<tr>
<td>Airbus A320-100</td>
<td>39,000 Flt cycles</td>
<td>48,000 Flt cycles</td>
<td>48,000 Flt cycles</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Extension in review</td>
</tr>
<tr>
<td>Boeing 727</td>
<td>80,000 Flt cycles</td>
<td>60,000 Flt cycles</td>
<td>100,000 Flt cycles</td>
</tr>
<tr>
<td>Boeing 737 Classics</td>
<td>92,000 Flt cycles</td>
<td>75,000 Flt cycles</td>
<td>100,000 Flt cycles</td>
</tr>
<tr>
<td>Boeing 747 Classics</td>
<td>37,000 Flt cycles</td>
<td>20,000 Flt cycles</td>
<td>35,000 Flt cycles</td>
</tr>
<tr>
<td>Boeing 757</td>
<td>47,000 Flt cycles</td>
<td>50,000 Flt cycles</td>
<td>75,000 Flt cycles</td>
</tr>
<tr>
<td>Boeing 767</td>
<td>50,000 Flt cycles</td>
<td>50,000 Flt cycles</td>
<td>75,000 Flt cycles</td>
</tr>
<tr>
<td>DC-9</td>
<td>105,000 Flt cycles</td>
<td>40,000 Flt cycles</td>
<td>110,000 Flt cycles</td>
</tr>
<tr>
<td>MD-80</td>
<td>55,000 Flt cycles</td>
<td>50,000 Flt cycles</td>
<td>110,000 Flt cycles</td>
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<tr>
<td>DC-10</td>
<td>46,000 Flt cycles</td>
<td>42,000 Flt cycles</td>
<td>60,000 Flt cycles</td>
</tr>
<tr>
<td>MD-11</td>
<td>13,000 Flt cycles</td>
<td>20,000 Flt cycles</td>
<td>30,000 Flt cycles</td>
</tr>
<tr>
<td></td>
<td>71,000 Flt hours</td>
<td>60,000 Flt hours</td>
<td>Flight hours in review</td>
</tr>
</tbody>
</table>
## Number of Affected Airplanes

January 2008 US Operator Fleet  
DSG & LOV Status  
(Does Not Include Airbus Airplanes)

<table>
<thead>
<tr>
<th></th>
<th>Passenger</th>
<th>Cargo</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Airplanes</strong></td>
<td>3,626</td>
<td>712</td>
<td>4,338</td>
</tr>
<tr>
<td><strong>Airplanes over DSG</strong></td>
<td>3</td>
<td>45</td>
<td>48</td>
</tr>
<tr>
<td><strong>Airplanes over LOV</strong></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Airplanes over 90% of LOV</strong></td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Airplanes over 80% of LOV</strong></td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>Airplanes over 75% of LOV</strong></td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>
Estimated Cost Assumptions

• **DAHs’ costs are $0**
  - Airbus: in compliance
  - Boeing: minimal cost
  - Lockheed: minimal cost

• **Operators’ costs are $4 Million**
  - We assume no LOV extensions
  - At LOV we estimate the full loss of retiring an airplane
  - Based on flight cycles, we assume only 2 airplanes are retired
  - There are no repairs and alterations expenses
  - Maintenance actions would be required with or without rule
    - Maintenance actions based on rule would be planned – less expensive
    - Maintenance actions based on in-service findings would be done on emergency basis – more expensive
# Estimated Costs Summary (Present Value)

<table>
<thead>
<tr>
<th></th>
<th>NPRM (Millions)</th>
<th>Draft Final Rule (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAH</td>
<td>$36</td>
<td>$0</td>
</tr>
<tr>
<td>Operator –</td>
<td>$164</td>
<td>$0</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operator –</td>
<td>$160</td>
<td>$4</td>
</tr>
<tr>
<td>Retirement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$360</td>
<td>$4</td>
</tr>
</tbody>
</table>
Benefits

Rule represents $12.9M in benefits with a present value of $7.2M

- Near elimination of emergency ADs

- Avoidance of 1.5 days of out-of-service downtime for each airplane
  (In 10 of the 15 emergency ADs issued for WFD so far, we identified 2,356 affected airplanes. Each of these airplanes lost an average of 1.5 days of service. This rule will prevent such emergency maintenance downtime.)

- Potential accident avoidance - current maintenance programs have missed WFD

- Without rule, 2 airplanes would fly beyond LOV
Summary

• Changes from the NPRM to the draft final rule and changes to assumptions about airplane retirement are reflected in substantially lower costs and benefits

• Present value costs fell from $360 million to $4 million

• Improved maintenance programs will result in less out-of-service costs

• Benefits > Costs