



U.S. Department of  
Transportation  
Office of the Secretary  
of Transportation

The Inspector General

Office of Inspector General  
Washington, D.C. 20590

September 7, 2006

The Honorable James L. Oberstar  
United States House of Representatives  
Washington, DC 20515

Dear Representative Oberstar:

This is in response to your May 30, 2006, letter requesting that we review the implementation of the Federal Aviation Administration's (FAA) Aging Airplane Safety Rule.<sup>1</sup> Specifically, you requested that we evaluate FAA's oversight of air carriers' aging aircraft programs to determine whether these programs are effective in managing and detecting issues associated with aging aircraft fleets and whether vulnerabilities exist in the commercial aviation industry due to aging aircraft. We briefed your staff on the results of our review and, as requested, are providing a summary of our observations. Further details on the results of our review and the specific work we performed can be found in the enclosure to this letter.

Two of the main factors that prompted FAA and the aviation industry to develop the Aging Airplane Program were the 1988 Aloha Airlines accident and the fact that airplanes were being operated beyond their original design goals. The Program was intended to preserve the structural integrity of the aging aircraft fleet. The 1988 Aloha Airlines accident also prompted the Aging Aircraft Safety Act of 1991,<sup>2</sup> which you sponsored. The Act required FAA to perform aircraft inspections and records reviews of each aircraft used in air transportation. To implement the Act's requirements, FAA issued the final Aging Airplane Safety Rule in 2005 and amended the Program to require certain operators to perform supplemental inspections of their aircraft.

Specifically, the Aging Airplane Safety Rule required that:

- FAA perform aircraft inspection and records reviews of each multi-engine airplane—14 years and older—used in scheduled operations and

<sup>1</sup> Aging Airplane Safety Rule, 70 F.R. 5518 (February 2, 2005).

<sup>2</sup> Aging Aircraft Safety Act of 1991, Pub. L. No. 102-143 (1991).

- *Operators* using aircraft with 30 or more seats perform supplemental inspections (detailed engineering reviews) of areas susceptible to cracks and corrosion. Supplemental inspections are based on complex engineering standards that are used to predict the amount of time the aircraft could continue to operate with damage, such as corrosion.

These requirements are significant first steps in attempting to mitigate the potential hazards for large aging transport and cargo aircraft fleets. FAA has other initiatives underway that could enhance current aging aircraft requirements for these operators. For example, FAA recently issued an additional rulemaking addressing potential structural damage that occurs over extended periods of time.<sup>3</sup> FAA has also initiated a task force to address general aviation aging aircraft issues. However, vulnerabilities still remain in aging aircraft inspection requirements for certain passenger air carrier and cargo aircraft fleets.

FAA's Aging Airplane Safety Rule requires that *FAA inspectors* perform reviews of aircraft maintenance records and visual spot inspections of certain aircraft; therefore, sub-surface cracks or hidden corrosion would be impossible to detect. The process does not require a focus on airplane fatigue cracks or crack growth, and these deteriorations can only be detected through supplemental inspections. For example, 2 months before the fatal Chalks Ocean Airways accident of December 2005, FAA completed an aging Airplane Inspection and Records Review on the aircraft, and no structural issues were noted during the review. But the National Transportation Safety Board's (NTSB) preliminary report<sup>4</sup> on the Chalks Ocean Airways accident indicates that fatigue cracking was evident in both wings. This incident shows that for those aircraft only covered under FAA's Aircraft Inspection and Records Review process, the structural integrity of the aircraft cannot be assured.

Additionally, we noted that FAA's Aircraft Inspection and Records Review process does not address three categories of aircraft. These categories are:

1. All *single-engine* airplanes under Part 91<sup>5</sup> (general aviation) and Part 135 scheduled and non-scheduled airplane operations with nine or fewer passenger seats. For example, we identified a Part 135 operator based in the State of Washington that operated over 1,300 scheduled flights in 2002 using a fleet with an average aircraft age of 39 years old. Many of these operators fly in harsh environmental conditions, such as those experienced by Chalks Ocean Airways.

<sup>3</sup> FAA Notice of Proposed Rulemaking, Widespread Fatigue Damage, issued April 18, 2006.

<sup>4</sup> NTSB Preliminary Report Number DCA06MA010.

<sup>5</sup> Part 91 and Part 135, 14 C.F.R. § 91 (revised January 1, 2006) and 135 (revised January 1, 2003).

2. All *multi-engine* airplanes used in non-scheduled (on-demand) passenger and cargo carrying operations under Part 135. We identified over 2,000 certificated on-demand Part 135 operators.
3. All *operators'* airplanes flying point-to-point within Alaska, regardless of operation or seating capacity. We identified 225 certificated on-demand or scheduled operators in Alaska. These operators fly under tremendously harsh environmental conditions, which could accelerate aging aircraft issues.

As part of FAA's Cost Benefit Analysis for the final Aging Airplane Safety Rule, the Agency determined that "it would be costly for operators to develop inspection programs..." for those operators that were not covered under the rule. As a result, a significant number of aging aircraft are not covered under any aging aircraft program, as shown in the chart below.

<b><u>Type of Operation</u></b>	<b><u>Operator Inspections</u></b> Supplemental Inspections	<b><u>FAA Inspectors</u></b> Inspection & Records Review
<b>Multi-Engine/Scheduled Operators With 30+ seats</b> (including Part 121 cargo)	Required	Required
<b>Multi-Engine/Scheduled Operators Below 30 seats</b>	Not Required	Required
<b>Multi-Engine/On-Demand Operators</b> (including Part 135 cargo)	Not Required	Not Required
<b>Single-Engine Operators</b>	Not Required	Not Required
<b>Alaska Operators</b> (flights within the State)	Not Required	Not Required

The gap in the aging aircraft program coverage, coupled with the limitations of the Aircraft Inspection and Records Review process, indicates that aging aircraft vulnerabilities still exist in portions of the U.S. aviation fleet. During its investigation of the Chalks Ocean Airways accident, NTSB identified similar vulnerabilities. In its July 2006 Safety Recommendation to FAA,<sup>6</sup> NTSB stated that the exemptions present

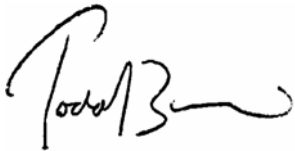
<sup>6</sup> National Transportation Safety Board Safety Recommendation, A-06-52, July 25, 2006.

in FAA's final rule are contrary to the Agency's one-level-of-safety initiative, which was developed in the mid 1990s, and to the instructions in the Aging Aircraft Safety Act of 1991. As a result, NTSB recommended that FAA require a records review, aging airplane inspections, and supplemental inspections for all airplanes operated under 14 Code of Federal Regulations (CFR) Part 121, all U.S. registered airplanes operated under 14 CFR 129, and all airplanes in scheduled operations under 14 CFR Part 135.

The Chalks Ocean Airways accident highlighted the importance of ensuring the structural integrity of older aircraft. FAA, Congress, and the aviation industry have made significant strides in this area. However, as operators continue to operate aircraft beyond their original design service goals, aging aircraft will continue to be an area that bears watching.

If we can answer any questions or be of further assistance, please feel free to contact me at (202) 366-1959 or David A. Dobbs, Acting Principal Assistant Inspector General for Auditing and Evaluation, at (202) 366-0500.

Sincerely,

A handwritten signature in black ink, appearing to read "Todd J. Zinser", with a stylized flourish at the end.

Todd J. Zinser  
Acting Inspector General

Enclosure



## Briefing on FAA's Aging Airplane Program



U.S. Department of Transportation  
Office of Inspector General

For the Committee on Transportation and Infrastructure

U.S. House of Representatives

## SUMMARY OF OIG WORK

- **To obtain information on FAA's implementation and oversight of the Aging Airplane Program, we contacted or visited the following entities:**
  - FAA Headquarters—obtained briefing on aging aircraft program.
  - National Institute for Aviation Research, Wichita State University—obtained information on a study commissioned by FAA on aging general aviation aircraft. *(See Appendix A)*
  - NTSB—met with investigators on the Chalks Ocean Airways (Chalks) accident.

## SUMMARY OF OIG WORK *(continued)*

- **With a focus on aging aircraft structures, we also:**
  - Researched applicable laws and rules.
  - Attended applicable conferences on aging aircraft.
  - Shadowed an FAA inspector during an aging aircraft inspection.
  - Analyzed FAA databases for operator information, including aircraft ages and FAA aging aircraft inspection information.

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## SUMMARY OF OIG WORK *(continued)*

- **General Findings and Comments:**
  - **All aircraft are required to have a records review and aircraft inspection by FAA, with the exception of:**
    - single engine aircraft,
    - aircraft used in on-demand operations, and
    - aircraft used in operations in Alaska.
  - **The Inspection and Records Reviews performed by FAA are very limited.**
    - For example, the inspections are visual inspections only, so subsurface corrosion or cracks would not be identified—e.g., Chalks.

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## SUMMARY OF OIG WORK *(continued)*

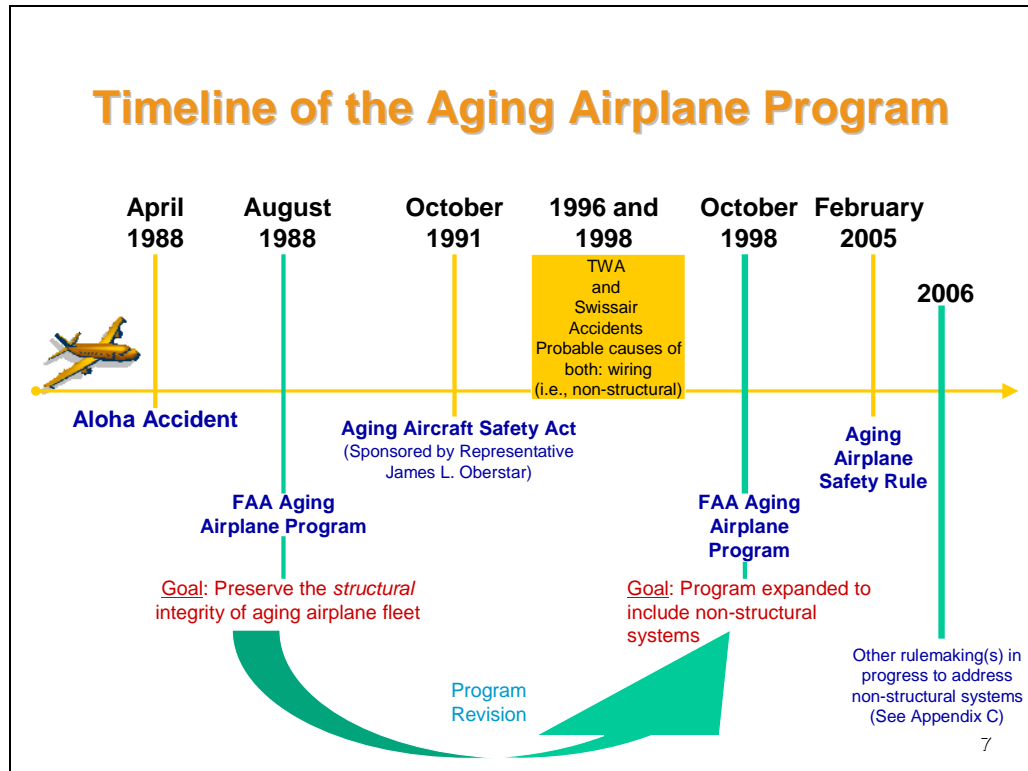
- **General Findings and Comments** *(continued)*:
  - Operators using aircraft with 30 or more seats are required to include supplemental inspections (detailed engineering reviews) of areas susceptible to cracks and corrosion—this becomes part of the operator’s maintenance program.
  - All other operators are not required to have these in-depth inspections.

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## Background

- **Working with the aviation industry, FAA developed an Aging Airplane Program in response to:**
  - Airplanes being operated beyond original design service goals.
  - Determination that original manufacturers’ maintenance plans were not required to address potential age-related issues.
  - 1988 Aloha B-737 accident.
    - *Probable Cause: Aloha’s failure to detect structural damage*
- **FAA revised the Aging Airplane Program in response to:**
  - The Aging Aircraft Safety Act of October 1991, sponsored by Representative James L. Oberstar.
  - The 1996 TWA 800 and 1998 Swissair accidents, which highlighted wiring issues related to aging aircraft.
- **The Aging Airplane Safety Rule was issued in 2005 to implement the 1991 Oberstar Act and to require certain operators to perform supplemental inspections of their aircraft**
  - Ultimately, FAA decided to address wiring (i.e., non-structural) issues in a separate rulemaking to be issued at a later date.

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## Background

### Aging Aircraft Safety Act— October 1991

- **Requires FAA to initiate a rule to assure the continuing airworthiness of aging aircraft.**
- **Requires FAA to perform an Inspection and Records Review of each aircraft air carriers use to provide air transportation.**
  - Inspection must show that maintenance of the aircraft's structure, skin, and other age-sensitive parts has been adequate and timely.
  - Inspections should be conducted as part of a heavy maintenance check after 14 years of service.



## **Rulemaking**

### **Aging Airplane Safety Rule – February 2005**

- **The Final Rule was issued to implement the 1991 Aging Aircraft Safety Act and to require certain operators to perform supplemental inspections on their aircraft.** (See Appendix B for Summary of Requirements)
  - Requires an FAA Inspection and Records Review of each multi-engine airplane—14 years and older—used in scheduled operation.
    - Airplanes over 24 years in service, must be inspected by 12/07.
    - Airplanes over 14 years but not yet 24 years, must be inspected by 12/08.
  - Requires operators to incorporate Damage Tolerance (DT) based inspections for airplanes with 30 or more passenger seats by specified deadlines.
    - DT inspections are based on predictive engineering analysis performed to provide early detection of fatigue cracks, including specific analysis of repairs, alterations, and modifications to the aircraft.
    - Operators must have a program in place by December 2010.

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## **Rule Requirements - FAA**

### **Inspection and Records Review**

**Per the 1991 Act, FAA is required to conduct an aging airplane Inspection and Records Review for each multi-engine airplane used in scheduled commercial service.**

- **FAA must perform a routine *visual* inspection of each airplane during a maintenance check and review the maintenance records of each airplane.**
  - Records Review –FAA will determine the number of years the airplane has been in service and the number of flight cycles and flight hours of the aircraft. In addition, FAA will determine whether the airplane is in compliance with all applicable Airworthiness Directives (ADs) and whether all age-sensitive parts have been replaced in a timely manner.
    - ADs are notifications to aircraft owner/operators of a known safety issue with a particular model of aircraft.
  - Airplane Inspection –FAA is required to perform a spot inspection of each airplane, looking for cracks and corrosion.

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## Rule Requirements - FAA

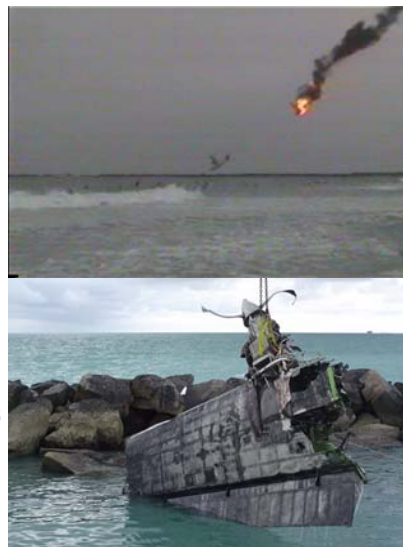
### Inspection and Records Review *(continued)*

- **Inspection and Record Reviews can be conducted by:**
  - *FAA Inspectors;*
  - *Designated Airworthiness Representatives (DAR)*—individual appointed by FAA to perform examination, inspection, and testing services necessary to issue FAA certificates; or
  - *Organizational Designated Airworthiness Representatives (ODAR)*—an organization (e.g., manufacturer or operator) appointed by FAA that collectively meets the experience and technical requirements of an individual DAR.

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## Weaknesses in the Inspection and Records Review Process

- **The process used does not require a focus on airplane fatigue cracks or crack growth (this would be accomplished through supplemental inspections).**
- **Because the inspections are only visual in nature, the inspections will not identify subsurface cracks or hidden corrosion.**
- **Example: Chalks Ocean Airways**
  - The accident airplane had an FAA aging airplane Inspection and Records Review 2 months prior to the fatal accident—no structural issues were noted by FAA. However, initial NTSB evidence points to fatigue cracking in both wings.
- **Under FAA's final rule, aircraft built before 1958 are exempt from supplemental inspections. Therefore, even if this category of aircraft would have been included in the final rule, the operator would have been exempt from performing supplemental inspections because this aircraft was built in 1947.**



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## **Rule Requirements - FAA**

### **Inspection and Records Review**

#### **■ Airplanes Not Covered**

- All single-engine airplanes under 14 CFR Part 91 (Part 91). Part 135 scheduled and non-scheduled airplane operations with nine or fewer passenger seats.
  
- Multi-engine airplanes used in non-scheduled (on-demand) passenger carrying operations under Part 135.
  
- Operators' airplanes that fly point-to-point only in the State of Alaska.

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## **Rule Requirements - Operators**

### **Supplemental Airframe Inspections**

**(Required for operators of aircraft with 30 or more seats,  
except those operated in Alaska)**

- The maintenance program for the airplane must include FAA-approved damage tolerance-based inspections and procedures for those structures susceptible to fatigue cracking.
  
- Damage tolerance-based inspections are inspections performed by operators based on complex engineering standards that are used to predict airplane structural cracks and corrosion.
  - Example—These inspections should help determine the amount of time that the aircraft could continue to operate with damage present.

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## Rule Requirements - Operators

### Supplemental Airframe Inspections

#### ■ Airplanes Not Covered

- All airplanes under Part 91 and 135 (scheduled, on-demand, and cargo)
- All Part 121 airplanes with fewer than 30 passenger seats (e.g., Chalks)
- All airplanes flying point-to-point only in the State of Alaska

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## Aging Airplane Inspection Coverage

### 1. Airplanes / Operations Covered by Inspection and Records Review Only (i.e., operator is not required to perform Supplemental Inspections)

#### Multi-engine airplanes with less than 30 passenger seats, used for scheduled operations

- Example: A Part 121 / 135 scheduled operator in Massachusetts
    - 49 Cessna 400 series multi-engine airplanes\* with 9 passenger seats.
    - Fleet average age is 25 years.
    - Harsh environmental conditions like Chalks operations.
  - Aircraft in this category are not built to be torn down for Supplemental Inspections—Example: major attachments such as wing-to-fuselage attachments are not removed and inspected because of the aircraft design.
  - According to FAA and industry, operators in this category would suffer an economic burden if they were required to implement Supplemental Inspection Programs.
  - Average age of aircraft in this category is 35 years and will be 50 years in 2020.
- \* *Cessna 400 series airplanes are said to be indicative of the Part 135 fleet. There are 367 Cessna 400 series aircraft in Part 135 service. These particular airplanes have a history of critical cracks and corrosion on engines and flight controls (see Appendix A).*

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## Aging Airplane Inspection Coverage

### 2. Airplanes / Operations Not Under *Any* Aging Airplane Program

(i.e., required Supplemental Inspection or Inspection and Records Review)

- All single-engine airplanes
- There are 2,438 U.S. registered single-engine airplanes (excluding Part 91).
  - Example: A Part 135 operator in Washington State
    - ➔ 24 single-engine airplanes (18 are seaplanes).
    - ➔ All are commuter or on-demand airplanes (i.e., nine passengers or less).
    - ➔ 1,346 scheduled departures in 2002.
    - ➔ Harsh environmental conditions like Chalks operations.
    - ➔ Fleet average age is 39 years (range from 6 to 54 years).

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## Aging Airplane Inspection Coverage

### 2. Airplanes / Operations Not Under *Any* Aging Airplane Program

(continued)

- **Part 135 on-demand** —There are 2,016 Certificated Operators
  - Example: An on-demand passenger and cargo carrier in California
    - ➔ 16 single and multi-engine airplanes, including 9 Cessna 400 series.
- **Part 135 air cargo**
  - Example: A large air cargo operator in California
    - ➔ Largest U.S. Part 135 cargo carrier—170+ multi-engine airplanes and 525 daily departures.
    - ➔ Destinations in 30 U.S. states, Canada, Mexico, and the Caribbean.

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## Aging Airplane Inspection Coverage

### 2. Airplanes / Operations Not Under Any Aging Airplane Program (continued)

- **All Airplanes Operated Within the State of Alaska** (exempt from rule)
  - 10,518 registered airplanes.
  - There are 225 air carriers certified in Alaska as either on-demand or scheduled carriers.
  - Example: A Part 121 / 135 passenger carrier in Alaska
    - 13 multi-engine airplanes (19 to 37 passenger seats).
    - Fleet average age is 27 years old.
    - Approximately 695 weekly scheduled departures.
- **General Aviation Part 91—privately owned airplanes**

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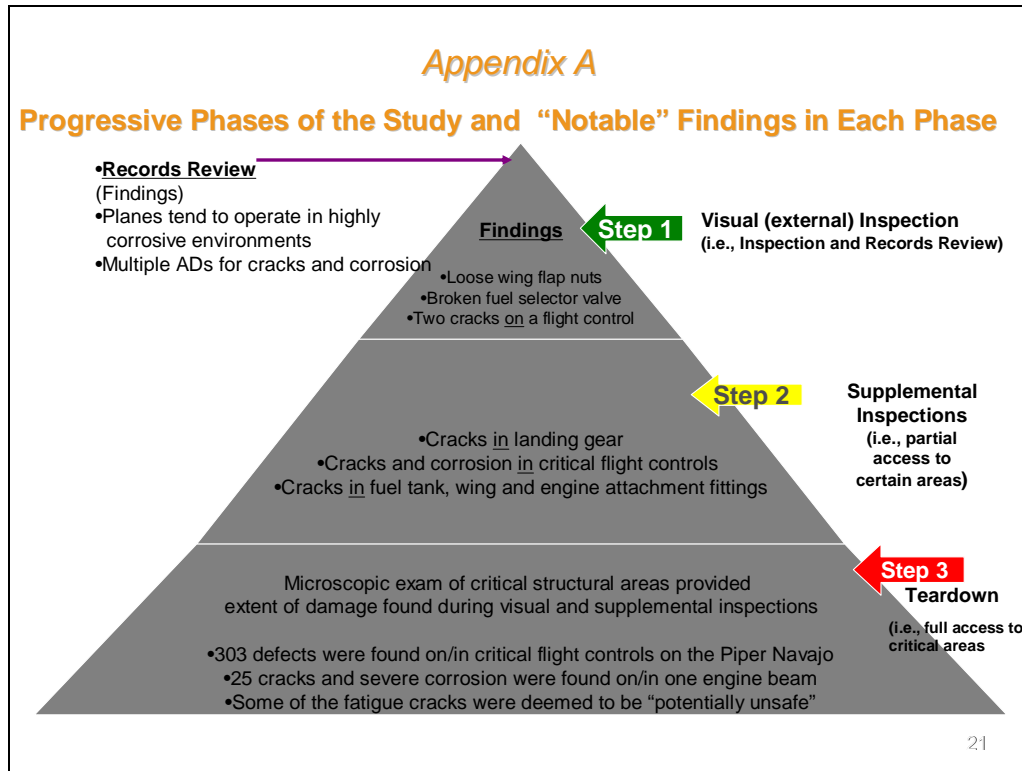
### Appendix A

## FAA / Wichita State University Study



- FAA established a research program at the National Institute for Aviation Research, *Wichita State University* to conduct destructive testing of aged general aviation aircraft to determine if potential airworthiness problems exist for the fleet as a result of the aging process.
- Study included destructive testing of three airplanes used in commuter service—a 1969 Cessna 402A, a 1979 Cessna 402C, and a 1975 Piper Navajo Chieftain. These aircraft were determined to be representative of the small airplane fleet.
- Compared results of routine visual inspections (i.e., similar to FAA's Inspection and Records Reviews) with air carrier supplemental Inspections and teardown inspections.

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**Appendix A**

**FAA / Wichita State University**

**Recommendations**

- “Maintenance inspection programs for General Aviation (GA) airplanes [including Part 135] and Alaska operators should include Supplemental Inspections based on either Service History or Damage Tolerance (DT) analysis.”
- “Teardown evaluations should be expanded to other models of GA airplanes that do not have Supplemental Inspections developed for them” (e.g., Piper airplanes).



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*Appendix B*  
**Summary of Aging Airplane Program Requirements**

Type of Operation	<u>Operator Inspections</u>	<u>FAA Inspectors</u>
	Supplemental Inspections	Inspection & Records Review
<b>Multi-Engine / Scheduled Operators with 30+ Seats</b> (including Part 121 cargo)	Required	Required
<b>Multi-Engine / Scheduled Operators Below 30 seats</b>	Not Required	Required
<b>Multi-Engine / On-Demand Operators</b> (including Part 135 cargo)	Not Required	Not Required
<b>Single-Engine Operators</b>	Not Required	Not Required
<b>Alaska Operators</b> (flights within the State)	Not Required	Not Required

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*Appendix C*  
**FAA Initiatives**

1. **Widespread Fatigue Damage (WFD)** - Simultaneous presence of cracks at multiple structural locations on the aircraft that are of sufficient size and density that the structure will no longer meet residual strength requirements.
  - Proposed rule, issued April 18, 2006, will establish operational limits for transport category aircraft 75,000 pounds and greater in order to preclude widespread fatigue damage. (Airplanes in this category range from regional jets to large transport category airplanes (e.g., B-747) The comment period was extended to September 18, 2006.
  - Applies to aircraft manufacturers and operators. Rule will require the development and incorporation of maintenance procedures to preclude widespread fatigue damage prior to the airplane reaching an established operational limit.
  - Operation beyond the established limit would be prohibited unless operators have established WFD detection procedures into their maintenance program. If WFD goes undetected, it could lead to catastrophic failure due to a reduction in strength
2. **General Aviation Committees**- Committees of FAA and non-FAA stakeholders were developed to establish proposals to address the top seven aging aircraft issues facing general aviation, including: defining the term "aging," education and training for owners and operators, repair data availability, and approved parts availability.

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**The following section contains the plain text version of the graphic enclosure, according to Section 508 requirements.**



# **Briefing on FAA's Aging Airplane Program**



**U.S. Department of Transportation  
Office of Inspector General**

**For the Committee on Transportation and Infrastructure**

**U.S. House of Representatives**

# SUMMARY OF OIG WORK

- **To obtain information on FAA's implementation and oversight of the Aging Airplane Program, we contacted or visited the following entities:**
  - FAA Headquarters—obtained briefing on aging aircraft program.
  - National Institute for Aviation Research, Wichita State University—obtained information on a study commissioned by FAA on aging general aviation aircraft. (*See Appendix A*)
  - NTSB—met with investigators on the Chalks Ocean Airways (Chalks) accident.

# SUMMARY OF OIG WORK *(continued)*

- **With a focus on aging aircraft structures, we also:**
  - Researched applicable laws and rules.
  - Attended applicable conferences on aging aircraft.
  - Shadowed an FAA inspector during an aging aircraft inspection.
  - Analyzed FAA databases for operator information, including aircraft ages and FAA aging aircraft inspection information.

# SUMMARY OF OIG WORK *(continued)*

- **General Findings and Comments:**
  - **All aircraft are required to have a records review and aircraft inspection by FAA, with the exception of:**
    - single engine aircraft,
    - aircraft used in on-demand operations, and
    - aircraft used in operations in Alaska.
  - **The Inspection and Records Reviews performed by FAA are very limited.**
    - For example, the inspections are visual inspections only, so subsurface corrosion or cracks would not be identified—e.g., Chalks.

# SUMMARY OF OIG WORK *(continued)*

## – General Findings and Comments *(continued)*:

- **Operators using aircraft with 30 or more seats are required to include supplemental inspections (detailed engineering reviews) of areas susceptible to cracks and corrosion—this becomes part of the operator’s maintenance program.**
- **All other operators are not required to have these in-depth inspections.**

# Background

- **Working with the aviation industry, FAA developed an Aging Airplane Program in response to:**
  - Airplanes being operated beyond original design service goals.
  - Determination that original manufacturers' maintenance plans were not required to address potential age-related issues.
  - 1988 Aloha B-737 accident.
    - *Probable Cause: Aloha's failure to detect structural damage*
- **FAA revised the Aging Airplane Program in response to:**
  - The Aging Aircraft Safety Act of October 1991, sponsored by Representative James L. Oberstar.
  - The 1996 TWA 800 and 1998 Swissair accidents, which highlighted wiring issues related to aging aircraft.
- **The Aging Airplane Safety Rule was issued in 2005 to implement the 1991 Oberstar Act and to require certain operators to perform supplemental inspections of their aircraft**
  - Ultimately, FAA decided to address wiring (i.e., non-structural) issues in a separate rulemaking to be issued at a later date.

# Timeline of the Aging Airplane Program

- April 1988 – Aloha Airlines Accident
- August 1988 – FAA Aging Airplane Program. Goal: Preserve the *structural* integrity of aging airplane fleet
- October 1991 – Aging Aircraft Safety Act (Sponsored by Representative James L. Oberstar)
- 1996 and 1998 – TWA and Swissair Accidents. Probable causes of both: wiring (i.e. non-structural)
- October 1998 – FAA Aging Airplane Program; Program Revision. Goal: Program expanded to include non-structural systems
- February 2005 – Aging Airplane Safety Rule
- 2006 – Other rulemaking(s) in progress to address non-structural systems (See Appendix C)



# Background

## Aging Aircraft Safety Act— October 1991

- **Requires FAA to initiate a rule to assure the continuing airworthiness of aging aircraft.**
- **Requires FAA to perform an Inspection and Records Review of each aircraft air carriers use to provide air transportation.**
  - Inspection must show that maintenance of the aircraft's structure, skin, and other age-sensitive parts has been adequate and timely.
  - Inspections should be conducted as part of a heavy maintenance check after 14 years of service.

# Rulemaking

## Aging Airplane Safety Rule – February 2005

- **The Final Rule was issued to implement the 1991 Aging Aircraft Safety Act and to require certain operators to perform supplemental inspections on their aircraft.** (See Appendix B for Summary of Requirements)
  - Requires an FAA Inspection and Records Review of each multi-engine airplane—14 years and older—used in scheduled operation.
    - Airplanes over 24 years in service, must be inspected by 12/07.
    - Airplanes over 14 years but not yet 24 years, must be inspected by 12/08.
  - Requires operators to incorporate Damage Tolerance (DT) based inspections for airplanes with 30 or more passenger seats by specified deadlines.
    - DT inspections are based on predictive engineering analysis performed to provide early detection of fatigue cracks, including specific analysis of repairs, alterations, and modifications to the aircraft.
    - Operators must have a program in place by December 2010.

# Rule Requirements – FAA

## Inspection and Records Review

**Per the 1991 Act, FAA is required to conduct an aging airplane Inspection and Records Review for each multi-engine airplane used in scheduled commercial service.**

- **FAA must perform a routine *visual* inspection of each airplane during a maintenance check and review the maintenance records of each airplane.**
  - Records Review –FAA will determine the number of years the airplane has been in service and the number of flight cycles and flight hours of the aircraft. In addition, FAA will determine whether the airplane is in compliance with all applicable Airworthiness Directives (ADs) and whether all age-sensitive parts have been replaced in a timely manner.
    - ADs are notifications to aircraft owner/operators of a known safety issue with a particular model of aircraft.
  - Airplane Inspection –FAA is required to perform a spot inspection of each airplane, looking for cracks and corrosion.

# Rule Requirements – FAA

## Inspection and Records Review (continued)

- **Inspection and Record Reviews can be conducted by:**
  - *FAA Inspectors;*
  - *Designated Airworthiness Representatives (DAR)—individual appointed by FAA to perform examination, inspection, and testing services necessary to issue FAA certificates; or*
  - *Organizational Designated Airworthiness Representatives (ODAR)—an organization (e.g., manufacturer or operator) appointed by FAA that collectively meets the experience and technical requirements of an individual DAR.*

# Weaknesses in the Inspection and Records Review Process

- The process used does not require a focus on airplane fatigue cracks or crack growth (this would be accomplished through supplemental inspections).
- Because the inspections are only visual in nature, the inspections will not identify subsurface cracks or hidden corrosion.
- Example: Chalks Ocean Airways
  - The accident airplane had an FAA aging airplane Inspection and Records Review 2-months prior to the fatal accident—no structural issues were noted by FAA. However, initial NTSB evidence points to fatigue cracking in both wings.
- Under FAA's final rule, aircraft built before 1958 are exempt from supplemental inspections. Therefore, even if this category of aircraft would have been included in the final rule, the operator would have been exempt from performing supplemental inspections because this aircraft was built in 1947.



Picture of Chalks accident airplane about to hit the water with a column of smoke and flames trailing



Picture of separated wing and engine being lifted from the water

# Rule Requirements - FAA

## Inspection and Records Review

- **Airplanes Not Covered**

- All single-engine airplanes under 14 CFR Part 91 (Part 91). Part 135 scheduled and non-scheduled airplane operations with nine or fewer passenger seats.
- Multi-engine airplanes used in non-scheduled (on-demand) passenger carrying operations under Part 135.
- Operators' airplanes that fly point-to-point only in the State of Alaska.

# Rule Requirements - Operators

## Supplemental Airframe Inspections

(Required for operators of aircraft with 30 or more seats,  
except those operated in Alaska)

- The maintenance program for the airplane must include FAA-approved damage tolerance-based inspections and procedures for those structures susceptible to fatigue cracking.
- Damage tolerance-based inspections are inspections performed by operators based on complex engineering standards that are used to predict airplane structural cracks and corrosion.
  - Example—These inspections should help determine the amount of time that the aircraft could continue to operate with damage present.

# Rule Requirements - Operators

- Supplemental Airframe Inspections

- Airplanes Not Covered

- All airplanes under Part 91 and 135 (scheduled, on-demand, and cargo)
- All Part 121 airplanes with fewer than 30 passenger seats (e.g., Chalks)
- All airplanes flying point-to-point only in the State of Alaska



# Aging Airplane Inspection Coverage

## 1. Airplanes / Operations Covered by Inspection and Records Review Only

(i.e., operator is not required to perform Supplemental Inspections)

### Multi-engine airplanes with less than 30 passenger seats, used for scheduled operations

- Example: A Part 121 / 135 scheduled operator in Massachusetts
  - 49 Cessna 400 series multi-engine airplanes\* with 9 passenger seats.
  - Fleet average age is 25 years.
  - Harsh environmental conditions like Chalks operations.
- Aircraft in this category are not built to be torn down for Supplemental Inspections—Example: major attachments such as wing-to-fuselage attachments are not removed and inspected because of the aircraft design.
- According to FAA and industry, operators in this category would suffer an economic burden if they were required to implement Supplemental Inspection Programs.
- Average age of aircraft in this category is 35 years and will be 50 years in 2020.

\* *Cessna 400 series airplanes are said to be indicative of the Part 135 fleet. There are 367 Cessna 400 series aircraft in Part 135 service. These particular airplanes have a history of critical cracks and corrosion on engines and flight controls (see Appendix A).*

# Aging Airplane Inspection Coverage

## 2. Airplanes / Operations Not Under *Any* Aging Airplane Program

(i.e., required Supplemental Inspection or Inspection and Records Review)

- All single-engine airplanes
- There are 2,438 U.S. registered single-engine airplanes (excluding Part 91).
  - Example: A Part 135 operator in Washington State
    - » 24 single-engine airplanes (18 are seaplanes).
    - » All are commuter or on-demand airplanes (i.e., nine passengers or less).
    - » 1,346 scheduled departures in 2002.
    - » Harsh environmental conditions like Chalks operations.
    - » Fleet average age is 39 years (range from 6 to 54 years).

# Aging Airplane Inspection Coverage

## 2. Airplanes / Operations Not Under Any Aging Airplane Program (continued)

- **Part 135 on-demand** —There are 2,016 **Certificated Operators**
  - Example: An on-demand passenger and cargo carrier in California
    - » 16 single and multi-engine airplanes, including 9 Cessna 400 series.
- **Part 135 air cargo**
  - Example: A large air cargo operator in California
    - » Largest U.S. Part 135 cargo carrier—170+ multi-engine airplanes and 525 daily departures.
    - » Destinations in 30 U.S. states, Canada, Mexico, and the Caribbean.

# Aging Airplane Inspection Coverage

## 2. Airplanes / Operations Not Under Any Aging Airplane Program (continued)

- **All Airplanes Operated Within the State of Alaska** (exempt from rule)
  - 10,518 registered airplanes.
  - There are 225 air carriers certified in Alaska as either on-demand or scheduled carriers.
  - Example: A Part 121 / 135 passenger carrier in Alaska
    - » 13 multi-engine airplanes (19 to 37 passenger seats).
    - » Fleet average age is 27 years old.
    - » Approximately 695 weekly scheduled departures.
- **General Aviation Part 91—privately owned airplanes**

## Appendix A

# FAA / Wichita State University Study



- FAA established a research program at the National Institute for Aviation Research, *Wichita State University* to conduct destructive testing of aged general aviation aircraft to determine if potential airworthiness problems exist for the fleet as a result of the aging process.
- Study included destructive testing of three airplanes used in commuter service—a 1969 Cessna 402A, a 1979 Cessna 402C, and a 1975 Piper Navajo Chieftain. These aircraft were determined to be representative of the small airplane fleet.
- Compared results of routine visual inspections (i.e., similar to FAA’s Inspection and Records Reviews) with air carrier supplemental Inspections and teardown inspections.

## Appendix A

# Progressive Phases of the Study and “Notable” Findings in Each Phase

- Records Review – Findings:
  - Planes tend to operate in highly corrosive environments
  - Multiple ADs for cracks and corrosion
- Step 1 – Visual (external) Inspection (i.e., Inspection and Records Review)  
Findings:
  - Loose wing flap nuts
  - Broken fuel selector valve
  - Two cracks on a flight control
- Step 2 – Supplemental Inspections (i.e., partial access to certain areas)  
Findings:
  - Cracks in landing gear
  - Cracks and corrosion in critical flight controls
  - Cracks in fuel tank, wing and engine attachment fittings
- Step 3 – Teardown (i.e. full access to critical areas)  
Findings:
  - Microscopic exam of critical structural areas provided extent of damage found during visual and supplemental inspections
    - 303 defects were found on/in critical flight controls on the Piper Navajo
    - 25 cracks and severe corrosion were found on/in one engine beam
    - Some of the fatigue cracks were deemed to be “potentially unsafe”

# FAA / Wichita State University

## Recommendations

- **“Maintenance inspection programs for General Aviation (GA) airplanes [including Part 135] and Alaska operators should include Supplemental Inspections based on either Service History or Damage Tolerance (DT) analysis”**
- **“Teardown evaluations should be expanded to other models of GA airplanes that do not have Supplemental Inspections developed for them” [e.g. Piper airplanes]**



Picture of separated wing from an unknown GA airplane sitting in the grass

*Appendix B*  
**Summary of Aging Airplane Program Requirements**

Operator Inspections

Inspectors



Type of Operation	Supplemental Inspections	Inspection & Records Review
<b>Multi-Engine / Scheduled Operators with 30+ Seats</b> (including Part 121 cargo)	<b>Required</b>	<b>Required</b>
<b>Multi-Engine / Scheduled Operators Below 30 seats</b>	<b>Not Required</b>	<b>Required</b>
<b>Multi-Engine / On-Demand Operators</b> (including Part 135 cargo)	<b>Not Required</b>	<b>Not Required</b>
<b>Single-Engine Operators</b>	<b>Not Required</b>	<b>Not Required</b>
<b>Alaska Operators</b> (flights within the State)	<b>Not Required</b>	<b>Not Required</b>



# FAA Initiatives

- 1. Widespread Fatigue Damage (WFD)** - Simultaneous presence of cracks at multiple structural locations on the aircraft that are of sufficient size and density that the structure will no longer meet residual strength requirements.
  - Proposed rule, issued April 18, 2006, will establish operational limits for transport category aircraft 75,000 pounds and greater in order to preclude widespread fatigue damage. (Airplanes in this category range from regional jets to large transport category airplanes (e.g., B-747) The comment period was extended to September 18, 2006.
  - Applies to aircraft manufacturers and operators. Rule will require the development and incorporation of maintenance procedures to preclude widespread fatigue damage prior to the airplane reaching an established operational limit.
  - Operation beyond the established limit would be prohibited unless operators have established WFD detection procedures into their maintenance program. If WFD goes undetected, it could lead to catastrophic failure due to a reduction in strength.
  
- 2. General Aviation Committees-** Committees of FAA and non-FAA stakeholders were developed to establish proposals to address the top seven aging aircraft issues facing general aviation, including: defining the term “aging,” education and training for owners and operators, repair data availability, and approved parts availability.