

FAA'S OVERSIGHT OF AMERICAN AIRLINES' MAINTENANCE PROGRAMS

Federal Aviation Administration

Report Number: AV-2010-042

Date Issued: February 16, 2010




**U.S. Department of
Transportation**

Office of the Secretary
of Transportation
Office of Inspector General

Memorandum

Subject: **ACTION:** FAA's Oversight of American Airlines' Maintenance Programs
Federal Aviation Administration
Report Number AV-2010-042

Date: February 16, 2010

From: 
Lou E. Dixon
Assistant Inspector General
for Aviation and Special Program Audits

Reply to
Attn. of: JA-10

To: Federal Aviation Administrator

American Airlines, one of the world's largest passenger airlines, has not experienced a fatal accident in 8 years. Despite this safety record, we received a complaint in February 2008 alleging that the overall operational reliability of the airline's aircraft had diminished and that previously reliable aircraft systems were regularly failing. Specifically, the complaint included 10 maintenance-related allegations and highlighted several incidents, including 3 flights that the complainant alleged had experienced cockpit windshield failures. The complaint also included allegations of unacceptably high levels of maintenance deferrals, performance of required aircraft inspections by non-qualified personnel, and failure to perform inspections called for in an aircraft manufacturer's service bulletin.

The complainant also sent the allegations to the Federal Aviation Administration (FAA). FAA Headquarters forwarded the allegations to its American Airlines Certificate Management Office (CMO) in Fort Worth, Texas, for investigation.

Given the seriousness of these allegations, we assessed (1) FAA's oversight of American Airlines' maintenance program and identified any underlying weaknesses and (2) FAA's response to the allegations. We conducted this audit in accordance with generally accepted government auditing standards between June 2008 and December 2009. Exhibit A details our audit scope and methodology. Exhibit B lists the entities we visited or contacted.

RESULTS IN BRIEF

FAA's oversight of American Airlines' maintenance program lacks the rigor needed to identify the types of weaknesses alleged by the complainant—at least four of which were confirmed and have potential safety implications.

- First, we confirmed the allegation that American Airlines' maintenance-related events have increased. Further, the National Transportation Safety Board (NTSB) recently found that American's Continuing Analysis and Surveillance System (CASS)—a system intended to monitor and analyze the performance and effectiveness of a carrier's inspection and maintenance programs—failed to detect repeated maintenance discrepancies, which, if found, could have prevented an in-flight engine fire that occurred in September 2007. However, during a 2-year period between 2005 and 2007, FAA did not perform required routine surveillance of American's CASS and reliability programs—two key systems for monitoring carriers' maintenance programs. While FAA reviewed the carrier's policies and procedures governing the two systems, it did not determine whether the carrier actually followed them.
- Second, we confirmed the allegation that maintenance deferrals increased significantly. From 2004 through the first 5 months of 2008, American's number of open maintenance deferrals increased by 32 percent, from an average of 298 per day to an average of 394 per day. Despite this increase, FAA only tracked the number of deferrals but did not identify the types of aircraft parts being deferred or the causes of the deferrals. As a result, FAA inspectors missed opportunities to identify potential fleet-wide maintenance issues and put corrective action plans in place.
- Third, we confirmed the allegation that American was not following procedures for required maintenance inspections. We found that FAA has not taken appropriate action to address American's longstanding failure to comply with required maintenance inspection procedures. In late 2005, FAA initiated a System Analysis Team, which made 35 recommendations to improve American's compliance, but corrective actions for the team's recommendations made in 2006 are still not complete.¹ In December 2007, inspections of repairs made to the aircraft damaged during an in-flight engine fire were performed by a technician whose qualifications had expired—a deficiency that was not discovered until the aircraft was ready to depart with passengers. Following this incident, FAA requested that American submit a comprehensive corrective action plan within 20 days. In September 2008—9 months after FAA's

¹ According to American officials, as of December 2009, they have implemented the majority of the System Analysis Team's recommendations to improve compliance with RII requirements, with one remaining to be implemented in April 2010.

request—American submitted its plan and is continuing its efforts to implement FAA’s 2006 recommendations.

- Finally, we confirmed the allegation that American did not implement a Boeing service bulletin² alerting carriers to problems with aircraft windshield heating systems that could cause the windshield to crack or shatter if left uncorrected. FAA did not identify process weaknesses in American’s maintenance and engineering programs that resulted in the carrier’s failure to perform planned inspections of Boeing 757 windshield heating systems. Further, FAA has yet to finalize and issue an airworthiness directive that would require carriers to address the windshield heating problem—a recommendation NTSB made in 2004.

To assess the February 2008 allegations, FAA undertook two reviews. One review was conducted by the CMO for American about 1 month after the allegations were submitted. The other review was conducted by FAA inspectors from outside the CMO utilizing an Internal Assistance Capability (IAC) process to independently review the February 2008 safety allegations.³ However, neither review was comprehensive. The CMO’s review of mechanical reliability focused on only one of the nine systems alleged to have experienced decreased reliability. The independent review did not include work at the air carrier. Instead, the review was performed hastily over 1 weekend and focused on the work already performed by the CMO, such as inspection reports filed by CMO inspectors. As a result, the IAC team reached a number of the same faulty conclusions made by the CMO. Additionally, the IAC’s June 2008 recommendations have not been acted upon because, according to CMO managers, they did not receive a copy of the IAC’s final report until June 2009.

Based on our findings, we are making several recommendations to enhance FAA’s oversight in key maintenance areas at American and improve its processes for assessing safety allegations.

BACKGROUND

In 1998, FAA implemented the Air Transportation Oversight System (ATOS), a data-driven, risk-based approach to air carrier safety oversight. ATOS was designed to shift inspectors away from the inspection method they had used for over 30 years, which focused on whether air carriers were complying with regulations, to an approach that proactively assessed risks within air carriers’

² Implementing the service bulletin was not required. However, service bulletins often highlight safety issues that lead to the issuance of an airworthiness directive.

³ The IAC was developed in response to an OIG recommendation: OIG Report Number AV-2007-080, “FAA’s Actions Taken To Address Unsafe Maintenance Practices at Northwest Airlines,” September 28, 2007. OIG reports are available on our website: www.oig.dot.gov.

maintenance and operations systems. Under ATOS, FAA inspectors are to use data analysis to focus their inspections on areas that pose the greatest safety risks and to shift the focus of those inspections in response to changing conditions within air carriers' operations.

CASS and reliability are two of the key air carrier systems that inspectors assess under ATOS. FAA regulations require some air carriers to have a CASS to assess maintenance performed on the carrier's aircraft.⁴ Although not required, air carriers may have an FAA-approved reliability program, which monitors failure rates of aircraft components with the goal of achieving improved operational performance. Air carrier personnel enter reliability program data into CASS for monitoring the effectiveness of air carriers' inspection and maintenance programs. FAA inspectors are responsible for determining whether these maintenance and monitoring systems are working effectively through routine ATOS surveillance.

The February 2008 complaint raised serious questions about the effectiveness of American's CASS and FAA's oversight of the air carrier's maintenance program. Specifically, the complaint included 10 maintenance-related allegations that indicated an overall deterioration in the airline's operational reliability. The complainant's 10 allegations are listed below.

February 28, 2008, Allegations Against American Airlines

- Maintenance-related delays, cancellations, and diversions have increased.
- Minimum Equipment List (MEL) deferrals have increased, and MEL authority has been abused.
- A Boeing service bulletin that could have prevented some cockpit windshield failures was not implemented.
- Certain Functional Check Flights (post-maintenance test flights) were eliminated.
- Maintenance check intervals were changed, resulting in fewer maintenance checks.
- Spare parts inventories were reduced.
- Required inspections of an aircraft repaired after a September 2007 engine fire were performed by a non-qualified mechanic.
- Computerized maintenance records were inadequate.
- Maintenance records were not transparent.
- Retribution was taken against personnel who have reported maintenance problems.

⁴ Maintenance may be performed in-house or by other entities, such as contract facilities.

In March 2008, FAA's CMO for American—which is responsible for overseeing American's maintenance and flight operations—initiated a review to look into the allegations.

FAA OVERSIGHT WAS INADEQUATE TO IDENTIFY WEAKNESSES IN AMERICAN'S MAINTENANCE OPERATIONS

FAA's oversight of American's maintenance operations was inadequate to identify the types of problems described in the February 2008 allegations. First, FAA did not conduct all required routine inspections of American's CASS and reliability programs and failed to identify weaknesses in these critical safeguards. Second, FAA did not determine reasons behind increased maintenance deferrals at American, although such deferrals could have significant safety implications or indicate financial difficulty at the carrier. Third, FAA has not held American accountable for addressing longstanding problems with required maintenance inspections. Finally, FAA did not identify internal process failures that led to American's inadequate response to Boeing's service bulletin.

FAA Did Not Perform Comprehensive Surveillance of American's CASS and Reliability Programs

ATOS requires inspectors to evaluate carriers' CASS and reliability programs—from both a policy and implementation standpoint. These routine reviews are intended to ensure that air carriers comply with regulatory requirements and that their operations and maintenance programs are working effectively. FAA's guidance specifically calls for ATOS inspections at least once every 6 months and a policy review at least once every 5 years. However, during a 2-year period between 2005 and 2007, CMO inspectors did not perform the required semiannual inspections of American's CASS and reliability programs. They only conducted a policy review, which disclosed a lack of procedures in American's CASS and reliability programs to identify root causes of identified maintenance problems as well as inconsistencies between the airline's CASS manual and other internal guidance.⁵ According to CMO officials, they did not perform the semiannual inspections because the carrier was making changes to its CASS and reliability programs in response to FAA findings. Yet, given the problems identified in its policy review, the CMO would have been prudent to comply with ATOS requirements and conduct semiannual inspections of the carrier's CASS and reliability programs.

The potential consequences of a poorly performing CASS were demonstrated in April 2009 when the NTSB determined that American's CASS failed to detect

⁵ American officials advised us that they have improved the carrier's CASS program, including adding root cause analysis procedures. In addition, they are rewriting the CASS manual and all maintenance manuals, which are planned for completion in 2010.

repeated maintenance discrepancies, which contributed to the September 2007 in-flight engine fire on American Airlines flight 1400 (see figure 1).⁶

Figure 1. American Airlines September 2007 In-Flight Engine Fire



Source: NTSB

Specifically, in the 13 days prior to the flight, the aircraft's left engine air turbine starter valve had been replaced six times in an effort to address an ongoing problem with starting the engine using normal procedures. None of the valve replacements solved the engine start problem, and the repeated failures to address the issue were not recognized by the airline's CASS personnel. According to the NTSB, if these maintenance discrepancies had been found, the engine fire could have been prevented.

The NTSB recommended that American evaluate and correct deficiencies in its CASS. American officials have completed their internal review and are preparing a response to the NTSB.

While we did not identify any immediate safety-of-flight issues, our analysis of maintenance-related incidents at American Airlines found that the carrier's overall operational reliability has decreased since 2004, which increases the risk of serious incidents. The rate of operational events across all fleets—including cancellations, in-flight diversions, and other delays—rose from 3.9 events per 100 departures in January 2004 to 5.8 events per 100 departures in December 2008. In June 2008, the CMO inspected American's CASS and concluded that American had improved its event analysis by including day-to-day operational events, rather than just events that the airline deemed to be "significant." Despite this improvement, inspectors expressed concern that American's CASS audit division was understaffed in relation to the complexity and size of the airline.⁷

The CMO inspectors for American also performed reliability inspections in early 2008 but disagreed with the complainant's allegation that operational reliability

⁶ In September 2007, an engine fire forced an emergency landing of an American Airlines MD-80 soon after its departure from Lambert-St. Louis International Airport. The fire damaged the hydraulic system, rendering the plane's rudder inoperable, and the nose landing gear failed to extend during the first landing attempt. A second attempt was successful, and none of the 143 people onboard were injured. However, the plane sustained substantial structural damage.

⁷ According to American officials, the carrier has added nine auditors and plans to add four CASS analysts in 2010.

had decreased. The CMO's conclusion, however, was based on limited inspections of American's MD-80s and A-300s, which account for only half of American's aircraft in its six⁸ fleets and exclude American's Boeing 757 fleet, the carrier's second-largest with 124 aircraft. Further, inspectors did not review automated reliability data that American provides to the CMO on a regular basis,⁹ and principal inspectors did not analyze or reconcile differences in inspection results. For example, inspection records for the MD-80 and A-300 show that one inspector identified problems with the carrier's CASS and reliability systems while the other concluded there were no problems. Ultimately, the CMO reviewed the performance of only one of the nine mechanical systems that the complainant alleged were failing at an increasing rate—the MD-80 nose landing gear—which experienced 27 failure-to-retract events in 2008, compared to 8 in 2005.¹⁰ Based on this limited review, the CMO concluded that American's fleet-wide operational reliability had not decreased. In contrast, we found that operational reliability had decreased for all nine systems, which included hydraulics, electrics, flight controls, and the MD-80 nose landing gear.

Finally, FAA assessed the allegation that American Airlines had reduced the number of Functional Check Flights (FCF)¹¹ it performs and that this action had resulted in increased numbers of mechanical failures following heavy maintenance. However, FAA's assessment lacked the rigor needed to verify or refute the allegation. While Federal Aviation Regulations require an FCF program, FAA lacks guidance detailing what attributes a properly functioning FCF program should contain, according to FAA inspectors. The inspectors added the FCF program to their risk management action plan but noted that they struggled with how to proceed with their inspections and that guidance would be helpful in performing their oversight duties. We verified that American has reduced the number of FCFs it performs on its Boeing 767 fleet but were unable to determine if this negatively affected aircraft mechanical reliability.

FAA Did Not Perform Comprehensive Analyses of Maintenance Deferrals

FAA guidance recommends that safety inspectors monitor the number of Minimum Equipment List (MEL) deferrals. MELs list the instruments and equipment that may be inoperative without jeopardizing the safety of the aircraft. This allows a carrier to continue to operate the aircraft provided it makes the repairs within a certain number of days. While FAA prescribes the number of

⁸ American retired its A-300 fleet in late August 2009.

⁹ We also determined that inspectors were not regularly reviewing these automated data as part of their risk assessments and routine surveillance.

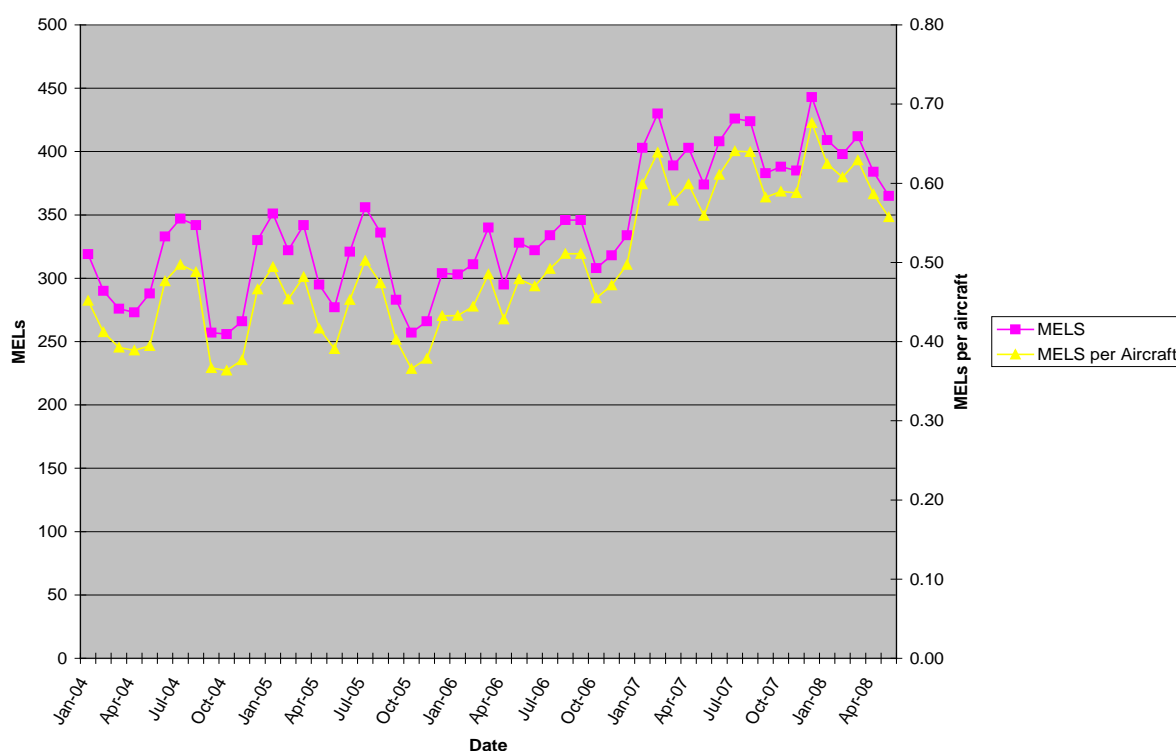
¹⁰ According to American officials, the carrier made multiple maintenance program changes in response to the MD-80 nose landing gear issue, which resulted in significantly improved performance in the first quarter of 2009.

¹¹ A Functional Check Flight is a test flight of an aircraft performed after major airframe maintenance to ensure that the aircraft is functioning normally.

days an air carrier can defer maintenance for each listed component, there is no limit on the number of MEL deferrals a carrier can have. An increase in deferrals does not necessarily indicate an increased safety risk, but analyses of trends and the types of deferrals can uncover fleet-wide maintenance issues or potential financial difficulty, which can have safety implications if the carrier forgoes needed maintenance to remain viable. While CMO inspectors track the number of maintenance deferrals across American's fleet, inspectors have not analyzed trends or monitored the types of components being deferred.

As alleged by the complainant, we confirmed that the number of open fleet-wide MEL deferrals increased by 32 percent between 2004 and the first 5 months of 2008, from an average of 298 per day to an average of 394 per day (see figure 2). On a per-aircraft basis for this period, the number of average open MELs per aircraft rose from 0.42 per aircraft to 0.60 per aircraft.¹²

Figure 2. Average Daily Open MELs, January 2004 to May 2008



Source: OIG analysis of FAA data

Since January 2007, American has submitted at least 13 self-disclosures regarding improper use or issuance of an MEL. Instances of misuse included deferring maintenance on a navigational component that was not listed in an MEL and

¹² Since May 2008, the number of maintenance deferrals has trended downward. In November 2009, the number of average open fleet-wide was 254 per day, or 0.42 per aircraft (just under the 2004 level).

therefore could not legally be deferred. FAA has several open enforcement investigations regarding MEL authority and, in August 2008, proposed a civil penalty of \$4.1 million against American for inappropriate use of an MEL to return an aircraft to service.¹³

In March 2008, the principal maintenance inspector reported to senior FAA managers on the CMO's response to the MEL allegations and indicated that the complainant did not provide any substantiating data to support the claim of MEL abuse. Consequently, the CMO did not assess this allegation or inspect American's MEL program.¹⁴ However, in April 2008, FAA identified American's MEL program as one of the programs that was 2 years overdue for an inspection. CMO inspectors completed the inspection in May 2008—almost 7 years since the previous inspection.

FAA Has Not Held American Accountable for Addressing Longstanding Problems with Required Maintenance Inspections

FAA has also failed to require American Airlines to comply with procedures for required inspection items (RII).¹⁵ Mechanics performing RII inspections must complete biannual training on current policies and procedures to maintain their authorization to perform these inspections. However, American has a history of noncompliance with RII requirements. For example, in 2007, American self-disclosed nine noncompliances—three disclosures involved expired technician qualifications, and six disclosures related to RII inspections that were not conducted.¹⁶ In late 2005, FAA and air carrier representatives initiated a System Analysis Team (SAT)¹⁷ to correct American's failure to comply with RII inspection requirements. In May 2006, the SAT made 35 recommendations, including promptly notifying employees whose qualifications are about to expire.

Despite the SAT's numerous recommendations, we confirmed the allegation that an American Airlines technician with an expired authorization performed an RII inspection on the fire-damaged MD-80 after mechanics had performed significant repairs on the aircraft.¹⁸ American did not discover the RII noncompliance until the aircraft had been returned to service and was at a gate ready to depart with

¹³ American officials disagreed with FAA's proposed penalty. As of December 2009, the case remains open.

¹⁴ The CMO is required to inspect a carrier's MEL policies and procedures every 5 years.

¹⁵ Required inspection items are mandatory maintenance activities that, due to their importance to the overall airworthiness of the aircraft, must be independently inspected by a specially trained inspector after the work is completed.

¹⁶ The self-disclosure program is intended to encourage data-sharing between FAA and air carriers to identify and address safety issues.

¹⁷ A System Analysis Team is a group of FAA and air carrier personnel that FAA CMO management can establish when it determines that a practice or process in place at an airline should be reviewed. Upon completing the review, the team makes recommendations for improvement.

¹⁸ The complainant alleged that repeat maintenance discrepancies may have led to the September 2007 in-flight fire. We did not perform a detailed review of this allegation since it was part of an ongoing NTSB investigation.

passengers. American self-disclosed this noncompliance to FAA in December 2007. Following American's self-disclosure, FAA requested that American submit a comprehensive corrective action plan within 20 days.¹⁹ FAA granted American an extension, and in September 2008—9 months after the self-disclosure—American submitted its plan, which proposed addressing the incident by counseling and retraining the mechanic involved.

American has taken some steps to address compliance with RII requirements, such as implementing an electronic notification system to warn mechanics when their authorization to perform inspections is about to expire. According to American Airlines officials, as of December 2009, they have implemented the majority of the SAT's recommendations to improve compliance with RII requirements, with one remaining to be implemented in April 2010.

According to FAA's principal maintenance inspector, FAA will continue to monitor American's compliance with RII requirements until it is satisfied that a long-term corrective action is in place. To date, however, FAA's actions have not elicited confidence that its oversight is sufficient. For example, in response to the RII allegation, the CMO assigned 1 inspector to review only 1 MD-80 aircraft—even though the MD-80 fleet is American's largest, with 279 aircraft.

FAA Did Not Identify Internal Process Weaknesses at American that Led to the Carrier's Failure To Perform Needed Inspections

FAA did not identify process weaknesses in American's maintenance and engineering programs that resulted in the carrier's failure to perform planned inspections of Boeing 757 windshield heating systems. In 2006, Boeing issued a service bulletin alerting carriers to a problem with a windshield heating component on its 757 aircraft and instructed air carriers on procedures for correcting the problem. Left uncorrected, the component could overheat, cause smoke to enter the cockpit, and crack or shatter the aircraft's cockpit windshield. Although American took steps to implement the inspections, neither FAA nor the carrier ensured the mechanics performed the work. For example:

- The engineer responsible for drafting the engineering change order—which is required to issue work cards to mechanics—left the company, and the order was never released. Without the order, American personnel could not issue work cards instructing mechanics to perform the work. The CMO incorrectly concluded, however, that American cancelled the order because it opposed the replacement windshields called for in the service bulletin.

¹⁹ FAA can accept self-disclosures and absolve carriers of any penalty if the carriers develop a comprehensive solution to keep reported safety problems from recurring.

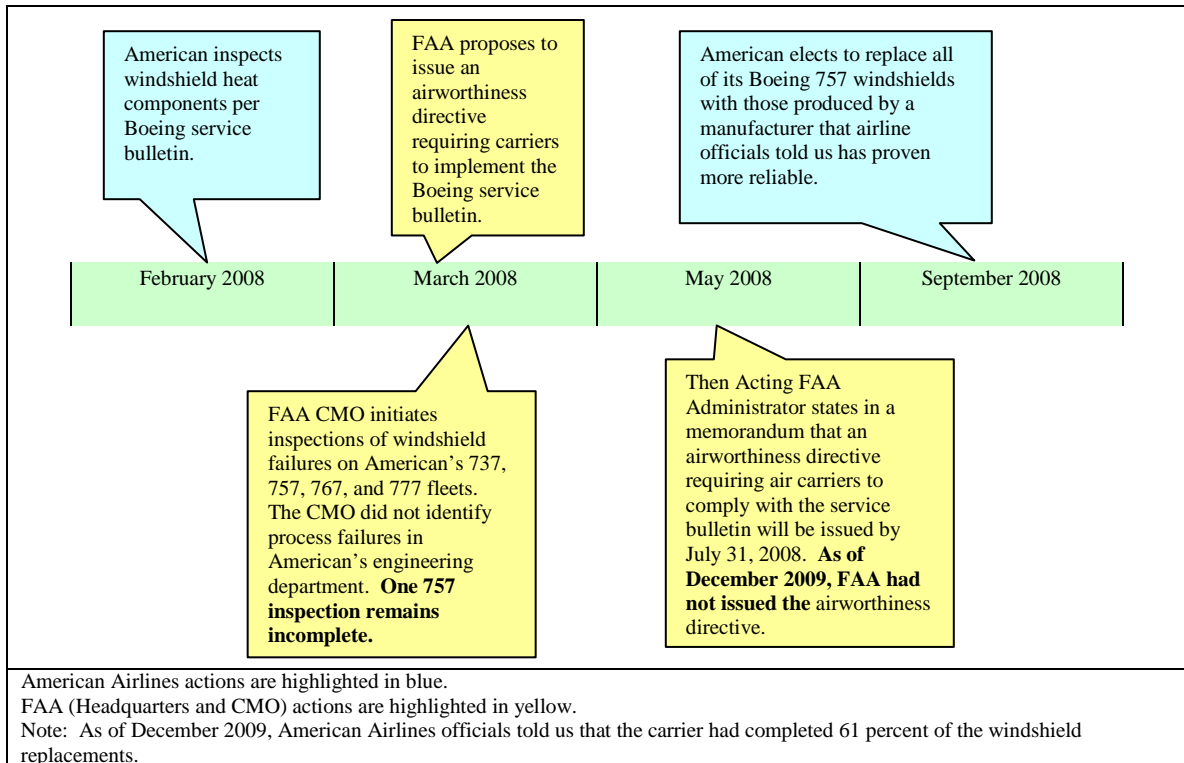
- According to American officials, its engineers verbally requested in 2006 that quality assurance representatives inspect the Boeing 757's windshield heat components as they came in for maintenance. However, the engineers did not document the request or inspection results, so we were unable to verify that the inspections were performed.

Implementing the service bulletin was not required, and, according to Boeing officials, correcting the identified problem would not have prevented a January 2008 incident as the complainant alleged. This incident involved an American Boeing 757 making an emergency landing after the cockpit filled with smoke and the inner pane of the co-pilot's windshield shattered, blocking visibility.²⁰ However, service bulletins often highlight safety issues that lead to the issuance of an airworthiness directive. While an airworthiness directive has not been issued, Boeing stated that the bulletin did have safety implications based on prior incidents and that all air carriers were expected to comply. Yet, as of January 2008, American had not performed planned inspections of Boeing 757 windshield heating systems.

Since the January 2008 incident and subsequent February 2008 allegations, American and FAA have initiated or taken actions to address windshield heating system concerns (see figure 3).

²⁰ The January 2008 flight landed safely, but the cockpit crew was treated for injuries from the shattered glass.

Figure 3. Air Carrier, FAA, and CMO Actions Taken in Response to Cockpit Windshield Heating Concerns



The effectiveness of FAA's actions, however, is unclear. For example, despite the number and proximity of reported incidents²¹ involving problems with windshields and American's failure to release an engineering change order for the windshields, FAA concluded that increased oversight was not warranted. Consequently, FAA inspectors were unaware of the process failures that led to American's failure to perform the windshield inspections recommended by Boeing. FAA's failure to complete other actions—including issuance of an airworthiness directive—further exacerbates risks. Specifically, as early as 2004, the NTSB recommended that FAA issue a directive to address the windshield heating problem on Boeing 747, 757, 767, and 777 aircraft. However, FAA did not propose the directive until March 2008, nearly 4 years later. FAA officials stated the delay was partly due to the need to obtain technical data from Boeing on other aircraft in addition to the 757.

²¹ In February 2008, two additional unscheduled American landings occurred due to windshield failures—one on a Boeing 737 and one on a 757.

FAA'S INDEPENDENT REVIEW OF ALLEGATIONS WAS NOT COMPREHENSIVE

As we recommended in September 2007, FAA developed an IAC process to independently review safety allegations. FAA assembled an IAC team to assess the CMO's response to the maintenance allegations. The team met on May 31 and June 1, 2008—the weekend before we began our audit at the FAA CMO. In its 2-day assessment, the team identified problems with the thoroughness of the CMO's review, such as not resolving differences of opinion between two inspectors on the airline's reliability. However, the team's review focused on the work already performed by the CMO, such as inspection reports filed by CMO inspectors, and did not conduct independent work at the air carrier. As a result, the IAC team reached a number of the same faulty conclusions made by the CMO, including that American had knowingly cancelled its engineering change order to address aircraft windshield problems. In addition, the IAC team did not review 4 of the complainant's 10 allegations, including the allegation regarding MEL abuse. A more comprehensive review—one that included work at the carrier—would likely have enabled the team to better determine the sufficiency and accuracy of the CMO's inspections as well as the validity of the complainant's allegations.

In June 2008, we recommended that FAA establish an independent organization to investigate safety issues identified by FAA employees. In response, FAA established a new organization in its Office of Chief Counsel to carry out these responsibilities. While we are still assessing whether this action addresses our concerns, we have questions about the extent to which the new office will coordinate IAC's safety-related independent reviews to maximize the effectiveness of the independent review process and avoid unnecessary delays in taking needed actions. For example, CMO managers did not act on the IAC's June 2008 recommendations because they did not receive a copy of the report until June 2009. According to FAA officials, the Agency has not decided whether IAC reviews will be coordinated through this new organization.

CONCLUSION

Although various factors underlie each of American Airlines' maintenance-related events, a lack of adequate FAA oversight is a critical thread. This raises significant concerns about potential maintenance weaknesses going uncorrected—not just at American but at other air carriers. FAA's failure to assess carriers' maintenance programs, identify root causes of maintenance deferrals, ensure properly trained mechanics perform RII inspections, and ensure carriers promptly respond to recommendations and service bulletins escalates these concerns. Additional action is needed from FAA to enhance its routine oversight of air

carriers, including American, and improve the Agency's processes for assessing industry-wide safety allegations.

RECOMMENDATIONS

We recommend that FAA:

1. Begin a review of American's CASS and reliability system to ensure that problems are identified and needed improvements are made. These steps should include a review of why American's CASS did not detect repeat maintenance discrepancies that led to an in-flight fire in September 2007.
2. Conduct comprehensive inspections of the allegations regarding operational reliability, MELs, RII requirements, and windshield inspections. Specifically, require inspectors to:
 - a. assess operational reliability for all fleets and the nine systems mentioned in the allegations;
 - b. evaluate American's use of its MEL authority and potential MEL abuse;
 - c. ensure American corrects deficiencies with required maintenance inspections identified in the 2006 SAT report and carrier self-disclosures, including problems with mechanics' expired RII qualifications; and
 - d. verify that American is identifying and correcting problems with windshield heat components and that controls are in place to prevent internal engineering and maintenance process failures.
3. Improve data analyses by requiring the CMO analyst and inspectors to regularly and thoroughly review available operational reliability data, track the types of maintenance items that are deferred, closely monitor trends in maintenance deferrals, and identify reasons for any significant negative changes in reliability or increases in deferrals.
4. Issue the proposed airworthiness directive that would require implementation of the Boeing service bulletin on repairs to windshield heating components on 757s.
5. Improve the independent review process by:
 - a. performing verification work at air carriers rather than just reviewing FAA inspection records and ensuring that the review results are shared with the office under review.

- b. coordinating all safety-related independent reviews conducted using the IAC process through its new Office of Audits and Evaluations.
6. Determine why FAA's oversight did not identify the weaknesses discussed in this report and whether these are Agency-wide issues or limited to American's CMO.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided our draft report to FAA on December 22, 2009, and received its formal response on February 1, 2010. American Airlines officials also reviewed our draft report and requested that we include information on actions they have taken in response to the issues we found. We have updated the report where appropriate. FAA concurred with recommendations 1 through 5 and partially concurred with recommendation 6. We are requesting additional information from FAA on recommendations 1, 2, 3, and 6 to ensure actions taken or planned are well supported and fully responsive. FAA's response is included in its entirety as an appendix to this report.

In summary, FAA claimed that it had already identified most of the issues found in our report through its own oversight processes and that no further action was necessary on many of the issues. However, we take exception to this assertion based on the following points. First, actions are still underway, and the effectiveness of these actions as well as those FAA has completed is still uncertain. Second, FAA has not completed its national assessments to address the issues we identified that were potentially cross-cutting or industry-wide. Finally, it is important to point out that where FAA has taken action, it only did so after we briefed Agency officials on the need for them; therefore, we will remain vigilant in overseeing FAA's implementation.

Regarding recommendation 1, FAA responded that the events surrounding flight 1400 (in-flight engine fire in 2007) were not due to CASS issues. Based on American Airlines,' the NTSB's, and our observations, we disagree with this assertion. Specifically, both American Airlines and the NTSB agreed that changes to American's CASS were needed since failures in American's maintenance program led to this incident. In response to the NTSB's recommendations, American officials took several actions to improve CASS, including improved oversight and tracking of repeat maintenance items and improved communication between their maintenance operations control and CASS departments.

FAA asserted that no further actions are needed to address recommendations 1, 2, and 6. However, recognizing that many of the actions are still underway, we are

requesting supporting documentation to validate that these issues are fully addressed. Specifically, we request that FAA provide:

- Actions taken or planned to monitor American Airlines' changes to its CASS made in response to the NTSB's flight 1400 recommendations. (Recommendation 1)
- The final results of its ACEP review of American Airlines, including the comparative analysis of ACEP findings versus those found in routine surveillance. (Recommendations 1, 2, and 6)
- Actions taken or planned to assess overall deterioration in operational reliability at American across all fleets and the nine systems mentioned in the allegations. (Recommendation 2.a.)
- Actions taken or planned to address the internal process failures we identified at American that led to the failure to perform planned inspections. (Recommendation 2.d.)

Finally, while FAA fully concurred with recommendation 3, we are also requesting information to verify that the new data analysis process being developed by the CMO will include a review of operational reliability data and types of maintenance items deferred, as we recommended.

ACTIONS REQUIRED

FAA's planned actions and target dates for recommendations 4 and 5 are responsive, and we consider these recommendations addressed but open pending completion. In accordance with Department of Transportation 8000.1C, we request that FAA provide, within 30 days of this report, additional and clarifying information for recommendations 1, 2 (2.a and 2.d), 3, and 6. We appreciate the courtesies and cooperation of FAA and American Airlines representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-0500 or Robin Koch, Program Director, at (404) 562-3770.

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cc: Assistant Administrator for Financial Services and Chief Financial Officer
FAA Associate Administrator for Aviation Safety
Director of Flight Standards Service
Martin Gertel, M-100
Anthony Williams, ABU-100

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. We conducted this review between June 2008 and December 2009. We used the following scope and methodology in conducting this review.

To assess FAA's oversight of American Airlines' maintenance program, identify any underlying weaknesses, and evaluate FAA's response to the allegations, we performed audit work at FAA Headquarters and FAA's Certificate Management Office for American Airlines in Fort Worth, TX. We interviewed FAA inspectors and the operations research analyst and analyzed inspection data from FAA inspection databases to determine the validity of the allegations. We obtained inspection reports from these data sources to identify strengths and weaknesses in FAA's surveillance of American Airlines as related to the allegations in the complaint. We also reviewed the IAC team's final report and interviewed team members.

While we did not perform an audit of American Airlines, we did assess FAA's oversight by interviewing officials at American Airlines' headquarters in Fort Worth, TX. In addition, we performed work at American Airlines' largest maintenance base in Tulsa, OK. We reviewed American Airlines' fleet reliability data and interviewed American Airlines' maintenance and engineering personnel. We also reviewed NTSB findings and recommendations concerning maintenance at American.

We interviewed industry safety experts (e.g., NTSB) to obtain their opinions on the windshield heating issue and contacted appropriate Boeing Commercial Airplane Company representatives regarding service bulletin processes to determine their view of the importance of the service bulletin related to windshield heating units on certain models of Boeing aircraft.

EXHIBIT B. ENTITIES VISITED OR CONTACTED**Federal Aviation Administration (FAA)****Headquarters:**

Flight Standards Service Washington, DC

Certificate Management Offices (CMO):

American Airlines CMO Fort Worth, TX

Air Carrier

American Airlines Headquarters Fort Worth, TX

American Airlines Maintenance & Engineering Facility Tulsa, OK

Other Industry Representatives or Organizations

Allied Pilots Association (APA) Fort Worth, TX

Transport Workers Union (TWU) Tulsa, OK

National Transportation Safety Board (NTSB) Washington, DC

The Boeing Commercial Airplane Company Seattle, WA

EXHIBIT C. MAJOR CONTRIBUTORS TO THIS REPORT

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APPENDIX. AGENCY COMMENTS



Federal Aviation Administration

Memorandum

Date: February 1, 2010

To: Lou Dixon, Assistant Inspector General for Aviation and Special Program Audits

From: Ramesh K. Punwani, Assistant Administrator for Financial Services/CFO
R. Punwani

Prepared by: Anthony Williams, x79000

Subject: OIG Draft Report: FAA's Oversight of American Airlines Maintenance Programs

Safety is at the heart of the Federal Aviation Administration's (FAA) mission, and every day thousands of inspectors around the country work to identify and ensure that appropriate action is taken to address safety issues on air carriers large and small. Our system of maintenance oversight is multifaceted and looks at both specific problems and seeks to identify trends characteristic of systemic issues. The agency requires carriers to take action and make corrections and does not hesitate to level civil penalties to further effect change in maintenance practices. In fact, over the last 24 months the Agency's routine oversight has resulted in around \$4.4 million in proposed civil penalties related to American Airline's maintenance programs.

The FAA's oversight of safety programs at American Airlines resulted in the implementation of strong and effective measures in ten specific areas of the air carrier's maintenance program. After careful review of the Office of Inspector General's (OIG) draft report, FAA has determined that the issues identified in the report are largely the same items that the FAA previously documented using its safety oversight processes. While not described in the OIG report, the actions on these measures have either been completed or are underway. The FAA will continue to ensure the carrier fully and effectively completes the actions through enhanced oversight by its American Airlines Certificate Management Team (CMT).

The FAA launched an Air Carrier Evaluation Program (ACEP) of American Airlines last year as a result of routine oversight by the CMT, which found problems with the carrier's airworthiness directive compliance. The ACEP revealed many of the same weaknesses detailed in the OIG audit, including: a high number of open maintenance deferrals; airworthiness directive compliance and management; and handling of engineering, major repairs, and alterations. FAA has been working to ensure the carrier elevates its maintenance practices and makes needed changes, including overhauling its Continuing Analysis and Surveillance System (CASS).

FAA's evaluation of American Airlines also clarified some areas where the Agency's maintenance oversight could be further strengthened. As a result, the Agency initiated three actions that will enhance oversight of all carriers. First, FAA launched a national Air Carrier Evaluation Program that uses a risk-based targeting process to make certain all part 121 air carriers are evaluated by national teams on a recurring basis. Second, FAA is using the new Corrective Action Tracking Tool (CATT) in the Air Transportation Oversight System (ATOS) software to track timely, effective completion of corrective actions. CMT managers and inspectors are required to use this tool to document required corrective actions so the FAA knows they were completed by the air carrier on time. Finally, the Flight Standards Evaluation Program (FSEP) is auditing FAA field offices to make sure they are operating according to national procedure.

As noted above, the FAA has taken a number of actions that are responsive to the findings and recommendations in the OIG report. However, we appreciate the recommendations enumerated by the OIG, and believe they further support FAA's previous findings and corrective actions. The IG's efforts continue to provide a positive contribution to our continuous efforts to further strengthen and fine tune our approach to safety oversight.

OIG Recommendation 1: Begin a review of American's CASS and reliability system to ensure that problems are identified and needed improvements are made. These steps should include a review of why American's CASS did not detect repeat maintenance discrepancies that led to an in-flight fire in September 2007.

FAA Response: Concur. FAA initiated efforts, based on the findings from the CMT and the ACEP as indicated above, which have already resulted in significant improvements to American Airlines' CASS. This includes enhanced CASS program staffing at the airline, revised and improved CASS guidance, and improved information systems.

While FAA continues to closely monitor the effectiveness of American Airlines' actions with respect to its CASS program, it is important to recognize that CASS is intended to provide a strategic tool to help airlines identify trends that may lead to safety issues and is not intended to be a tactical tool capable of addressing individual component failures. While the complainant's allegations led OIG to focus on the accident involving American Airlines flight 1400 as a failure of American Airlines' CASS, FAA's review of maintenance records indicate that the systems performance issues involved in the accident would not typically be identified through CASS as a chronic problem. Specifically, FAA's review identified an error in the National Transportation Safety Board's (NTSB) data. While NTSB's data indicated the errant start valve was changed six times, further review indicates it was actually changed four times and the third valve operated normally for 25 flights over the course of seven days. The fourth valve failed after installation and was deferred the very next flight (flight 1400). This performance would not typically be flagged as an issue by the CASS program. As a result of the changes already implemented, and the data error issue, no further action is necessary to address American Airlines' CASS with regard to the issues surrounding flight 1400.

Nonetheless, FAA recognized the need to take action to address the type of situation that arose surrounding flight 1400. As a result, since this accident, the American Airlines CMT's oversight has led to improvements in American's FAA approved Reliability Program. These improvements include automated web-based reporting, standardization of product team activity reports, automated mean-time-between-unscheduled-removal reporting, FAA sponsored system analysis

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team (SAT), development and deployment of a web-based chronic aircraft reliability analysis tool, and the establishment of a dedicated reliability engineering group under separate company management.

OIG Recommendation 2: Conduct comprehensive inspections of the allegations regarding operational reliability, MELs, RII requirements, and windshield inspections. Specifically, require inspectors to:

- a. assess operational reliability for all fleets and the nine systems mentioned in the allegations;
- b. evaluate American's use of its MEL authority and potential MEL abuse;
- c. ensure American corrects deficiencies with required maintenance inspections identified in the 2006 SAT report and carrier self-disclosures, including problems with mechanics' expired RII qualifications; and
- d. verify that American is identifying and correcting problems with windshield heat components and that controls are in place to prevent internal engineering and maintenance process failures.

FAA Response: Concur.

- a. assess operational reliability for all fleets and the nine systems mentioned in the allegations;

The February 2008 complaint focused on a degradation of operational reliability for all fleets to include recordable in-flight events involving smoke/fire, landing gear, engines, fuel, hydraulics, electrics, radar, flight controls and air conditioning/pressurization. The only specific examples of reliability degradation cited by the complainant focused on MD-80 nose gear retraction failures, B-757 windshield failures, and an A300 yaw damper problem. Through a series of surveillance activities, the CMT assessed performance of the above mentioned systems and determined problems existed in the MD-80 nose gear retraction system, the B-757 windshield heat system, and an isolated, single event involving an A300 yaw damper malfunction.

The CMT's oversight led American to implement nose landing gear strut pressure checks on a monthly basis as well as strut fluid changes on a 14 month interval starting in April 2007. Since American flight 1400 in September 2007, American Airlines has implemented additional maintenance program changes to improve MD-80 nose landing gear retract system performance. These program improvements include improved spray deflector repair requirements and additional landing gear strut visual inspections. These changes far exceed the original equipment manufacturer recommended requirements.

The B-757 windshield heat issue is discussed in paragraph d below. The A300 yaw damper issue was investigated and the FAA determined American correctly diagnosed and repaired the malfunction. As a result, while the CMT will continue to conduct careful surveillance of American Airlines' management of maintenance issues, no further action is necessary to address this recommendation.

- b. evaluate American's use of its MEL authority and potential MEL abuse;

FAA conducted an evaluation of MEL authority and its implementation at American and found that multiple American Airlines' initiatives reduced open minimum equipment list (MEL) to

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approximately 354 in January 2009, with a further reduction to 254 by November 2009. According to the Air Transport Association (ATA), the industry averages approximately 0.5 open MELs per aircraft per day. Based on American Airlines' November 2009 data, American averaged 0.42 open MELs per aircraft per day, slightly below industry averages.

CMT assessments of American Airlines' MEL management since September 2007 concluded that American's MEL process design and performance is satisfactory. Further, two design assessments completed since 2007 identified deficiencies that have been addressed through program revisions. The latest design and performance assessments, conducted during the ACEP in the third and fourth quarters of fiscal year 2009, identified items of concern in performance which were evaluated and found acceptable. As a result, while the CMT will continue to conduct careful surveillance of MEL management, no further action is necessary to address this recommendation.

- c. ensure American corrects deficiencies with required maintenance inspections identified in the 2006 SAT report and carrier self-disclosures, including problems with mechanics' expired RII qualifications;

The required inspection items (RII) SAT initiated in January 2006 made 35 recommendations for program improvements. Following completion of the SAT in April 2006, the team continued as a collaborative working group (American Airlines management, Transport Workers Union, and FAA) until July 2008 to address the recommendations. American implemented numerous corrective measures, which include increased awareness of RII requirements, training, and system improvements. Of the 35 RII program recommendations produced by the SAT, the airline has incorporated 22, the working group determined 12 did not provide value to the process, and one will be implemented by April 2010.

The comprehensive fixes put in place by American Airlines can be seen in a significant reduction in RII events over the last three years. Major program improvements include identification of RII tasks in the aircraft maintenance manuals, restrictions on temporary RII authorizations, confirmation and critical items check policies were eliminated to avoid confusion with the RII program, a personalized "expired qualification" notice displayed when the employee signs on to the corporate website, a monthly "training dashboard" distributed system wide, annual RII awareness training regardless of RII authorization, and a monthly expired-qualifications report distributed system wide. The third quarter 2009 ACEP confirmed RII system design, and its performance was affirmed one month later. As a result, while the CMT will continue to conduct careful surveillance of these issues, no further action is necessary to address this recommendation.

- d. verify that American is identifying and correcting problems with windshield heat components and that controls are in place to prevent internal engineering and maintenance process failures.

American Airlines' engineering analysis demonstrated that the failures were due to design deficiencies which would not be addressed by Boeing service bulletins 757-30-19 and 757-30-20. Recognizing this shortcoming, American opted to replace all of the suspect window assemblies with new windows from a different manufacturer. American has completed more than 75% of these replacements. American's efforts in this arena go well beyond Boeing's recommendations and there have been no additional instances of windshield failure in this

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manner since this event in early 2008. As a result, while the CMT will continue to conduct careful surveillance of this issue, no further action is necessary to address this recommendation.

OIG Recommendation 3: Improve data analyses by requiring the CMO analyst and inspectors to regularly and thoroughly review available operational reliability data, track the types of maintenance items that are deferred, closely monitor trends in maintenance deferrals, and identify reasons for any significant negative changes in reliability or increases in deferrals.

FAA Response: Concur. The American Airlines CMT manager will establish a local process to gather and analyze data in order to better identify adverse trends in American's operation. This process will specifically focus on MEL rates, delays, cancellations, MEL extensions, and maintenance escalations.

A quarterly report of the data will be generated by the American Airlines unit operations research analyst. This report will be issued to the Principal Inspectors (PIs) and Partial Program Managers (PPMs). The PIs and PPMs will review the data looking for adverse trends that may warrant special targeted surveillance in order to reverse these adverse trends.

Preventive Action Request (PAR) P-10-81 was generated to create this process for inclusion in the American CMT's quality manual. This process will be in place and the first report produced no later than June 2010.

OIG Recommendation 4: Issue the proposed airworthiness directive that would require implementation of the Boeing service bulletin on repairs to windshield heating components on 757s.

FAA Response: Concur. On March 5, 2008, the FAA issued notice of proposed rulemaking (NPRM) 2008-NM-038-AD to address reports of window heat system malfunctions on Boeing models 757, 767, and 777 airplanes, causing electrical arcing. Specifically, the NPRM addressed the lower electrical connectors of the windshields. We received extensive comments during the NPRM comment period. We are currently reviewing the NPRM comments and expect to issue the final rule before the end of February 2010.

Although an Airworthiness Directive for the B-757 windshield failures has not been issued, American Airlines revised its maintenance program to replace all B-757 windshields with the PPG products outlined in the service bulletin. As stated above, American Airlines is 75% complete on B-757 windshield replacement. The American Airlines CMT will conduct follow-up reviews to ensure 100% completion.

OIG Recommendation 5: Improve the independent review process by:

- a. performing verification work at air carriers rather than just reviewing FAA inspection records and ensuring that the review results are shared with the office under review;
- b. coordinating all safety-related independent reviews conducted using the IAC process through its new Office of Audits and Evaluations.

FAA Response: Concur. FAA will revise its independent review process to include verification of work performed, in addition to reviewing FAA inspection records. We will also revise our independent review process to ensure the results of the review are shared with the office under review so that all safety concerns are addressed in a timely manner. These revisions will be

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incorporated into the Flight Standards Service (AFS) Internal Assistance Capability Document by June 30, 2010.

Flight Standards Service (AFS) Internal Assistance Capability (IAC) is devoted to fact finding, assessing, and making recommendations on matters of special interest to AFS top leadership. While AFS will continue to direct and manage this process, the FAA believes the Office of Audit and Evaluation (AAE) can add value to the process by performing quality assurance functions with respect to IAC results and reviews. Accordingly, effective immediately, AAE will review final reports from IAC reviews for accuracy and completeness. AAE will also evaluate whether the IAC review was fair and followed established AFS processes. These new responsibilities are consistent with AAE's role to coordinate and provide independent quality control of certain investigations and to assess whether investigations and resolutions are fair, impartial and in conformance with established processes.

OIG Recommendation 6: Determine why FAA's oversight did not identify the weaknesses discussed in this report and whether these are Agency-wide issues or limited to American's CMO.

FAA Response: Partially concur. As described above, FAA's oversight identified many of the weaknesses discussed in this report. For example, FAA's American Airlines CMT and the ACEP review of American Airlines identified discrepancies requiring corrective action in the following areas:

- required inspection items;
- MEL/configuration deviation list;
- AD management;
- engineering/major repairs and alterations;
- continuous analysis and surveillance;
- weight and balance program;
- extended operations (ETOPS);
- carry-on baggage;
- training of station personnel; and
- station facilities.

The ACEP evaluation of American Airlines took place from April to September 2009 and warrants discussion in the OIG report as ACEP evaluations are an important part of the FAA's oversight of part 121 air carriers. Furthermore, routine surveillance conducted by the American Airlines CMT discovered many of the weaknesses discussed in the report. In many cases, American Airlines failed to complete corrective actions in a timely and effective manner. We implemented a new software tool to help us make sure that airline performance improves in this regard (see below).

Overall, FAA initiated the following actions to strengthen its oversight of all air carriers:

1. **We are supplementing routine surveillance with a national air carrier evaluation program.** The national ACEP program uses a risk-based targeting process and ensures that all part 121 air carriers will be evaluated by national teams on a recurring basis. A component of the national program will be a comparative analysis of ACEP findings

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versus those discovered during routine surveillance. Where statistically significant differences exist, further analysis will seek root causes that result in system improvements such as changes to data collection tools, handbook guidance, or training curricula.

2. **We are following up on air carrier corrective actions using a new software tool.** We deployed the Corrective Action Tracking Tool (CATT) in our ATOS software to track timely, effective completion of corrective actions. CMT managers and principal inspectors must use the CATT to document corrective actions required of air carriers and to ensure that actions are completed in a timely manner.
3. **We are ensuring that inspectors follow FAA policy.** In addition to the national ACEP program, the FSEP is being used to assess whether FAA offices operate according to national policy. The objective of this program is to audit our offices to determine if they are providing surveillance and analysis of the ATOS program for performance and effectiveness and are implementing corrective action of any deficiency. This initiative was beta tested in July 2009. It was used effectively on an audit in November 2009. It is scheduled for five more audits through 2nd quarter of fiscal year 2010 and approximately 14 total audits for the fiscal year.

As a result, while FAA will continue along these and other lines to ensure that it provides useful and effective safety oversight to the nation's air carriers, no further action is necessary to address this recommendation.