FAA NEEDS TO IMPROVE RISK ASSESSMENT PROCESSES FOR ITS AIR TRANSPORTATION OVERSIGHT SYSTEM

Federal Aviation Administration

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Memorandum

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

Subject: <u>ACTION</u>: FAA Needs To Improve Risk Assessment Processes for Its Air Transportation Oversight System
Federal Aviation Administration
Report Number AV-2011-026

Date: December 16, 2010

From: Jeffrey B. Guzzetti
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  for Aviation and Special Program Audits
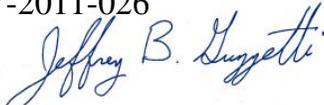
Reply to
Attn. of: JA-10

To: Federal Aviation Administrator

The Federal Aviation Administration (FAA) uses its Air Transportation Oversight System (ATOS) to conduct surveillance of nearly 100 airlines. These airlines transport more than 90 percent of U.S. airline passenger and cargo traffic. We have consistently reported that ATOS is conceptually sound because it is data-driven and intended to target inspector resources to the highest risk areas. However, in 2002 and 2005, we reported that FAA needed to strengthen national oversight of ATOS to hold field managers more accountable for consistently implementing effective oversight practices.[1] In 2008, safety lapses at Southwest Airlines exposed serious weaknesses in FAA's risk-based oversight process at that airline.

After hearings on the safety issues at Southwest, the Senate Committee on Science, Commerce, and Transportation and the House Committee on Transportation and Infrastructure requested that we review FAA's oversight of the U.S. airline industry. As a result of the weaknesses identified in our 2008 testimony,[2] the Committees asked us to determine if similar oversight weaknesses existed elsewhere in the system. Accordingly, our audit objectives were to determine (1) whether FAA has completed timely ATOS inspections of air carriers' policies and procedures for their most critical maintenance systems;

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[1] OIG Report Number AV-2002-088, "Air Transportation Oversight System," April 8, 2002.
OIG Report Number AV-2005-062, "FAA Safety Oversight of an Air Carrier Industry in Transition," June 3, 2005.
OIG reports are available on our website: www.oig.dot.gov.

[2] OIG Testimony Number CC-2008-046, "Actions Needed To Strengthen FAA's Safety Oversight and Use of Partnership Programs," April 3, 2008.

(2) how effective ATOS performance inspections have been in testing and validating that these critical maintenance systems are working properly; and (3) how well FAA implemented ATOS for the remaining Part 121[3] air carriers and what, if any, oversight challenges FAA inspection offices face. We conducted the audit from May 2008 through July 2010 in accordance with government auditing standards prescribed by the Comptroller General of the United States.

RESULTS IN BRIEF

FAA has worked to continuously improve its risk-based air carrier oversight system since introducing it in 1998. However, we identified three areas where FAA could improve its management and oversight of ATOS:

- FAA did not perform timely ATOS inspections of policies and procedures (i.e., design assessments) for air carriers' most critical maintenance systems. At all eight major air carriers we reviewed,[4] inspectors did not complete these inspections[5] within FAA's required 5-year interval—some had not been completed for nearly 8 years. For example, in three inspection offices, more than 5 years had lapsed between inspections of the Airworthiness Directive (AD) Management program, even though inspectors noted in ATOS that it had increased risk. Further, overdue inspections continued even after FAA reduced the number of maintenance programs that inspectors were required to review. Inspectors cited confusion with interpreting FAA guidance as one reason for not completing timely inspections. We also found that some inspections were overdue because FAA does not monitor inspections that have been scheduled but not yet assigned to an inspector.

- FAA inspectors did not effectively assess whether critical maintenance systems were performing as intended (i.e., performance assessments) due to three process weaknesses. First, like the design assessments, FAA did not complete these inspections in a timely manner. For example, at the 8 major air carrier inspection offices we reviewed, between fiscal year (FY) 2005 and FY 2009, inspectors did not complete 340 inspections on time. Second, ATOS design flaws allow lower risk maintenance programs to be inspected before higher risk programs. For example, at one FAA inspection office, the risk level for the air carrier's maintenance manual system had nearly doubled within 1 year; yet, it received lower inspection priority than the carrier's cargo handling program, which showed minimal risk. Third, inspectors were not using all

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[3] This refers to large, commercial operators regulated under 14 CFR Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations. These carriers operate larger aircraft with primarily scheduled flights.

[4] Alaska Airlines, American Airlines, Continental Airlines, Delta Air Lines, Northwest Airlines, Southwest Airlines, United Airlines, and US Airways. For this review, we visited each of these FAA air carrier offices except Southwest Airlines; instead, we conducted a review of inspection data to supplement our report.

[5] The terms "assessment" and "inspection" are used interchangeably in this report.

available safety data to assess risk. For example, inspectors' risk assessments did not include analyses of voluntary disclosure data (i.e., maintenance errors that air carriers self-report) or changes that occurred in the airline industry. These data are readily available and, if analyzed regularly, could be valuable risk indicators to monitor air carrier maintenance programs.

- Finally, FAA completed transitioning the remaining Part 121 air carrier inspection offices to ATOS at the end of 2007. However, at the time of our review, effective implementation of ATOS was hindered due to inspectors' frustrations with adapting ATOS principles to smaller carrier operations, citing problems with broad or redundant inspection checklist questions, air carrier staffing limitations, and insufficient data to support the ATOS "data-driven" approach. Our analysis shows that a contributing problem may be long gaps— 3 years or more—between when inspectors received initial system safety training and when they began actually using ATOS. While these inspection offices have not reached the end of their first 5-year inspection interval, these issues warrant attention to avoid overdue design assessments in the future.

Weaknesses in FAA's current ATOS approach hinder its ability to effectively target inspector resources to the areas of greatest need. We are making recommendations to FAA to improve its data, training, and risk assessment processes for ATOS.

BACKGROUND

In October 1998, FAA launched its data-driven, risk-based Air Transportation Oversight System at the 10 Part 121 air carriers[6] that transported the most passengers. Today, FAA inspectors use ATOS to conduct surveillance of air carrier maintenance and operations at 94 Part 121 U.S. air carriers. Under the ATOS concept, FAA inspectors apply system safety principles and use data analysis to focus their inspections on areas that pose the greatest risk and identify potential problems before accidents occur. ATOS also permits inspectors to shift the focus of their inspections in response to changing conditions within air carriers' operations. ATOS has three primary functions: assessments of air carrier system design, assessments of air carrier system performance, and risk management. All three of these functions require decisions by FAA inspectors and managers; therefore, ATOS is considered a decision support system.

- *Design assessments* are the most important ATOS function because safety is the outcome of a properly designed system. Inspectors evaluate air carriers'

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[6] The initial group of ATOS air carriers included: Alaska Airlines, America West Airlines, American Airlines, Continental Airlines, Delta Air Lines, Northwest Airlines, Southwest Airlines, Trans World Airlines, United Airlines and US Airways.

policies and procedures (typically through reviews of air carrier manuals) to determine if their operating systems comply with safety regulations and standards. Design assessments are required every 5 years.

- *Performance assessments* confirm that air carriers' operating systems produce intended results. Inspectors determine whether air carriers are following their FAA-approved procedures and that those procedures and operating systems are working as intended. Performance evaluations are conducted at prescribed intervals depending on the criticality level assigned to each air carrier program. Programs considered to be high-criticality[7] are inspected every 6 months, medium criticality every 12 months, and low-criticality programs every 36 months.

- *Risk management* is the ATOS function to identify and control unsafe situations. Inspectors examine air carrier processes dealing with hazards and associated risks that are subject to regulatory control (e.g., enforcement actions and rulemaking). FAA uses these analyses as a basis to target resources towards the most at-risk programs. Risk is determined by analyzing consequences relative to likelihood and severity and the combined effects are assessed to determine priorities when multiple risks are identified.

FAA HAS NOT COMPLETED TIMELY ATOS INSPECTIONS OF AIR CARRIERS' POLICIES AND PROCEDURES FOR KEY MAINTENANCE SYSTEMS

Overdue ATOS inspections have been a longstanding challenge for FAA in implementing its risk-based oversight system at major U.S. air carriers. Over an 8-year period, inspectors at all 8 major air carrier inspection offices in our review did not complete 207 key inspections of carriers' maintenance policies and procedures on time. This is despite changes FAA has made to ATOS over the last 10 years that actually decreased the number of maintenance programs inspectors were required to review and increased the intervals between inspections. Confusion over when design assessments should be completed was one reason cited by multiple inspectors for missing inspection intervals. Additionally, FAA Headquarters is not using available inspection status data to hold these offices accountable for overdue ATOS inspections. In our view, tracking all overdue inspections and using available data would assist FAA in achieving more timely and targeted ATOS inspections.

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[7] FAA defines high-criticality maintenance programs as those programs where the likelihood of a system failure could lead to an unsafe condition. Conversely, medium- and low-criticality maintenance programs are those less likely to produce an unsafe condition if they fail.

FAA Inspection Offices for Major Air Carriers Missed ATOS Design Assessments

From FY 2002 to FY 2009, all eight FAA major air carrier inspection offices we reviewed did not complete systemic ATOS reviews of air carrier maintenance policies and procedures (i.e., design assessments) on time. As shown in figure 1, four of the eight FAA inspection offices completed less than 50 percent of their inspection workload at the required interval; the US Airways inspection office completed slightly less than one-quarter of its workload on time.[8] As a result, any risks in the air carrier systems would remain "unknown" until inspections are completed.

Figure 1. Percentage of Design Assessments Not Completed Within Prescribed Intervals
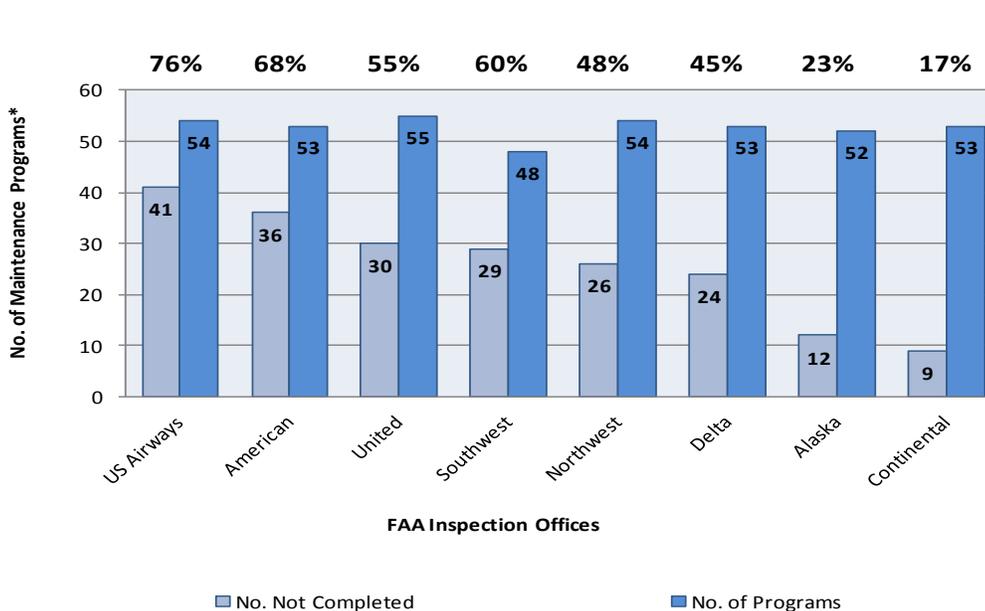
Source: OIG analysis of FAA data, FY 2002 – FY 2009
*Due to the unique operations of each air carrier, not all air carriers have the same type or number of maintenance programs; therefore, not all will apply.

As shown in table 1 below, the most commonly missed inspections of maintenance programs included reviews of air carrier manuals and training requirements for Required Inspection Items (RII).[9]

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[8] FAA office managers stated they had delayed completing these inspections because the air carrier was merging with America West Airlines, and they believed it would be more efficient to wait and review the maintenance programs once the merger was completed.

[9] RII are maintenance tasks that, if not properly performed or if done with improper parts or materials, could result in a failure, malfunction, or defect that would endanger the continued safe flight and landing of aircraft.

Table 1. Common Overdue Inspections at Eight FAA Offices

Maintenance Program Description	No. of Offices with Overdue Inspections for this Maintenance Program
Required Inspection Item Training Requirements	7
Availability (Manuals)	6
Manual Currency	6
Supplemental Operations Manual Requirements	6
Chief Inspector *	6
Director of Maintenance *	6
Parts/Material Control/Suspected Unapproved Parts	6
Engineering/Major Repairs and Alterations	4
Airworthiness Directive Management	3

Source: OIG analysis of FAA data, FY 2002 – FY 2009
*These inspections are used to validate the qualifications of the individuals holding these positions.

Two of the maintenance programs shown in table 1—Airworthiness Directive Management and Engineering/Major Repairs and Alterations—are considered high-criticality maintenance programs. Inspectors for five inspection offices identified increased risk levels (i.e., meaning vulnerabilities in these programs could negatively impact safety) in these programs during the time when they should have been inspected; however, at least 5 to 6 years had lapsed between inspections.

Principal inspectors stated that they missed inspection intervals due to confusion over FAA's guidance on when they should complete ATOS design assessments. According to these inspectors, the guidance only "suggested" a 5-year inspection cycle for this type of assessment. While this may have been the case when FAA issued guidance in 2001, it reissued the guidance in July 2007, in part, to clarify inspection requirements. The revised guidance explicitly stated that these assessments must be completed every 5 years. Our review showed that even after FAA clarified inspection interval requirements, inspections were still not completed on time.

FAA principal inspectors for Alaska Airlines informed us that because their office was transitioning to a newer version of ATOS in 2008, FAA Headquarters had permitted them to "reset the clock" on inspections nearing the 5-year time requirement. At that time, 10 design assessments were nearing their due dates and would be considered late under existing guidelines, if not completed. However, inspectors were later told to "hurry up and finish" any outstanding assessments. These inspectors stated that they believed FAA reversed its position due to the scrutiny that overdue ATOS inspections had received during congressional hearings in April 2008. These hearings likely served as a trigger to inspectors to complete overdue inspections. For example, after the hearings, the 8 major air carriers we reviewed completed 188 of 215 inspections (87 percent) that were overdue during FY 2002 through FY 2009.

Smaller Air Carrier Inspection Offices Also Face Overdue ATOS Design Assessments

In December 2007, FAA completed transitioning the remaining Part 121 inspection offices to ATOS oversight. Because FAA guidance requires design assessments to be completed every 5 years, the 12 smaller inspection offices in our review still have time to complete these assessments. However, at the time of our review, only 2 of the 12 FAA inspection offices had completed 50 percent or more of their inspections.

Inspectors for small air carrier offices face challenges in completing their assigned ATOS design assessments. This is due, in part, to the fewer number of inspectors assigned to oversee these carriers and the distance from their offices to air carrier headquarters and main maintenance bases. Inspectors assigned to small air carrier offices need more time to complete inspections than their larger air carrier counterparts because, while they usually have fewer aircraft to inspect and fewer inspectors on staff, they have nearly the same number of maintenance programs as large carriers. Table 2 shows the relationship of numbers of inspectors to the number of maintenance programs and size of air carrier fleet.

Table 2. Relationship of the Number of FAA Inspectors to Maintenance Programs and Aircraft Fleet Size

	No. of Inspectors	No. of Maint. Programs[10]	No. of Aircraft
Small Air Carriers	3 to 9	42 to 51	1 to 83
Major Air Carriers	15 to 32	48 to 55	117 to 750

Source: OIG analysis of FAA data

Also, we identified four inspection offices during our review that were either not located near the carriers' headquarters, main maintenance base, or even in the same country where the carrier conducts most of its operations. These inspectors expressed concerns about their inability to have timely access to observe aircraft maintenance operations. For example, FAA inspectors for Executive Airlines must travel from their office in Miami, Florida, to San Juan, Puerto Rico—where the aircraft are based—to perform inspections of the air carrier's headquarters and maintenance operations. Conversely, inspectors for major air carriers are often located near air carrier headquarters and major hubs around the country, allowing them easy access to review air carrier maintenance records and observe aircraft maintenance operations.

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[10] By March 2010, FAA completed action to eliminate or consolidate 27 air carrier maintenance inspection programs; therefore, the number of authorized programs is proportionately less now for each air carrier than during our review.

FAA Headquarters Does Not Track Overdue and Unassigned ATOS Inspections

FAA recently implemented a quarterly report to monitor field office inspections, but the report does not track overdue inspections that remain unassigned to an inspector or provide trend analyses of offices with habitually late inspections. Since July 2008, the Flight Standards Certification and Surveillance Division Manager has been sending these quarterly inspection status reports—commonly referred to as the Quarterly ADI[11] Completion Report—to regional managers. FAA initiated this process in response to our June 2008 report[12] in which we recommended that FAA implement a process to monitor field office inspections and alert local, regional, and Headquarters management of overdue inspections. Although it appears that FAA Headquarters has developed this report to monitor field inspections, the report does not include a cumulative data roll-up that could be useful in identifying problem offices where inspections are habitually late. As a result, Headquarters officials do not readily know if uncompleted inspections— whether assigned or unassigned—in that quarter would be scheduled and completed in the following quarters.

Inspections are automatically scheduled in ATOS based on intervals established within the system, and office managers assign inspectors to complete them. We examined FAA's quarterly reports from June 2008 through June 2009 and identified 237 scheduled inspections[13] that were left unassigned[14] and uncompleted. However, FAA did not use the Quarterly ADI Completion Report to track any of these to ensure they would be rescheduled and completed. For example, our review of ATOS data disclosed 11 inspections that were at least 90 days past due but not rescheduled. In other instances, inspection offices did reschedule unassigned inspections; however, as illustrated in table 3 below, projected completion dates for these inspections will be up to 4 years past the original due date. Inspectors had previously identified four of these programs as having increased levels of risk, meaning vulnerabilities in these programs could negatively impact safety.

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[11] ADI: Action, Determination, and Implementation is a process in ATOS designed to permit a principal inspector or management official to collect and analyze inspection data in order to make decisions to mitigate risks found during inspections of air carriers' operating programs.

[12] OIG Report Number AV-2008-057, "Review of FAA's Oversight of Airlines and Use of Regulatory Partnership Programs," June 30, 2008.

[13] These are Element Performance Inspections designed to assess whether critical maintenance systems are performing as intended.

[14] Unassigned inspections are scheduled in the ATOS automated system, but managers have not committed inspector resources to complete them.

**Table 3. Unassigned and Overdue Inspections
With Projected Completion Dates**

Inspection Program	Original Due Date	Revised Due Date	Time Past Due
Engineering/Major Repairs and Alterations*	Dec. 31, 2008	Dec. 31, 2012	**4 years**
Line Stations	Sept. 30, 2008	Sept. 30, 2012	**4 years**
Other Personnel with Operational Control*	Sept. 30, 2008	Dec. 31, 2011	**3 years, 3 months**
Training of Flight Attendants*	Dec. 31, 2008	June 30, 2010	**18 months**
Major Repairs and Alterations Records*	Sept. 30, 2008	Mar. 31, 2010	**18 months**
Deicing Program	Dec. 31, 2008	Mar. 31, 2010	**15 months**

Source: FAA ATOS repository, June 30, 2008 – June 30, 2009
*Inspection programs that were identified with elevated risk.

Unassigned inspections pose a significant problem for FAA because managers cited a lack of inspector resources needed to complete them. Our analysis of ATOS data showed that a lack of inspector staffing was cited in 165 of the 237 (70 percent) unassigned inspections over a 1-year period.

FAA Headquarters officials stated that not all scheduled ATOS inspections will be completed at the required interval and that, in their opinion, it is not practical or desirable to complete all inspections just for the sake of completing inspections. Therefore, Headquarters officials do not hold local inspection offices accountable for completing unassigned inspections because that would impede the time inspectors need to perform quality inspections for areas that pose greater risk. While we agree that higher-risk air carrier programs should be inspected ahead of lower-risk programs, inspectors still did not complete some of the unassigned inspections where they had found increased risk levels. All air carrier programs should be inspected at regular intervals to mitigate risk before system failure occurs.

FAA Inspections Were Late Despite Changes to ATOS That Decreased Inspectors' Workload

FAA has not met its ATOS inspection intervals despite cutting the number of maintenance programs requiring inspection nearly in half—from 59 to 31—over the last 10 years. According to FAA, these changes were intended, in part, to reduce redundancy in the system and more efficiently target inspector resources.

In FY 1999, ATOS required local inspection offices to complete a minimum of 151 maintenance inspections annually; now, they only have to complete 37 inspections (as shown in figure 2 below).[15] Over time, this resulted in a 75-percent reduction in workload for FAA inspectors. It also resulted in air

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[15] These numbers may be less based on the number of applicable maintenance programs at an air carrier.

carriers receiving fewer inspections during a time when the air carrier industry was facing record financial losses and making unprecedented changes to their operations (e.g., retiring and storing aircraft, making personnel cuts, and closing maintenance facilities) to regain profitability. An air carrier program, such as Airworthiness Directive Management, which had received a minimum of one quarterly inspection when ATOS was first implemented, now receives only two inspections annually, primarily as a result of FAA's revisions to ATOS, not because of reduced risks.

Figure 2. Reduction in the Minimum Number of Required Element Performance Inspections — FY 1999 - FY 2010
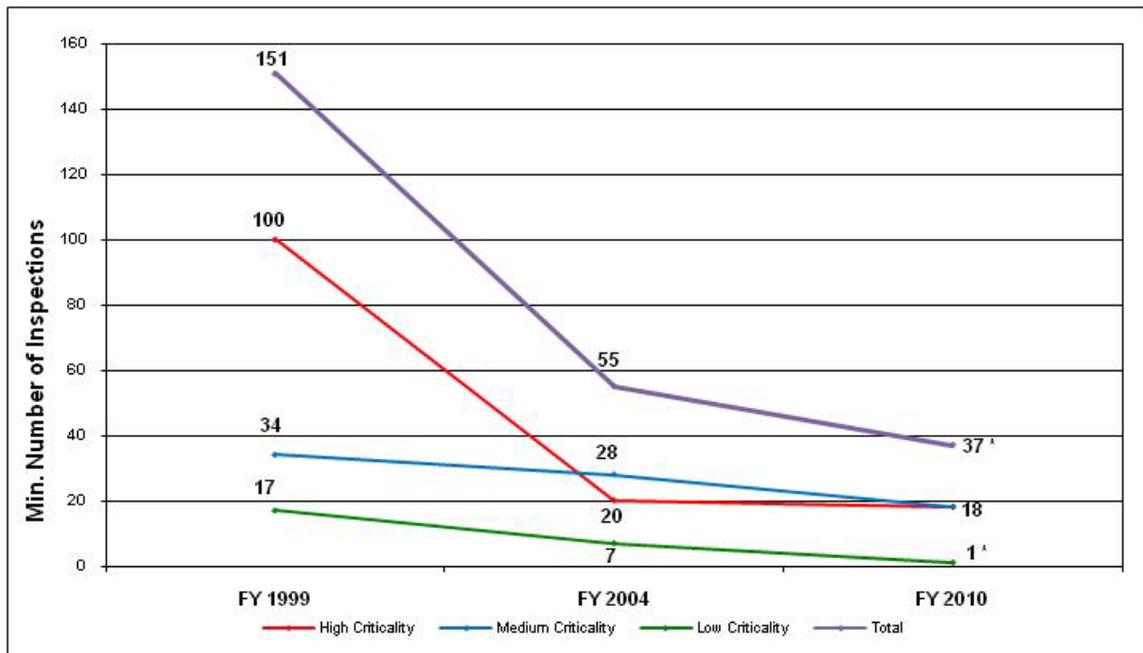
Source: FAA ATOS data
* Number rounded.

While fewer maintenance programs—and therefore fewer inspections—will reduce the likelihood of missed inspections, FAA's changes to ATOS may not necessarily result in more effective risk assessment processes.

Specifically, FAA did not base its decision to reduce, eliminate, or consolidate maintenance inspections on sound analytical support:

- In 2003, FAA convened a workgroup to review the risk assessment process in ATOS. The workgroup reviewed the criticality level (i.e., the likelihood that a system failure could lead to an unsafe condition) assigned to each air carrier maintenance program and recommended that 15 of the 25 high-criticality programs be downgraded to medium- and low-criticality levels. However, the

workgroup did not consider whether past inspection reports revealed any problems that would reverse their decision to make these changes.

- In March 2010, FAA again revised ATOS. In this revision, FAA eliminated or consolidated 27 maintenance programs into the remaining 31 programs, in part, to remove redundancy within ATOS. Similar to 2003, FAA did not analyze historical ATOS data to support its decision to make these changes. Instead, FAA relied on concerns inspectors voiced during their visits to local inspection offices (e.g., ATOS was difficult to use).

FAA views its latest decision to reduce the number of maintenance programs as a means of producing a more efficient oversight system by eliminating overlapping inspection areas. While this action has merit, it also seemed to focus on maintenance programs that had habitually late inspections, not just those with overlapping areas. For example, four[16] of the most commonly missed inspections (as previously shown in table 1) were eliminated or combined with other inspections based on FAA's revision to ATOS. As a result, these maintenance programs no longer exist as separate programs.

ATOS INSPECTIONS WERE NOT EFFECTIVE AT TESTING AND VALIDATING THAT CRITICAL MAINTENANCE SYSTEMS WERE WORKING PROPERLY

FAA inspectors did not complete ATOS performance assessments on time at all 8 major and 12 smaller air carrier inspection offices we reviewed despite having fewer maintenance programs to inspect. Performance assessments are intended to confirm that air carrier systems operate as required by Federal Aviation Regulations. Yet, over a 5-year period, inspectors did not complete 576 inspections at the required intervals. Additionally, ATOS was envisioned to be a risk-based oversight system, but we found the risk assessment process—the basis for prioritizing inspections for timely completion—does not give priority to maintenance programs where FAA inspectors found increased risk. Also, inspectors we interviewed were not analyzing voluntary disclosure data (i.e., maintenance errors that air carriers self-report) or industry events that could impact a carrier's performance and stability. Voluntary disclosure data and changes in the airline industry are important indicators of whether air carriers are properly maintaining their aircraft during times of economic downturn.

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[16] Required Inspection Item (RII) Training Requirements, Availability (Manuals), Chief Inspector, and Supplemental Operations Manual Requirements.

FAA Inspectors for Major Air Carriers Missed Timelines for Conducting ATOS Performance Assessments

FAA inspectors are required to conduct ATOS performance assessments of air carriers' policies and procedures at specified time intervals. Performance assessments have different inspection intervals than design assessments. For example, depending on the criticality (i.e., the likelihood that a system failure could lead to an unsafe condition) of a maintenance program, performance assessments are conducted at 6, 12, or 36-month intervals.

Between FY 2005 and FY 2009, inspectors at 8 major air carrier inspection offices did not complete 340 performance assessments within FAA's required time intervals to test whether air carriers' policies and procedures were operating effectively. Of the 340 missed inspections, 180 were high-criticality maintenance program inspections; the remaining 160 were medium-criticality inspections. As shown in figure 3, the Southwest Airlines inspection office missed the most (57) inspections at the required time intervals while the Delta Air Lines inspection office missed the least (26).

Figure 3. Number of Performance Assessments Not Completed at Required Intervals for Major Carriers — FY 2005 - FY 2009
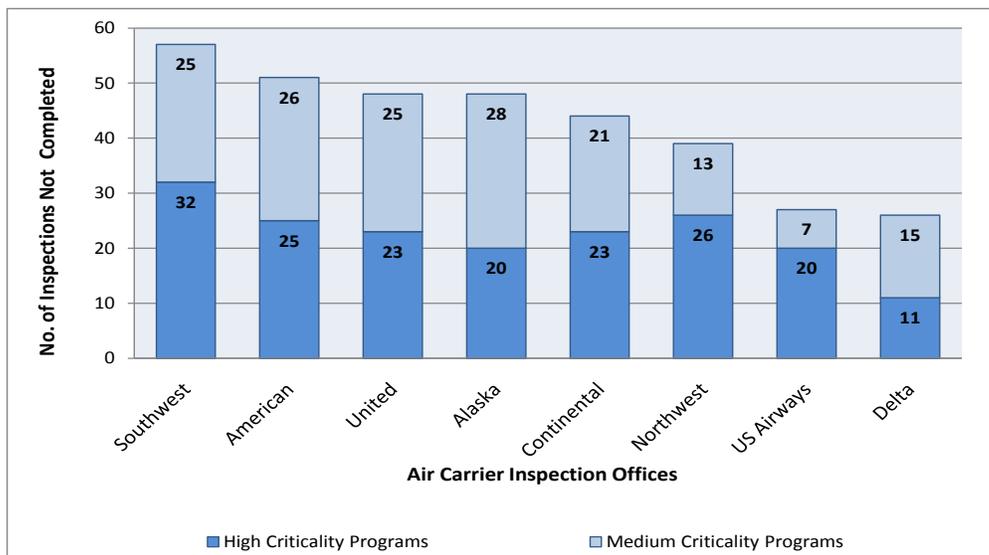
Source: OIG analysis of FAA data, FY 2005 – FY 2009

Examples of high-criticality inspections missed most often at major air carriers included the following:

- 30 Continuing Analysis and Surveillance System (CASS) inspections
- 28 Aircraft Reliability Program inspections
- 21 AD Management inspections

All air carrier maintenance programs are important, but these three programs are especially key because they are designed to: (1) monitor and analyze the performance of air carrier inspection and maintenance programs, (2) monitor failure rates of aircraft components, and (3) alert air carriers to potentially unsafe manufacturing defects in aircraft parts and components. Yet, our work has continually found that FAA has problems completing inspections of these programs on time. For example, between 2005 and 2007, FAA inspectors for American Airlines did not inspect the carrier's CASS and Aircraft Reliability programs.[17] Also, between 2006 and 2007, inspectors for Southwest Airlines did not inspect the AD Management program for almost 18 months.[18] On average, the number of days in which inspections were completed beyond their original due dates was 54 days for high-criticality and 96 days for medium-criticality programs.

Small Air Carrier Inspection Offices Also Missed Timelines for Conducting ATOS Performance Assessments

Twelve small air carrier FAA inspection offices we visited also did not meet inspection baseline intervals for 236 inspections.[19] These offices are required to complete performance assessments at the same time intervals as the major air carrier inspection offices. Of the 236 overdue inspections, 116 were high-criticality maintenance program inspections and the remaining 120 were medium-criticality inspections. As shown in figure 4 below, 7 of the 12 inspection offices did not complete 20 or more inspections within the required intervals.

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[17] OIG Report Number AV-2010-042, "FAA's Oversight of American Airlines' Maintenance Programs," February 16, 2010.

[18] OIG Report Number AV-2008-057, "Review of FAA's Safety Oversight of Airlines and Use of Regulatory Partnership Programs," June 30, 2008.

[19] Because these offices did not transition to ATOS at the same time, our analysis was limited to reviewing available data in the ATOS data repository from the time of each office's transition through the end of FY 2009.

Figure 4. Number of Performance Assessments Not Completed at Required Intervals for Small Carriers — FY 2007 - FY 2009
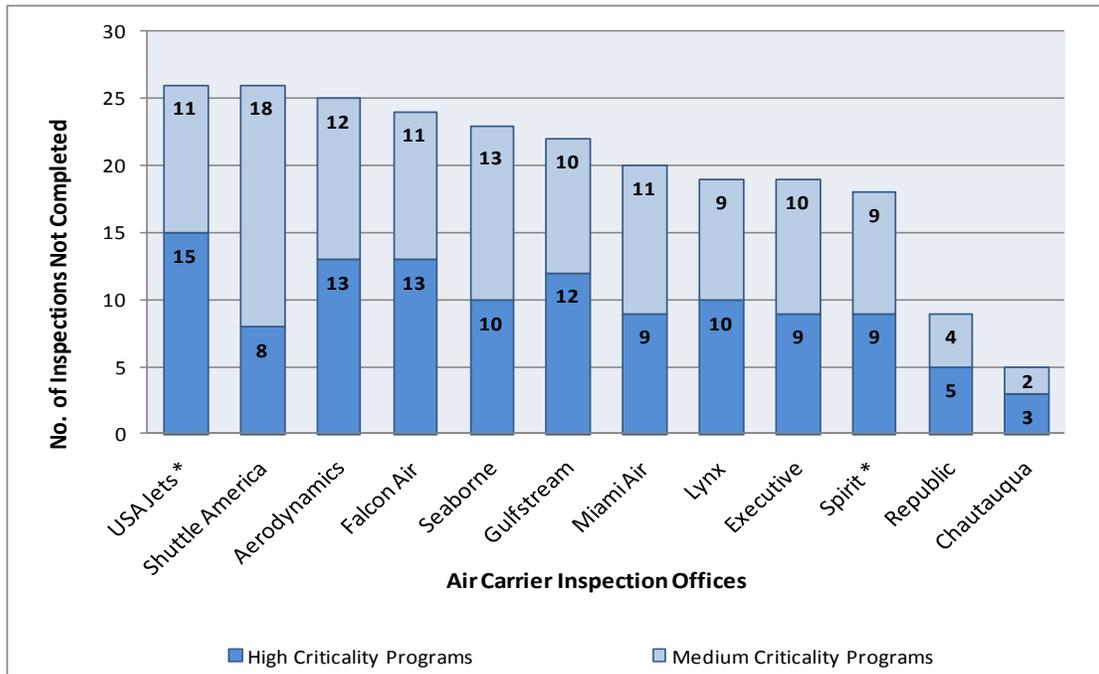
Source: OIG analysis of FAA data, FY 2007 – FY 2009
* Transitioned to ATOS in FY 2008

Examples of high-criticality inspections missed most often at small carriers included the following:

- 20 Engineering/Major Repairs and Alterations Program inspections
- 15 Maintenance Control Program inspections
- 15 CASS inspections
- 12 Aircraft Airworthiness inspections

Because these are high-criticality programs, FAA guidance requires that they be inspected every 6 months. Two local inspection offices that transitioned to ATOS at the end of FY 2007 did not complete timely inspections of the Aircraft Airworthiness and Engineering/Major Repairs and Alterations programs. When these two programs were finally inspected—12 and 18 months later, respectively—inspectors identified deficiencies. For example, at one air carrier, inspectors discovered that the carrier had not completed an audit of the maintenance records department to determine whether existing processes were effectively identifying problems and providing corrective actions. Until these overdue inspections were completed, the risks in these programs could only be described as "unknown" because inspections were not performed at the required intervals to monitor any changes.

ATOS Design Limitations Hinder Timely and Targeted Inspections

The ATOS system design prompts inspectors to place priority on programs that are not necessarily high risk.[20] This is because ATOS disproportionately weights maintenance programs designated as high-criticality over lower-criticality maintenance programs even though inspectors have identified deficiencies in the lower-criticality programs. As a result, lower-criticality maintenance programs with increased risk may not receive priority for inspection at required intervals.

ATOS is designed to assign high-criticality programs three times the baseline risk value of low-criticality programs. As a result, these programs will normally receive first inspection priority. For example, if an air carrier's Airworthiness Directive program is operating normally, it will be assigned a baseline risk value of 84 while an air carrier's maintenance manual program, with no risk, will receive a baseline risk value of 28. As a low-criticality program, an air carrier's General Maintenance Manual system, by itself, will not result in an unsafe condition on an aircraft. However, as the foundation for an effective aircraft maintenance program, without accurate manuals, maintenance errors can occur. We agree that high-criticality programs warrant vigilant FAA oversight, but they may not always present the highest risk to safe air carrier operations if inspectors have not identified any hazards in the programs.

Table 4 below shows how considering increased risk along with program criticality would impact inspections at one air carrier. As shown in the table, all but 1 of this carrier's top 10 maintenance programs listed in the column "Increased Risk Score" are high-criticality programs; therefore, they will receive priority for inspection even though 3 of them show no increased risk above their baseline score (84). However, the maintenance manual program nearly doubled in risk, but ranks only 35th in priority.

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[20] Maintenance programs can be designated as high-criticality (likely to produce unsafe results if the program fails), but may not be considered "high risk" if FAA inspectors have not found problems with the program.

Table 4. Example of an Air Carrier's Maintenance Programs Prioritized According to Highest Risk Score

Maintenance Program	Criticality Designation	Baseline Risk Score	Increased Risk Score *	Priority Ranking
Aircraft Airworthiness	H	84	141	1
AD Management	H	84	123	2
CASS	H	84	117	3
Line Stations	H	84	102	4
Maintenance Control	H	84	96	5
Outsource Organization	H	84	93	6
Weight & Balance	M	56	86	7
RII**	H	84	84	8
Engineering / Major Repairs & Alterations**	H	84	84	9
Cargo Handling Equipment, & Appliances**	H	84	84	10
General Maintenance Manual	L	28	53	35

Source: FAA ATOS data repository
*Increased risk scores are derived from inspectors' analyses of air carrier data and inspection reports, which indicate that the individual maintenance program is experiencing problems.
**These programs have no increased risk.

More emphasis on prioritizing programs with increased risk, regardless of the criticality designation, would allow FAA to better target inspector resources. Table 5 shows an example where calculating the percentage of increased risk should ensure that low-criticality maintenance programs with higher risks will receive the same consideration for inspector resources as high-criticality programs.

Table 5. Example of One Air Carrier's Maintenance Programs Prioritized According to Percentage of Increased Risk

Maintenance Program	Criticality Designation	Baseline Risk Score	Increased Risk Score	Initial Priority Ranking	% of Increased Risk to Baseline	New Priority Ranking
General Maintenance Manual	L	28	53	35	89%	1
Aircraft Airworthiness	H	84	141	1	68%	2
Weight & Balance	M	56	86	7	54%	3
AD Management	H	84	123	2	46%	4
CASS	H	84	117	3	39%	5
Maintenance Program	M	56	70	11	25%	6
Line Stations	H	84	102	4	21%	7
Maintenance Facility/Main Maintenance Base	M	56	66	12	18%	8
MIS Reports	L	28	33	36	18%	9
Service Difficulty Reports	L	28	33	38	18%	10

Source: FAA ATOS data repository

An internal FAA report issued in November 2008[21] stated that surveillance planning is mainly targeted to high-criticality programs and not enough inspections are directed toward low-criticality programs. FAA's report concluded that the ATOS system would miss low-criticality programs with high probability of risk and FAA should review how inspection offices target their surveillance planning to determine if ATOS should be modified to increase the frequency of inspections for low-criticality maintenance programs. We agree with this assessment, and FAA officials stated that the Agency is working to address this issue.

FAA Inspectors Do Not Analyze All Available Data Sources or Relevant Industry Events To Ensure Accurate Risk Assessments

Inspectors' risk assessment plans do not consider all available safety data; rather, they place more emphasis on the results of their surveillance activities and enforcement actions and do not fully analyze or trend data from the Safety Performance Analysis System (SPAS) database (e.g., hotline complaints and Service Difficulty Reports) or the Voluntary Disclosure Reporting Program (VDRP).[22] Disclosure data, which are not typically obtained through normal surveillance means, could serve as a valuable source of information to assist inspectors in monitoring the safety compliance and trends of their assigned carriers. For example, repetitive disclosures of mechanic errors at an air carrier should indicate to FAA that problems still exist in the carrier's maintenance training program.

None of the FAA inspection offices we visited performed ongoing trend analyses of voluntary disclosure reports to identify potential repeat violations. Disclosure reports we reviewed indicated inspectors were more concerned about whether the number of disclosures had increased rather than trending the data to look for repetitive submissions. Trending air carrier self-disclosure data is important to ensure that corrective actions are working and prevent abuse of the system. Such trend analyses would also benefit the risk assessment process because repetitive self-disclosures indicate that an air carrier is unable to correct identified maintenance deficiencies and would trigger inspectors to adjust the risk level of that maintenance program so that it receives an adequate level of inspection.

FAA recently took steps to ensure inspectors considered VDRP data as part of their normal surveillance planning by directing inspectors to review national trend analyses of VDRP data and identify potential safety risks. This is a good first step to ensure that self-disclosure data will receive heightened consideration.

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[21] FAA internal report dated November 2008. Availability determined by 5 USC §552.
[22] The VDRP provides air carriers with the opportunity to notify (self-disclose) FAA of known safety violations without fear of legal enforcement action.

However, FAA will need to closely monitor whether inspectors consistently apply the results of their reviews when developing their risk assessment plans.

In addition, inspectors do not fully consider events occurring in the air carrier industry that could impact maintenance programs within their assigned carrier. For example, while Delta Air Lines was merging with Northwest Airlines in 2008, FAA inspectors for both offices did not document potential concerns in ATOS to acknowledge these events. According to FAA guidance, identification of risks in areas such as "Merger or Takeover," "Reduction in Workforce," changes in "Financial Conditions," or "Labor-Management Relations" is likely to impact the carriers' ability to effectively manage their workforce. However, FAA inspectors' risk assessments of Delta and Northwest showed little to no increase for potential risk in these areas during the merger.

We also found that when inspectors did document risks, their risk assessment plans frequently lacked substantive supporting statements to justify why inspectors raised or lowered risk levels for each of the maintenance programs. ATOS guidance recommends that inspectors annotate reasons for adjusting risk levels; however, we examined risk assessments for eight major air carrier inspection offices and found inconsistencies. For example, inspectors at the Continental Airlines inspection office raised the level of risk for the Aircraft Airworthiness maintenance program based on vague justifications (e.g., "substantial number of human factors performance errors" and "large number of self disclosures") that did not identify the specific safety concerns that existed at the air carrier at the time of the risk assessment. Additionally, inspectors at the Southwest Airlines inspection office initially identified increased levels of risk for 10 ATOS maintenance programs but did not document reasons to support their actions. However, more than 5 months later, inspectors realized that they overstated the risk; yet, these programs received higher priority to be inspected first.

FAA stated that it is aware of the inconsistencies in how its field inspection offices assess risk and of the need to reevaluate whether all ATOS risk indicators should have equal weighting for each maintenance program. While this seems to be a practical approach to ensure that ATOS is truly a risk-based system, it could reduce the flexibility of ATOS to adapt to ever-changing conditions, especially since all air carriers do not operate in the same environment.

FAA INSPECTORS FOR SMALLER PART 121 AIR CARRIERS DID NOT EFFECTIVELY TRANSITION TO ATOS

FAA completed transitioning all of its Part 121 inspection offices to ATOS at the end of 2007; however, some inspectors for smaller air carriers expressed concerns with adapting ATOS to smaller carrier operations. Our work shows one reason for

this difficulty may be gaps between when inspectors received initial system safety training and their actual use of ATOS. Additionally, our discussions with supervisory inspectors indicate that they do not fully support or accept the ATOS concept due, in part, to the inspection checklist design. Our prior reviews and ongoing work, as well as an FAA internal review, have identified lack of management support for these initiatives as an obstacle to successful ATOS implementation.

Inspectors for Smaller Air Carriers Cited Frustration and Confusion with ATOS

Managers and inspectors at 12 FAA inspection offices for smaller air carriers that recently transitioned to ATOS cited concerns with the system's design such as inspection checklist questions, air carrier staffing limitations, confusion over how to record inspection findings, and insufficient data to effectively support the ATOS "data-driven" approach.

- **Inspector Frustration With ATOS Inspection Checklist Questions and Procedures:** At the time of our review, managers and inspectors we spoke with felt that ATOS questions were hard to understand and redundant. These inspectors also stated concerns that a system safety approach to air carrier oversight that required more time spent in front of a computer compromised the time needed to conduct actual hands-on inspections. FAA inspectors have voiced this complaint to us since we first began reviewing ATOS implementation in 2000. In 2009, FAA implemented changes to ATOS data collection tools, which simplified and removed redundant inspection questions. FAA also commissioned a Time Allocation Study,[23] which showed that inspectors actually spent less time using computer automation (less than one-third of an inspector's workweek was devoted to computer usage) than what was previously reported by inspectors.

- **Small Air Carrier Staffing Limitations:** Inspectors stated that ATOS was originally designed for oversight of larger air carriers that have access to fully staffed engineering and quality assurance departments. These carriers are better equipped to handle needed changes and respond to FAA inspection findings in a more timely fashion. Conversely, smaller air carriers typically have less staff—in some cases, one or two persons to handle an entire engineering program—to address required maintenance program changes. Therefore, smaller air carriers require more time to correct deficiencies identified during FAA inspections. As a result, air carriers could be operating unsafe aircraft or air carrier employees could be following deficient manual procedures while management is trying to make corrections to their programs.

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[23] This report was prepared for FAA by Booz Allen Hamilton in August 2009; availability determined by 5 USC §552.

- **Inspector Confusion Over How To Record Inspection Findings:** Several inspectors expressed concerns that the process for recording inspection findings in ATOS is confusing and difficult to adapt to smaller carrier operations. For example, an air carrier providing seaplane passenger service between islands in the Caribbean is more prone to experiencing airframe corrosion due to long exposure to salt water than aircraft operating in other environments. This is unique to this air carrier, and inspectors stated there is no place in ATOS to accurately record these findings because the ATOS checklist questions are too broad. In another example, an air carrier providing service to its sports franchise customers frequently flies into airports where the carrier has no established company maintenance, contract facilities, or gate personnel. As a result, the air carrier's mechanics routinely fly to the destination and provide on-call maintenance services, as needed. FAA inspectors expressed frustration with their ability to schedule and perform comprehensive inspections of this carrier due to the "on-demand" nature of the carrier's operations. Also, because these carriers operate in non-traditional environments, inspectors found it difficult to associate their inspection findings to structured ATOS checklists.

- **Data Limitations:** Inspectors did not know if ATOS was actually working for the carriers they oversee. Inspectors overseeing air carriers that operate only one or two aircraft are not seeing the benefits of a risk-based oversight system because there are not enough data to fuel the "data-driven" nature of ATOS.

The uniqueness of small air carrier operations raises questions about whether inspectors can adjust ATOS to the size and complexity of air carrier operations. Addressing these questions will be particularly important if FAA plans to expand ATOS as its oversight system. According to inspectors, FAA Headquarters was aware of the ATOS issues with these air carrier operations, and some of them were told that a scaled-down version of ATOS—or "ATOS Lite" as the inspectors referred to it—was in the works to address such issues. However, FAA contends that ATOS was originally designed to be scalable to any size air carrier operation.

Frustration With Training and Lack of Management Support Hinder Acceptance of ATOS at Smaller Inspection Offices

Inspectors expressed frustration with the gap between the time in which they received system safety training and when they actually began using ATOS to oversee their assigned air carrier. We surveyed 63 airworthiness inspectors[24] at the 12 small inspection offices we reviewed and found that they received initial system safety training, but in some cases, this training occurred as much as 6 years before they actually began performing inspections. For those inspectors who had

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[24] Airworthiness includes both maintenance and avionics specialties.

a gap of 3 or more years, nearly 70 percent reported being unable to recall and apply system safety concepts to answer ATOS inspection questions. Understanding and applying system safety principles is key to ensure that air carriers' maintenance programs work effectively and that ATOS contains accurate data.

In 2008, FAA commissioned an internal report to gauge the effectiveness of the transition from existing oversight systems to a newer ATOS version 1.2.[25] The report's findings reiterate our concerns. For example, specific issues regarding FAA's transition disclosed in the report included the following:

- Inspectors have a partial understanding of system safety theory and principles.

- Inspectors do not understand ATOS inspection checklist questions.

- Inspectors who transitioned to ATOS were generally more negative about the newer version of ATOS (1.2).

- Inspectors perceived that the new version does not adequately account for either air carrier size or scope of operations when planning for surveillance activities.

This report also highlighted inconsistent ATOS data reviews across local inspection offices and regions. More importantly, the report found that training for the new ATOS version was poorly received, which negatively affected the inspectors' acceptance of it. This complaint was exacerbated by the fact that FAA's study found that the lack of management buy-in and supervisory support for new initiatives were impeding ATOS acceptance and success. We also reported this issue with management support in our 2002 audit of the initial ATOS implementation.

The internal report also recommended the following actions to FAA:

- Enhance the workforce knowledge of system safety principles and their understanding of the ATOS inspection checklist questions.

- Evaluate the design of the new ATOS version as it relates to scalability across all Part 121 air carriers.

- Develop resources for use by field office managers and supervisors that support their understanding of effective ways to demonstrate ATOS buy-in.

- Develop supplemental training for inspectors using the new ATOS version.

- Conduct additional research to further understand ATOS version 1.2 implementation at other offices.

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[25] This report was prepared for FAA by Booz Allen Hamilton in July 2008; availability determined by 5 USC §552.

FAA has taken initial steps to address some of these recommendations. For example, as of April 2010, FAA has developed and implemented ATOS interactive training courses for managers and inspectors to emphasize the relationship between system safety principles and ATOS. More work remains to fully address the recommendations.

CONCLUSION

The United States has traditionally operated the safest air carrier system in the world, and risk-based oversight of air carriers is critical to ensure that the American public continues to have access to safe and reliable air transportation. FAA has faced many challenges in implementing ATOS since its inception, including the expansion of ATOS to all Part 121 air carriers. While FAA is making progress in addressing these challenges, a number of critical actions, such as ensuring accountability for overdue inspections and accurate and consistent risk assessment, are needed to ensure ATOS operates as originally intended. Without these improvements, FAA lessens its ability to effectively oversee the National Airspace System.

RECOMMENDATIONS

We recommend that FAA:

1. Redesign the Quarterly ADI Completion report to include cumulative roll-up data from previous quarters and conduct trend analyses that could be used to hold regional and local inspection offices accountable for scheduling uncompleted inspections.

2. Develop procedures to document justification for significant changes to ATOS (i.e., planned changes to alter the number of data collection tools or prescribed inspection time intervals).

3. Redesign the current risk assessment process within ATOS so that it appropriately prioritizes maintenance programs with the greatest percentage of increased risk (regardless of criticality level) for inspector resources.

4. Provide training to inspectors to help them more accurately interpret data from all available sources (i.e., self-disclosure data, ATOS Data Packages, events occurring in the aviation industry) and apply the results more consistently when planning risk assessments.

5. Evaluate ATOS to determine if it is designed to accurately record inspection findings unique to smaller air carrier operations.

6. Evaluate whether ATOS is scalable across all Part 121 air carriers.

7. Expedite enhancement of ATOS training methods (as identified in its 2008 internal report) to assist inspectors in understanding how to use ATOS data collection tools and increase their proficiency in using ATOS.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We discussed the results of our review with FAA's Deputy Director of Flight Standards Field Operations on July 13, 2010, and provided FAA with our draft report on September 23, 2010. We received the Agency's formal response on October 20, 2010, which is included in its entirety as the appendix to this report. FAA concurred with four of our seven recommendations and partially concurred with three. FAA agreed to implement actions we recommended to evaluate whether ATOS is scalable to all carriers; therefore, we are closing recommendation 6. FAA generally agreed with the remaining six recommendations, but did not propose actions that we consider sufficient to address our concerns. Therefore, we consider them as open and unresolved and request that FAA provide further information, as discussed below.

Recommendation 1: FAA stated that it had modified ATOS with a ghost icon to indicate that an inspection was not completed. However, this modification still does not provide Headquarters with a process that could be used to hold local inspection offices accountable for scheduling uncompleted inspections. Therefore, we request that FAA clarify its response or provide an alternative course of action that would meet the intent of this recommendation.

Recommendation 2: FAA stated that it has developed a Quality Management System (QMS) process to support its decision to revise ATOS Decision Collection Tools (DCT). However, during our audit, FAA officials never discussed developing a QMS process or how it would be used to support decisions to revise ATOS. Therefore, we request that FAA clarify how the QMS process will be used to document future changes to ATOS.

Recommendation 3: FAA stated that an ATOS process already exists that permits principal inspectors to manually adjust inspection priorities and that our recommendation to redesign the current risk assessment process is unwarranted. However, this process is neither automated nor objective. Further, it does not use the percentage of increased risk to determine when a maintenance program should be inspected. Therefore, we request that FAA reconsider its response or provide an alternative course of action to satisfy the intent of this recommendation.

Recommendation 4 and 7: FAA stated that it revised two ATOS training courses designed to provide newly assigned Part 121 inspectors and managers with in-depth coverage of risk assessment processes. We found, however, that existing inspectors and managers were not using all available data sources when analyzing risk. Therefore, we request that FAA clarify its planned action to provide training to existing inspectors and managers.

Recommendation 5: FAA stated that it completed revisions to its ATOS DCTs in July 2010 after our audit work was completed. Because these revisions to ATOS are still relatively new, we request that FAA provide us with additional details on how it will determine whether these changes have been effective in improving the accuracy of recording inspection findings unique to smaller air carrier operations.

ACTIONS REQUIRED

We consider all recommendations—except for recommendation 6—as unresolved and open, pending additional information from FAA. In accordance with Department of Transportation 8000.1C, we request that FAA clarify its response on actions it intends to take to fully address all recommendations along with estimated target completion dates. We would appreciate receiving this response within 30 calendar days.

We appreciate the courtesies and cooperation of FAA representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-0500 or Tina B. Nysted, Program Director, at (404) 562-3770.

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cc: FAA Associate Administrator for Aviation Safety
       Director of Flight Standards
       Anthony Williams, AAE-001
       Martin Gertel, M-100

EXHIBIT A. OBJECTIVES, SCOPE, AND METHODOLOGY

Our audit objectives were to determine (1) whether FAA has completed timely ATOS inspections of air carriers' policies and procedures for their most critical maintenance systems; (2) how effective ATOS performance inspections have been in testing and validating that these critical maintenance systems are working properly; and (3) how well FAA implemented ATOS for the remaining Part 121 air carriers and what, if any, oversight challenges FAA inspection offices face. We conducted this audit between May 2008 and July 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide 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 selected 20 FAA inspection offices for our review. Eight offices were selected because they have been under ATOS since FY 1999 and would provide the greatest amount of data for analysis. Also, these carriers and their affiliates are, in part, responsible for transporting more than 90 percent of passengers and air cargo in the United States. The remaining 12 inspection offices were chosen because they were new to using ATOS in the last 3 years, and some of these carriers participate in multiple code-sharing agreements with major air carriers. At the time of our review, there were 104 FAA Part 121 air carrier inspection offices that transitioned to ATOS. Exhibit B lists the entities we contacted or visited during our review.

We evaluated ATOS oversight and implementation at the national, regional, and local levels. To accomplish this, we interviewed officials from FAA Flight Standards Service to obtain information regarding ATOS implementation to determine the effectiveness of FAA's national oversight of the ATOS program. We also contacted Division Managers for all eight FAA Regional Flight Standards Offices (Alaska, Central, Eastern, Great Lakes, Northwest Mountain, Southern, Southwest, and Western-Pacific) to obtain their input as to the usefulness of FAA Headquarters' Quarterly ADI Completion Reports.

We interviewed FAA Managers, Principal Airworthiness Inspectors, Aviation Safety Inspectors, and Operations Research Analysts to determine what processes, procedures, guidance, and data they use to conduct ATOS inspections and analyze data. Our review also included analyses of ATOS design and performance assessments obtained from FAA's Safety Performance Analysis System and the ATOS data repository for FY 2002 through FY 2009 to determine the timeliness of completing inspections. For our review, we evaluated whether inspectors completed design assessments within the 5-year interval and performance

assessments within the 6, 12, or 36-month interval requirements, as prescribed by FAA. Assessments that were not completed within the required intervals were considered overdue.

For this analysis, we determined the date when an inspection of a maintenance program was completed and then, using FAA's guidance for prescribed time intervals, we measured the time difference to the next time this same maintenance program was inspected. FAA revised the ATOS program in 2004, which included increased time intervals; therefore, we chose to begin our analysis of performance assessment data starting with FY 2005. Finally, we surveyed all 63 airworthiness inspectors from the 12 small inspection offices to obtain their personal impressions of system safety and ATOS.

Exhibit A. Objectives, Scope, and Methodology

EXHIBIT B. ACTIVITIES VISITED OR CONTACTED

FEDERAL AVIATION ADMINISTRATION

Headquarters:

Aviation Safety (AVS)	Washington, DC
Flight Standards Service (AFS)	Washington, DC

Regions*:

Alaska Region	Anchorage, AK
Central Region	Kansas City, MO
Eastern Region	Jamaica, NY
Great Lakes Region	Des Plaines, IL
Northwest Mountain Region	Renton, WA
Southern Region	College Park, GA
Southwest Region	Fort Worth, TX
Western-Pacific Region	Los Angeles, CA

Local Inspection Offices for:

Aerodynamics	Belleville, MI
Alaska Airlines	SeaTac, WA
American Airlines	Fort Worth, TX
Chautauqua Airlines	Plainfield, IN
Continental Airlines	Houston, TX
Delta Air Lines	College Park, GA
Executive Airlines	Doral, FL
Falcon Air	Doral, FL
Gulfstream Airlines	Doral, FL
Lynx Aviation	Doral, FL
Miami Air International	Doral, FL
Northwest Airlines	Bloomington, MN
Republic Airlines	Plainfield, IN
Seaborne Virgin Island	Doral, FL
Shuttle America	Plainfield, IN
Southwest Airlines**	Dallas, TX

*Contacted only to obtain clarifying data
**Did not visit; performed data analyses only

Exhibit B. Activities Visited or Contacted

Spirit Airlines	Belleville, MI
United Airlines	Daly City, CA
US Airways	Coraopolis, PA
USA Jet Airlines	Belleville, MI

Other FAA Offices:

Seattle Aircraft Certification Office	Renton, WA

AIR CARRIERS*

Republic Airlines	Indianapolis, IN
Shuttle America	Indianapolis, IN

*Contacted only to obtain clarifying data

Exhibit B. Activities Visited or Contacted

EXHIBIT C. MAJOR CONTRIBUTORS TO THIS REPORT

Name	Title
Tina Nysted	Program Director
Kevin George	Project Manager
Anne Longtin	Senior Analyst-in-Charge
Galen Steele	Senior Auditor
Jeannette McDonald	Senior Analyst
Sara Gragg	Analyst
Stefanie McCans	Senior Analyst
Travis Wiley	Senior Analyst
Andrea Nossaman	Writer-Editor

Exhibit C. Major Contributors to This Report

APPENDIX. AGENCY COMMENTS

# Federal Aviation Administration

Memorandum

Date: October 20, 2010

To: Jeffrey B. Guzzeti, Assistant Inspector General for Aviation and Special
              Program Audits

From: Clay Foushee, Director, Office Audit and Evaluation, AAE-1
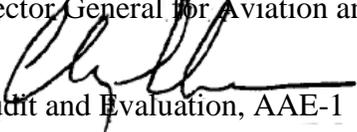
Prepared by: Anthony R. Williams, x79000

Subject: OIG Report: FAA Needs to Improve Risk Assessment Processes for Its
              Air Transportation Oversight System (ATOS)

The Air Transportation Oversight System (ATOS) is an ambitious attempt to utilize the best available data sources to detect and predict safety trends, and use those trends as a tool to prioritize risk areas that could benefit from increased surveillance. The FAA recognizes that ATOS still has limitations, and as such, the system is subject to continuous refinement to improve its capabilities. As a result of this continuous improvement process, FAA has already addressed many of the issues identified in the OIG draft report, which includes cases that date as far back as 1999. Since accurately predicting risk factors is an imprecise science, ATOS is just one of a number of methods the FAA uses to inform decisions about the allocation of aviation safety inspector resources. Despite its limitations, ATOS provides useful information to help better focus FAA's safety inspection activities. As a result, the most critical inspections are now being completed in a timely manner, and FAA is better able to identify and defer, low risk inspections to better focus its inspection activities on the most critical safety priorities.

The draft report's acknowledgement that ATOS is conceptually sound is reassuring as FAA continues to evolve its oversight systems to take full advantage of system safety frameworks including the integration of other safety management systems. For example, FAA is developing the Safety Assurance System (SAS), with system implementation planned for 2013. SAS will employ enhanced analytic processes focused on hazard identification, risk mitigation, and validation of risk control effectiveness as a result of lessons learned during ATOS development and implementation. We anticipate that SAS will further improve FAA's analytic capabilities, enabling even more precise focus on the most important safety priorities.

Recommendations and Responses

OIG Recommendation 1: Redesign the Quarterly ADI [Assessment Determination and Implementation] Completion report to include cumulative roll-up data from previous quarters and conduct trend analyses that could be used to hold regional and local inspection offices accountable for scheduling uncompleted inspections.

FAA Response: Partially concur. FAA has already taken action to ensure that uncompleted inspections (design and performance assessments) are rescheduled when justified by their relative risk. The agency modified the ATOS software in April 2010 to employ a "ghost" icon that represents an assessment that did not have resources assigned to it and, therefore, was not completed. The icon automatically appears in the calendar quarter subsequent to the quarter in which the assessment was not completed. Consequently, uncompleted assessments from a previous quarter will compete for resources with assessments scheduled for the current quarter, and principal inspectors have the opportunity to make priority adjustments based on the fact that an assessment has been deferred.

Each calendar quarter, principal inspectors rank all of the ATOS assessments due in that quarter according to their relative safety risk. This process provides an additional check to ensure that managers assign inspectors to assessments with the highest risk and work down the priority list until expending all resources. ATOS-generated inspections may be deferred for other acceptable reasons. For example, if an air carrier is required to make changes to its flight crewmember training program due to observed deficiencies, there is no point in assessing the performance of the training program until the changes are complete. Another example would be a principal inspector deferring an assessment so something that has not been assessed for an extended period can receive attention, even though it might have a lower ATOS risk value.

After years of experience with ATOS and because of inspector resource limitations, FAA recognizes the importance of maintaining high standards for inspection quality, even if that means it will not complete every ATOS-scheduled inspection. Principal inspectors and their front-line managers are responsible for making decisions on the best use of resources, using the best available data and knowledge. As described in FAA's September 2009 Report to Congress,[1] FAA depends on front line managers to make resource allocation decisions to focus their limited resources as effectively as possible. It is unwise to override local decisions on resource allocation based on national trend analyses. Further, unexpected incidents and findings from surveillance activities will always require priorities to shift and be redefined, and a strict adherence to ATOS-defined schedules would not be in the best interests of aviation safety.

The Quarterly ADI Completion report, referenced in OIG's recommendation, is used to update a dashboard used by the Associate Administrator for Aviation Safety to track the status of a variety of programs. The report is also sent to all Flight Standards (AFS)

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[1] Please see FAA's September 21, 2009, Report to Congress: Semi-Annual Overdue Safety Attribute and Element Performance Inspections.

Appendix. Agency Comments

regional division managers. It is effective for its intended purpose, which is to hold certificate-holding offices accountable for completing "assigned" inspections (those with resources assigned to them) in accordance with the principles of a risk-based oversight system, i.e., using available resources to accomplish the highest priority work. Certificate management teams (CMT) are expected to complete assigned inspections in accordance with ATOS policy. After we began tracking trends in accomplishing <u>assigned</u> assessments in the 3rd quarter of 2008, 100 percent of them have been completed on time. This was not the case before we began tracking them. The Quarterly ADI Completion report also tracks "unassigned" assessments (those that did not have resources assigned to them) at the regional level.

The utility of this OIG report finding could be enhanced if it offered greater emphasis on assigned ATOS inspections rather than simply focusing upon all uncompleted ATOS-scheduled inspections, as these inspections reflect higher priorities. Unassigned assessments equate to the "uncompleted inspections" referenced in the OIG recommendation. ATOS policy establishes how often inspectors conduct design and performance assessments (baseline frequency). Inspectors must conduct design assessments every 5 years. FAA considers a design assessment completed in the past 5 years as up-to-date. We intend to accomplish all design assessments as close as possible to the baseline, 5-year interval. However, current ATOS policy permits design assessments to be completed beyond their 5-year due dates if Principal Inspectors document a risk-based rationale for doing so in ATOS automation.

 Similar criteria apply to performance assessments. Inspectors must conduct performance assessments every 6 months, 1 year, or 3 years, depending on the criticality[2] of a failure in the program element assessed. An assessment can be scheduled to be completed before its baseline due date. When this occurs and the assessment is not completed, it will be an "uncompleted inspection" by the criteria used in the OIG recommendation, but it will not be overdue in relation to its baseline frequency. The agency prepares an ad hoc report to track overdue assessments. In the future, we will produce this report each calendar quarter and provide it to AFS regional division managers.

The intent of this recommendation is met. We request that it be closed.

<u>OIG Recommendation 2</u>: Develop procedures to document justification for significant changes to ATOS (i.e., planned changes to alter the number of data collection tools or prescribed inspection time intervals).

<u>FAA Response:</u> Concur. FAA has documented procedures for making significant changes to ATOS as part of the agency's ISO 9001-registered quality management system (QMS), which was not considered as part of the OIG audit. These QMS processes and work instructions are used when we make changes such as policy revisions, automation changes, data collection tool revisions, and certification process changes.

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[2] The criticality of an air carrier operating system (e.g., deicing, fueling, flight crewmember training) is categorized as high, medium, or low based on the likelihood that a failure in the system will result in an unsafe condition.

Appendix. Agency Comments

The most recent changes to the data collection tools (DCT) were made by AFS subject matter experts, who followed a process approved and overseen by management. These changes to the DCTs eliminated redundant questions and combined several elements so that ATOS procedures and tools would be more efficient and easier to use by small CMTs. If a future safety-mandated, significant change becomes necessary, we will follow our QMS processes and document the justification for the change.

The intent of this recommendation is met. We request that it be closed.

OIG Recommendation 3: Redesign the current risk assessment process within ATOS so that it appropriately prioritizes maintenance programs with the greatest percentage of increased risk (regardless of criticality level) for inspector resources.

FAA Response: Partially concur. FAA agrees that the ATOS methodology for prioritizing risk could benefit from further improvement and is being continually refined as a result of our experience with the system, and with ever-changing risk profiles within the industry. Earlier versions of ATOS used an algorithm that calculated percentage of increased risk to trigger an increased level of criticality for an inspection element. However, this does not necessarily equate to significantly increased safety criticality because the element may be a low priority item in which failure would have limited consequences. The criticality of an ATOS element should be determined by the likelihood that a failure in the system represented by the element could lead to a significantly unsafe condition or failure. In other words, critical items are those in which failure would more likely lead to an incident or accident. FAA has developed and implemented such methodology.

FAA also recently convened a panel of subject matter experts to study ways to improve the Air Carrier Assessment Tool (ACAT), including several alternatives that would allow for lower-criticality elements to compete more successfully for resources. Given the planned future enhanced system assessment tools (SAS), the cost of re-engineering the ATOS software to accommodate these changes is not warranted; however, this will be addressed in SAS.

As noted above, a process has been implemented that allows principal inspectors to adjust inspection priorities in the current ATOS system. This process allows principal inspectors to adjust ATOS assessment priorities if there are overriding factors such as significant changes in risk indicators or an extended time since the last assessment. FAA Order 8900.1, Flight Standards Information Management System, volume 10, chapter 2, includes examples of why a principal inspector may adjust the priority of an assessment. Examples include:

- Results of a bottom-line assessment for that element.

- Status of the element in relation to the 6-month, 1-year, 3-year performance assessment review cycle, or the 5-year design assessment cycle.

- Any increase or decrease in the risk score over time.

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- Assignment of assessment completion dates based on the highest risk.

- New elements that are added as a result of major changes to air carrier operations.

- Work that was unassigned in the previous planning cycle that may have a higher priority level for the current planning cycle.

We believe these procedures enable principal inspectors to adjust assessment priorities as intended by OIG's recommendation. Consequently, the intent of this recommendation is met, and we request that it be closed.

OIG Recommendation 4: Provide training to inspectors to help them more accurately interpret data from all available sources (i.e., self-disclosure data, ATOS Data Packages, events occurring in the aviation industry) and apply the results more consistently when planning risk assessments.

FAA Response: Concur. FAA has deployed two new courses for ATOS aviation safety inspectors (ASI), principal inspectors, and managers. They are FAA course 21000051, ATOS 1.2 Interactive Training for Aviation Safety Inspectors; and FAA course 21000052, ATOS 1.2 Interactive Training for Principal Inspectors and Managers. Both courses underwent a major update this summer (2010). The revised course curriculum for course 21000052 for principal inspectors and managers provides in-depth coverage of the risk assessment process using ACAT risk indicators and demonstrates how they can be affected by reports available in the Safety Performance Analysis System, including the ATOS data packages referenced in the OIG recommendation. The course also emphasizes using operational research analysts to assist in the interpretation of data and adjustment of risk scores. This course is required for all newly assigned principal inspectors and managers. By December 31, 2010, we will complete a review of this revised course to determine if additional enhancements would be useful.

OIG Recommendation 5: Evaluate ATOS to determine if it is designed to accurately record inspection findings unique to smaller air carrier operations.

FAA Response: Partially concur. The examples of CMTs having difficulty using ATOS DCTs seem to be unique—in one case a seaplane operator and in the other a service provider to sports franchise customers. Redesigning ATOS software to make changes to the data recording process would be very expensive and is not justified for a few relatively unique operations.

FAA's recent revision to the DCTs, completed in July 2010, was largely in response to inspector input gathered during extensive listening sessions with small, medium, and large CMTs. The modifications combined elements, eliminated redundancies, clarified questions, and applied plain language to make it easier to answer DCT questions and record results. Inspectors now have the option of entering comments for "yes" answers to DCT questions as well as to "no" answers. These revisions, completed in large part after the timeframe of OIG's audit, address most of the concerns of smaller CMTs. These actions are responsive to the intent of this recommendation, and FAA requests that it be closed.

Appendix. Agency Comments

OIG Recommendation 6: Evaluate whether ATOS is scalable across all Part 121 air carriers.

FAA Response: Concur. FAA has completed the recommended evaluation based on our responses to recommendations 1 and 5, and is confident that ATOS is as scalable as is feasible given ATOS' remaining life span. Scalability is a major design requirement for the AFS SAS. Significant attention and resources are being devoted to ensuring the AFS SAS can be effectively used by small and large CMTs. Extensive documentation of the AFS SAS design requirements is available for the OIG's review. Consequently, we believe we have met the intent of this recommendation, and we will enhance the scalability of our oversight system when SAS is deployed in 2013. We request that this recommendation be closed.

OIG Recommendation 7: Expedite enhancement of ATOS training methods (as identified in its 2008 internal report) to assist inspectors in understanding how to use ATOS data collection tools and increase their proficiency in using ATOS.

FAA Response: Concur. Two new courses were developed for ATOS aviation safety inspectors (ASI), principal inspectors, and managers. They are FAA course 21000051, ATOS 1.2 Interactive Training for Aviation Safety Inspectors; and FAA course 21000052, ATOS 1.2 Interactive Training for Principal Inspectors and Managers. These courses incorporate recommendations from the 2008 internal report. Both courses underwent a major update this summer (2010).

The walk-through and operational try-out of revised course 21000051 were completed on August 27 and September 18, 2010, respectively. The course prototype is scheduled for October 8 through 14. Course 21000051 for ASIs includes training on understanding and use of DCTs as OIG recommends. All newly hired ASIs are required to complete this course. The course focuses on ATOS functions that are essential for job performance, including data collection and reporting. The course curriculum is available for the OIG's review.

The prototype of revised course 21000052 was completed on July 29, 2010. Two classes of the revised course for principal inspectors and managers have been taught since then.

All of the recommendations of the 2008 internal report are closed either by incorporating them into ATOS training and processes or referring them to the Systems Approach to Safety Oversight Program Office for inclusion in the AFS SAS. A copy of the 2008 report and its disposition is available for the OIG's review. Consequently, we request that this recommendation be closed.

Appendix. Agency Comments